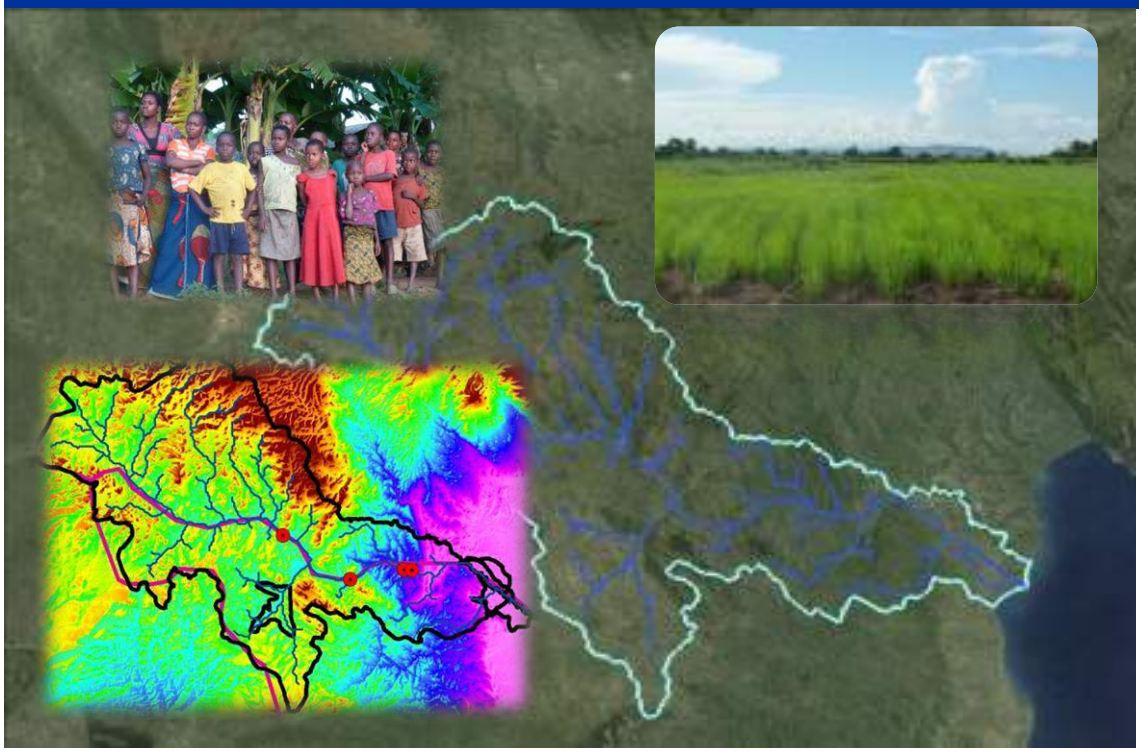
A Joint Project between the Governments of the
Republic of Malawi and the United Republic of Tanzania
funded by African Development Bank / AWF / NEPAD

DETAILED DESIGN AND INVESTMENT PREPARATION PROJECT FOR THE SONGWE RIVER BASIN DEVELOPMENT PROGRAMME

SRBDP VOLUME 1

SUMMARY OF THE SRBDP



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FINAL

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Acronyms and Abbreviations

a	annum (year)
AfDB	African Development Bank
AWF	African Water Facility
B/C ratio	Benefit / cost ratio
CBA	Cost Benefit Analysis
CoM	Council of Ministers
cm	Centimetre
CSO	Civil Society Organisation
DDIP	Detailed Design and Investment Preparation
EA	Executing Agency
EIRR	Economic internal rate of return
ENB	Economic net benefits
ESAP	Environmental and Social Assessment Procedures (of AfDB)
ESCOM	Electricity Supply Corporation of Malawi Ltd
ESIA	Environmental and Social Impact Assessment
EUR	Euro
EWURA	Energy and Water Utilities Regulatory Authority (Tanzania)
2003 FS	Feasibility Study conducted by Norplan in 2003 (Stabilisation of the Course of the Songwe River Basin)
FAO	Food and Agriculture Organisation (of the UN)
FSL	Full Supply Level
GPS	Global positioning system
GVP	Gross value of production
GW	Gigawatt
GWh	Gigawatt hour
ha	hectare
HPP	Hydropower Plant
IFI	International Financing Agency
IWRM	Integrated Water Resources Management
JCO	Joint Committee of Officials
JSC	Joint Steering Committee
kg	Kilogram
km	Kilometre
km^2	Square kilometre
kW	Kilowatt
kWh	Kilowatt hour
l	Litre
LRMC	Long-run Marginal Costs
LSRM	Lower Songwe River Malawi (Irrigation and Drainage Scheme)
LSRT	Lower Songwe River Tanzania (Irrigation and Drainage Scheme)
m	Metre
m^2	Square metre
m^3	Cubic metre
MAIWD	Ministry of Agriculture, Irrigation and Water Development (Malawi)
MAREP	Malawi Rural Electrification Programme
m asl	Metres above sea level
MERA	Malawi Energy Regulatory Authority
MDGs	Millennium Development Goals
MGDS	Malawi Growth and Development Strategy

Mio.	Million
mm	Millimetre
MOL	Minimum Operating Level
MWh	Megawatt hour
MWK	Malawi Kwacha
NPC	National Project Coordinator
NEPAD	New Partnership for Africa's Development
NGO	Non-Government Organisation
NPV	Net present value
NWDP	National Water Development Program (2009-2013) (Malawi)
SESA	Strategic environmental and social assessment
O&M	Operation and Maintenance
PM	Project Manager
PMU	Project Management Unit
RAP	Resettlement Action Plan
REA	Rural Energy Agency (Tanzania)
REMC	Rural Electrification Management Committee (of Malawi)
s	second
SADC	Southern African Development Community
SC	Steering Committee
SDC	Swiss Development Cooperation
SESA	Strategic Environmental and Social Assessment
SRB	Songwe River Basin
SRBC	Songwe River Basin Commission
SRBDP	Songwe River Basin Development Programme
SRTCMP	Songwe River Transboundary Catchment Management Project
t	Tons
TANESCO	Tanzania Electric Supply Company
TASAF	Tanzania Social Action Fund
ToR	Terms of Reference
TZS	Tanzanian Shilling
US$	United States Dollar
VAT	Value added tax
vs.	Versus
WSSP	Water Sector Support Project (2007-12) (Tanzania)
WUA	Water User Association
WWF	World Wide Fund for Nature

1 INTRODUCTION

1.1 DESCRIPTION OF THE REPORT

This document is Volume 1, SRBDP Summary of four volumes of the Final Report of the Songwe River Basin Development Programme. The SRBDP as a whole is made up of three Sub-Programmes:

1. Community Development Sub-Programme, reported in Volume 2
2. Natural Resources and Land Use Management Sub-Programme, reported in Volume 3
3. Economic Development Sub-Programme, reported in Volume 4

The four volumes of the SRBDP documents have been prepared under the Detailed Design and Investment Preparation (DDIP) phase of the Songwe River Basin Development Programme (SRBDP). DDIP-SRBDP is a multipurpose and multi-objective project with the main goals of improving the livelihoods of the people of, and reducing poverty in, the Songwe River Basin (SRB). This, Volume 1, is intended to be read in conjunction with the other three volumes.

Additionally, the DDIP-SRBDP project has produced several reports over the two years of the project. The documents with the closest links to this report are:

- Update of the 2003 Feasibility Study: April 2014
- Shared Vision 2050: April 2014
- Water Related Social Infrastructure: April 2015
- Business Plan for the SRBC: April 2015

The other documents prepared under this project are:

- Inception Report: May 2013
- Strategic Environmental Assessment for the SRBDP: April 2014
- ESIA Scoping Report: June 2014
- Convention for the Songwe River Basin Commission (SRBC): September 2014
- Songwe River Basin Development Programme: April 2015
- Detailed Design for the Stabilisation of the Lower Songwe River: April 2015
- Detailed Design for Water Supply for Kasumulu Town and Lower Songwe Communities: June 2015
- Detailed Design for Water Supply for Songwe Town and Lower Songwe Communities: June 2015
- Detailed Design and Tender Documents for the Lower Songwe Dam and HPP: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Tanzania Irrigation and Drainage Scheme: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Malawi Irrigation and Drainage Scheme: June 2015

- Environmental and Social Impact Assessment: April 2015
- Resettlement Action Plan for the Lower Songwe Dam and HPP: April 2015
- Resettlement Action Plan for the Lower Songwe River Irrigation and Drainage Schemes: April 2015

1.2 THE DDIP-SRBDP PROJECT

The Songwe River Basin Development Programme is a bilateral initiative between Malawi and Tanzania on the transboundary Songwe River.

Initiated more than a decade ago by the concern for stabilising the meandering course of the lower Songwe River, as it forms the border between Malawi and Tanzania, the DDIP - SRBDP project has grown to become a major international, transboundary river basin development programme consisting of significant multipurpose water resources and power infrastructure, the establishment of an international joint commission to manage the water resources of the basin and further investments aimed at improving the livelihoods and opportunities of the people of the Songwe River Basin.

The stated goal of the SRBDP is to contribute to the economic growth, reduced poverty, improved health and living conditions, and enhanced food and energy security for the people of the Songwe River Basin in the context of the overall economic development of the two countries.

The project objectives are to assist the two countries in creating a long term strategic framework, investment plans, and an enabling environment for basin wide socioeconomic development based on joint management of the shared waters.

1.3 PROJECT ADMINISTRATION AND BACKGROUND

The DDIP – SRBDP Project is funded through the African Development Bank (AfDB), with financial resources jointly provided by the African Water Facility (AWF) and the New Partnership for Africa's Development (NEPAD), Infrastructure Project Preparation Facility (IPPF) and contributions from the Governments of the United Republic of Tanzania and the Republic of Malawi.

The Client for the project is the Ministry of Agriculture, Irrigation and Water Development (MAIWD), which was appointed as the Project Executing Agency (EA), acting on behalf of the Republic of Malawi and the United Republic of Tanzania. A Joint Committee of Officials (JCO) is the highest decision making body of the Project and is responsible for management and coordination of the Project and reports to the Council of Ministers (CM) for policy guidance. The Joint Steering Committee (JSC) is comprised of representatives of relevant ministries from both governments, including two National Project Coordinators, one from each Government. The MAIWD of the Republic of Malawi, and the Ministry of Water (MW) of the United Republic of Tanzania, are represented by the Project Management Unit (PMU), headed by the Project Manager (PM) and supported by two National Project Coordinators (NPC); one from each of the countries. Project Offices have been established in Kyela, Tanzania.

The Consulting Team is made up of the Joint Venture of Lahmeyer International, GmbH of Germany and Arab Consulting Engineers Moharram-Bakhoum (ACE) of Egypt, working with M-Konsult Ltd. of Tanzania and RD Consultants of Malawi.

1.4 OVERVIEW OF THE DDIP-SRBDP

The DDIP-SRBDP project as a whole prepares detailed designs and tender documents for several large scale water resources infrastructure investments, specifically:

- Lower Songwe Dam and HPP
- Lower Songwe River Tanzania (LSRT) irrigation Scheme
- Lower Songwe River Malawi (LSRM) irrigation Scheme
- Stabilisation of the course of the Lower Songwe River
- Water Supply for the Town of Kasumulu (Tanzania) and the Lower Songwe Communities of : Mwalisi, Ngana and Ushirika in Ngana Ward, Kandete in Itope Ward and Isaki, Kabanga, Katumba Songwe, Mpunguti, Ndwanga and Njisi in Katumba Songwe Ward, Ibungu, Kilasilo, Mbako in Ikimba Ward, Ikolo, Lupembe, Muungano in Ikolo Ward, and Itenya, Itete, Lugombo, Ngonga and Nsasa in Ngonga Ward.
- Water Supply for the Town of Songwe (Malawi) and the Lower Songwe Communities of: Mwambuli, Mwakyusa, Mwasuluma, Mwakatika, Kashata and Kaposo in the TA of Kilupula and Alick Mponda, Ndenga, Timothy Chibwana, Kakuyu, Mwangwale, Mayoka, Iponga and Ndenga in the TA of Mwakaboko.

ESIAs have also been completed for these projects.

In addition, the DDIP-SRBDP project has a strong institutional component to ensure sustainability of the investments. With the Convention, whose Final Report was prepared under the DDIPP-SRBDP, forming the legal basis, the Songwe River Basin Commission (SRBC) will be established. A Business plan for the SRBC has also been prepared which details what the SRBC needs in terms of human resources, financial resources, hardware, etc. to carry out its mandate under the Convention.

The development of the large infrastructure in the SRB leads to significant changes in its economy and the livelihoods and social aspects of the people of the basin. Planning for such change facilitates the ability to direct it. Planning also helps to determine what financial resources will be needed so that support can be sought from financial partners.

With the large water resources infrastructure forming the main investments in the SRB under the overall project, the SRBDP specifically looks to other potential interventions that the SRBC can initiate, promote and manage to enhance the economic and social benefits the larger capital investments will have on the people of the SRB.

The SRBDP is a 10 year plan for the development of the Songwe River Basin. It is intended to support the Songwe River Basin Commission, providing guidance and outlining its main tasks over that initial 10 years of its work. It is therefore targeted to the specific mandate for authority of the SRBC which, in general terms, is integrated water resources management in the SRB.

2 THE SONGWE RIVER BASIN

2.1 PHYSICAL ENVIRONMENT

The Songwe River Basin (SRB) lies in the southwest of Tanzania and the northeast of Malawi. The river basin location is shown on Figure 2-1. The SRB is, for the most part, a steep, mountainous catchment with an area of 4,243 km^2. About 55% of the catchment area is in Tanzania and 45% of the area is in Malawi. It is a steep, mountainous catchment with the upper part of the basin having elevations of 2000 – 2400 masl and peaks over 3,000 masl, and the lower part of the basin on the shores of Lake Nyasa / Malawi at about 470 masl.

The upper areas of the basin are relatively dry, with mean annual rainfall ranging from 900 mm to 1400 mm per annum. Unusually, lower down the basin on the floodplain near the lake, rainfall is as high as 3,200 mm per annum, probably due to the effect of Lake Nyasa / Malawi.

The Songwe River forms the border between Malawi and Tanzania over a distance of some 200 km. In the lower floodplain of the river, from Kasumulu to Lake Malawi / Nyasa, the straight line distance is 23 km but the length of river channel is more than 40 km due to its meandering nature. The course of the river is in constant flux due to erosion of the loose, unconsolidated, former lake bed sediments, and the very low slope of this section of the river. As the river channel is the international boundary, this has been a cause of concern.

The economy of the SRB is primarily based on agriculture, making land and water the most important resources. Farming is almost entirely rainfed, even in the upper parts of the basin where rainfall is low (though some 6,200 ha of land in the lower basin will be irrigated under the SRBDP project).

In much of the basin land resources have deteriorated over the last decades because of population growth creating land pressures. Poor land management, coupled with low, and unreliable rainfall, especially in the upper catchment, has exacerbated already significant poverty. Population pressure has also resulted in a loss of forest area as cultivation increases. Forests are also lost to the increasing pressure for timber, poles and charcoal. Intensive shifting cultivation is a feature of most of the basin, with legumes such as beans, cowpeas and groundnuts, intercropped with cereals like maize as common crops, but agriculture is more settled in the lower basin where a traditional variety of rice is grown and cocoa is also an important crop.

Figure 2-1: Location of the Songwe River Basin

2.2 ADMINISTRATION WITHIN THE SRB

In Malawi two districts have land area in the SRB: Chitipa and Karonga Districts. In Tanzania there are five districts: Kyela, Ileje, Mbozi, Mbeya Rural and Momba Districts. Table 2-1 shows the areas of each district and their proportions within the basin, and the proportion of the basin they comprise. As is evident in Table 2-1 Ileje and Chitipa form by far the largest parts of the basin (together comprising 72% of total land area). Figure 2-2 below presents a map of the Songwe River Basin with the District and Ward (Tanzania) and TA (Malawi) boundaries superimposed.

Table 2-1: Areas of SRB Districts, Total and In-Basin

Country	District	Area			
		Total	Total in Basin		District as % of Basin
		(km^2)	(km^2)	(%)	
Malawi (45% of Basin)	Chitipa	4,288	1,590	37%	37%
	Karonga	3,355	335	10%	8%
Tanzania (55% of Basin)	Mbeya Rural	2,432	136	6%	3%
	Ileje	1,908	1,500	79%	35%
	Kyela	1,322	118	9%	3%
	Mbozi	3,404	484	14%	11%
	Momba	6,275	80	1%	2%
	Total	**22,984**	**4,243**		100%

Source: Project Assessments. Note: minor difference in percentage addition is due to rounding

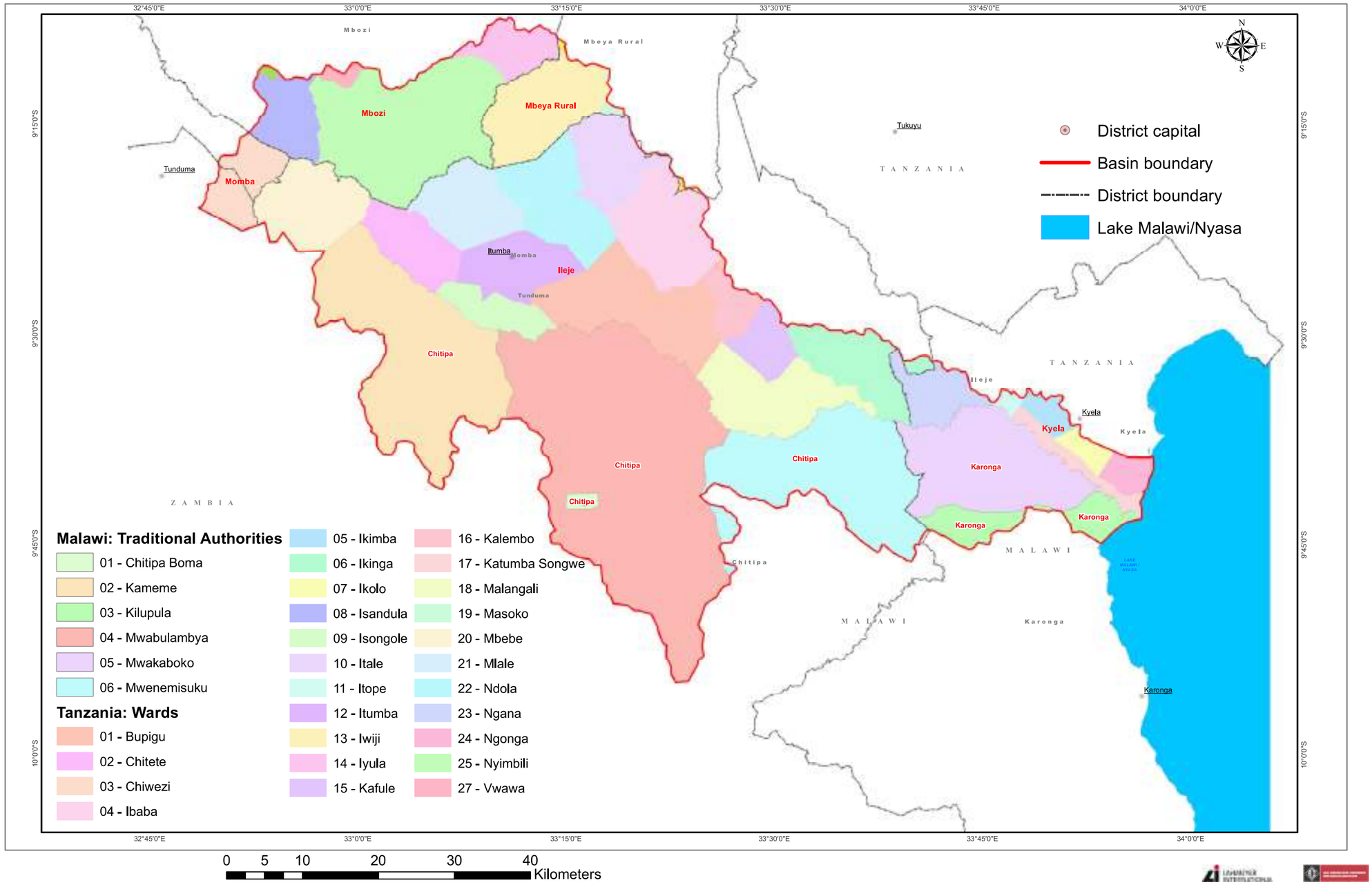


Figure 2-2: Administrative Divisions of the Songwe River Basin

2.3 POPULATION OF THE SRB

Table 2-2 shows the population of each district for the proportion that lies within the basin. Not surprisingly, Chitipa and Ileje Districts, which together cover 72% of the land area, also make up a good portion of the population of the SRB, at 59%. Kyela, with by far the highest population density, has a land area in the basin amounting to only 3% of the total basin area, has about 10% of the population.

Table 2-2: Population Estimates of the SRB by District

District	Estimated Population 2013	Population Density 2013 (people/km^2)	Population as % of Total SRB
Chitipa	99,698	63	29%
Karonga	31,401	94	9%
Total Malawi in SRB	131,099	78	38%
Mbeya Rural	15,852	116	5%
Ileje	102,599	68	30%
Kyela	32,993	280	10%
Mbozi	46,156	95	14%
Momba	12,405	155	4%
Total Tanzania in SRB	210,005	143	62%
Total Songwe Basin	**341,104**	**125**	

Source: Statistics generated for the current study from various primary sources
Note: minor difference in percentage addition is due to rounding

3 SRBDP IN CONTEXT

3.1 SRBDP AND WATER RESOURCES INFRASTRUCTURE

In parallel with the preparation of this SRBDP detailed designs are being prepared for several large capital investments for water resources, which are:

- Lower Songwe Dam and HPP
- Lower Songwe River Tanzania (LSRT) Irrigation and Drainage Scheme
- Lower Songwe River Malawi (LSRM) Irrigation and Drainage Scheme
- Stabilisation of the course of the Lower Songwe River
- Water Supply for the Towns of Kasumulu (Tanzania) and Songwe (Malawi) and surrounding rural areas

These are detailed in the Update of the Feasibility Study (LI / ACE, 2014c) and a brief description of these projects is provided here:

Lower Songwe Dam and HPP

The Lower Songwe Dam and Hydropower Plant (HPP) is a 115 m high concrete dam located in Ileje District in Tanzania and in Chitipa and Karonga Districts in Malawi. It is a multipurpose project contributing to:

- generation of hydroelectric power with an installed capacity of 180.2 MW of which 175 MW are generated by the three main turbines and 5.2 MW from the Small Hydropower Plant (SHPP), generating annual revenues around US$ 62 million;
- the additional power available in the region due to the Lower Songwe Dam and HPP also supports rural electrification in the SRB;
- irrigation of the two Lower Songwe Irrigation and Drainage schemes, LSRT (Tanzania) and LSRM (Malawi), supplying water through both wet and dry seasons;
- stabilisation of the lower reaches of the Songwe River channel, which also forms the international boundary between Tanzania and Malawi, through moderating the flow regime downstream of the dam;
- flood protection for the lower Songwe floodplain through capturing flood flows in the reservoir (associated with the use of an early warning system for dam operation);
- water supply for the towns of Kasumulu (Tanzania) and Songwe (Malawi) taking bulk source water from the irrigation feeder canals;
- the potential for promoting the development of fisheries and tourism

The Lower Songwe Dam and HPP is the centrepiece of the infrastructure development in the Songwe Basin because it provides the water supply for the other developments listed above. Further, it provides impetus for the development interventions, which are presented in this SRBDP document. The increased reliability of power supply is also likely to encourage the growth of small industries and other commercial activities.

Lower Songwe Irrigation and Drainage Schemes

Utilising outflows from the Lower Dam, the LSRM and LSRT schemes irrigate 3,050 and 3,150 ha respectively. Both are areas of existing cultivation based on a high value traditional rice crop in the wet season and upland crops (cassava and maize, mainly) in the dry season. Irrigation will provide supplementary water in the wet season, thereby ensuring maximum crop yields, and water for expanding the cropped areas and increasing yields in the dry season. Annual net incremental benefits are estimated at US$ 7.7 million for LSRT and US$ 12.7 million for LSRM. In addition the greater crop production and greater income of farmers impacts positively on the economy of the basin.

Stabilisation of the Course of the Lower Songwe River

In its lower reaches the Songwe River meanders with the course of the channel constantly changing, including times when the river breaks through loops in the channel leaving land that had been in one country now in the other. The unstable course causes concern as the Songwe forms part of the international boundary between Tanzania and Malawi. While meandering is a natural process, deforestation of the Lower Songwe floodplain for cultivation is a contributing factor to the instability of the banks of the river and the erodibility of the channel. Stabilising the channel also has socioeconomic benefits as a more stable river instils greater confidence in investing in land use such as cultivation. Of specific importance is that, with such a major investment in irrigation, a stable channel protects that infrastructure.

The approach to river stabilisation, detailed in the Update of the 2003 FS, is to implement a community based reforestation programme for the 60 m legal buffer zone on each side of the river over the length of the Lower Songwe. This would be carried out during the time of the construction of the Lower Songwe Dam and HPP, which also contributes to river stabilisation through reduced magnitude and frequency of floods. Together these will substantially improve the stability of the river channel. A period of study of five years following commissioning of the Lower Songwe Dam will then determine if any further, structural works will be required.

Water Supply

Improving the water supply for both urban and rural areas is a key element in socioeconomic development. This project undertakes detailed design of water supply for the Town of Kasumulu (Tanzania) and the Lower Songwe Communities of: Mwalisi, Ngana and Ushirika in Ngana Ward, Kandete in Itope Ward and Isaki, Kabanga, Katumba Songwe, Mpunguti, Ndwanga and Njisi in Katumba Songwe Ward, Ibungu, Kilasilo, Mbako in Ikimba Ward, Ikolo, Lupembe, Muungano in Ikolo Ward, and Itenya, Itete, Lugombo, Ngonga and Nsasa in Ngonga Ward. As well, the project undertakes detailed design of water supply for the Town of Songwe (Malawi) and the Lower Songwe Communities of: Mwambuli, Mwakyusa, Mwasuluma, Mwakatika, Kashata and Kaposo in the TA of Kilupula and Alick Mponda, Ndenga, Timothy Chibwana, Kakuyu, Mwangwale, Mayoka, Iponga and Ndenga in the TA of Mwakaboko.

Water Related Social Infrastructure

Under the DDIP-SRBDP project Water Related Social Infrastructure has also been assessed. Included are assessments of potential investments in Fisheries, Water Supply (in addition to the above detailed designs, outline designs for identified water supply service areas across the basin have been developed), Tourism and Rural Electrification. These are intended as a means of getting the most out of the core infrastructure investments which will enhance the economic and social development of the SRB. The Water Related Social Infrastructure are detailed in a separate document of that name under this project, but the financial aspects and the economic impacts are considered in the Economic Development Sub-Programme of this SRBDP.

3.2 SRBDP AND THE SHARED VISION 2050

The first step in the preparation of the SRBDP was the development of the Shared Vision 2050 for the Songwe River Basin, which was completed in April 2014 (LI / ACE, 2014a). The Shared Vision 2050 is a qualitative statement of the broad direction which development of the Songwe River Basin should take and the desired (long-term) destination; i.e. an indication of where all stakeholders would like to see the situation in the whole of the Basin in the year 2050. The Vision 2050 defines the aspirations of the people of the Songwe River Basin (SRB) providing the guide for the Songwe River Basin Development Programme. The Shared Vision 2050 defines the development targets for 2050 and acts as the guiding framework for the development of the Songwe River Basin.

3.3 SRBDP, THE SRBC AND IWRM

As has been described above, the SRBDP follows from the development of major infrastructure and the Shared Vision 2050. It is a recommended development programme for the Songwe River Basin for the next 10 years (2015 to 2025). It is intended as the guiding document for the work of the Songwe River Basin Commission (SRBC) and will be implemented by the SRBC in collaboration with the seven Administrative Districts which comprise the SRB, and other relevant authorities.

The SRBC is the joint (international) water resources management authority for the Songwe River Basin between Malawi and Tanzania. As the river basin management authority its job is to manage the water resources of the basin for the benefit of all. Parallel with the preparation of the SRBDP the SRBC is being established under this project. The SRB Convention underpins the SRBC, giving it a legal mandate for water resources management in the SRB, as well as for ownership of the major infrastructure, which has also been prepared under this project and will be enacted by the two parliaments. The Convention specifies the authority of the SRBC and defines its relationship with other authorities in the two countries.

The SRBC is guided by the principles of Integrated Water Resources Management (IWRM). IWRM goes beyond strictly water, encompassing other aspects which affect water resources. In the past the establishment of IWRM in a river basin supposed that the basin authority, (such as the SRBC in this case), would take responsibility for, and administer, all aspects of land, water and issues of development in the basin, effectively taking over functions previously under local administration. Experience has shown that

such an approach is counterproductive to effective management because it conflicts with the work of the authorities and administrations who are already mandated to do this work and therefore actually retards establishing IWRM in a river basin as well as nationally and, in the case of transboundary river basins, internationally.

The modern approach to IWRM is that the river basin authority monitors, assesses and manages the water resources of the basin according to the principles of IWRM but works with the administrative authorities to guide, support and assist them toward the common goal of effective and integrated water resources development and management. Such an approach makes the water resources management of a transboundary river much simpler. While the river basin is in two countries, there may not be need for harmonisation of laws, regulations or policies. Development interventions and other works can remain under the administration of local authorities following the policies and regulations of the respective countries. Therefore, the SRBC will work with all levels of government administration, but most closely with local administration – the District Councils and their various departments and offices - to promote IWRM practices and provide technical assistance and, where possible, financial support to works which improve the water resources management of the basin.

There are several articles in the ToR for the preparation of the SRBDP that presuppose authority that the SRBC will not have, partly because they do not fit with the modern approach to IWRM, but mainly because the SRBC is not mandated to have those authorities in the Convention which defines that mandate.

3.4 ROLE OF SRBC AND OTHER STAKEHOLDERS

Various stakeholders will play an important role in ensuring that projects and programmes proposed in the basin are implemented and become sustainable in the short to long term. These are discussed in the following sections.

3.4.1 SONGWE RIVER BASIN COMMISSION

The Songwe River Basin Commission (SRBC) is an international joint commission for managing the water resources of the Songwe River Basin. It will also play central, but supporting role of ensuring that there is coordination in how developments associated with the SRBDP will be carried out. This will particularly be important because it will be responsible for managing investments being planned for implementation during the first phase running from 2015 to 2025. These investments (Lower Songwe Dam and HPP, LSRT and LSRM Irrigation and Drainage Schemes, Lower Songwe River Stabilisation) mainly impact the lower basin, with the direct benefits from these investments going to the communities in the lower basin. This is the case only because the location of the Lower Songwe Dam is very low down in the catchment and the available water is downstream of the dam.

A question throughout the preparation of the ten year SRBDP has been about the benefits that will accrue to communities in the middle and upper parts of the basin which form the larger part of the basin as a whole. If tangible benefits will not be extended to these communities, they will not appreciate the need to be fully involved in interventions aimed

at sustainable utilization and management of natural resources in the entire Songwe River catchment. The SRBDP aims at making the distribution of benefits more equitable.

Among others the SRBC will ensure that it supports the District Councils in implementing projects whose impact will be felt beyond their boundaries, such as soil and water conservation, reforestation projects and provision of other social facilities such as roads, schools, dispensaries and roads. The SRBC also needs to link up with all stakeholders involved in these to ensure that there are no conflicts and to minimise any negative impacts.

The SRBC is expected to facilitate and support sector plans and initiatives directly and indirectly, as far as is practically possible, so that the overall goal of the SRBDP is achieved. The SRBC is also expected to link up with Central and Regional Governments on interventions that require higher level collaboration. Major infrastructure such as roads, especially those proposed to connect districts, need to be implemented within the context of national infrastructure plans and close coordination is integral to avoid duplication of efforts.

3.4.2 DISTRICT COUNCILS

District Councils in the basin are focal points or entry points to any interventions being proposed. Sector plans at district level need to be cognizant of SRBDP objectives. Just like any stakeholder, District Councils need to collaborate fully among themselves and with the SRBC in order to extend benefits of their interventions beyond their boundaries. As a transboundary project, the SRBDP needs the support of all District Councils in the basin, even where the project impacts are localized. This is in recognition of the fact that communities living along the Songwe River, which is the boundary between the two countries, have much in common and share resources.

Each District Council will therefore need to have official 'link' officers who will collaborate and coordinate with other stakeholders on developments intended for the Songwe River Basin. The Local Government Act in Malawi and the Village Land Act in Tanzania already have provisions on joint local committees, especially for developments/interventions falling along boundaries of planning units such as Wards and TAs.

3.4.3 LOCAL COMMUNITIES

One of the factors in the success of community development programmes is that communities themselves should be organized and their aspirations should be reconciled with those of higher level authorities. Communities need to be involved in the planning, implementation and review of community projects and programmes, as they are the primary beneficiaries of such interventions. All social facilities such as schools and dispensaries need the support and contribution of local communities. Most projects funded through Malawi's Local Development Fund and Tanzania's TASAF need communities to make a contribution of construction materials such as bricks, sand and in some cases, even labour force. This ensures local ownership of such projects.

In this regard, local communities shall be part and parcel of the whole implementation set up of all community projects and programmes in the Songwe River Basin. It is therefore

strongly recommended that various interventions proposed in the basin should only be undertaken with full involvement, consent and contribution from beneficiary communities themselves. This is in line with decentralization principles and practices for both countries.

3.4.4 NON-GOVERNMENTAL ORGANIZATIONS

Non-governmental organizations, including civil society organizations, are involved in various activities in order to achieve high level participation of communities in development endeavours. NGOs and CSOs are involved in civic educating the masses to actively take part in all community development initiatives and it is expected that they will continue to fulfil this role during implementation of various interventions in the Songwe River Basin.

NGOs and CSOs will play a critical role in assisting to mobilize local communities to contribute effectively in the realization of the Shared Vision 2050 through various programmes. It is also recommended that some interventions that the SRBDP intends to carry out should be implemented directly by these organizations. Resources may be channelled directly to the communities through NGOs and CSOs as they have also proved to be effective on issues of accountability and adherence to strict implementation guidelines.

3.4.5 CENTRAL AND REGIONAL GOVERNMENTS

These are expected to play a crucial role in the financing of major projects which cannot be funded through locally generated resources at district councils. In collaboration with the SRBC, the central governments need to engage financial partners, including International Financing Agencies (IFIs), donor agencies and private investors to partly or wholly finance some interventions proposed in the Songwe River Basin. Central or Regional Governments need to coordinate projects such as major road construction as they go beyond district boundaries and sometimes beyond international boundary. The proposed upgrading of a road linking Chitipa and Ileje is a good example of a project that needs proper and sufficient coordination by both governments in order to ensure that the basin connectivity is achieved.

3.4.6 FINANCIAL PARTNERS

The contribution of financial partners needs no emphasis. The SRBC will own and operate the Lower Songwe Dam and HPP, and collect significant revenues from the sale of electricity to ESCOM and TANESCO. However, this revenue will not come on stream until the dam is operational, which will be 2022 at the earliest. Especially in the first seven or so years of the implementation of the SRBDP, the SRBC will need financial support from lending institutions, bilateral and multilateral donors, private investors and others.

With AfDB already supporting this DDIP-SRBDP project, it is most likely that they will lead the financing of the major investments. AfDB can also play an important role in supporting approaches to other such institutions. Also, communities in the upper and middle parts of the basin, who do not benefit directly from the core infrastructure, will require the support of the donor community.

3.5 THE SRBD PROGRAMME

The Songwe River Basin Development Programme (SRBDP) as its name specifies, is a programme of development. It is for the SRBC to follow in the first 10 years of its operations. The SRBDP is based on the development priorities and aspirations from the communities themselves as presented in the Shared Vision 2050, and also on the specific projects, identified in the three sub-programmes, which are themselves taken from the priorities provided by the District Councils. However, as a programme, and not an implementation plan, it is highly likely that the specifics will change with time depending on how quickly the SRBC gets established, how much donor funding can be attracted prior to 2022 when the revenue stream comes on line, and other issues.

The three sub-programmes of the Community Development Sub-Programme, the Natural Resource and Land Use Management Sub-Programme and the Economic Development Sub-Programme together form the Songwe River Basin Development Programme. There is need to integrate interventions in all sub-programmes in order to ensure that results are felt across various sectors of development. In this way, overall economic and social development will be visible. Figure 3-1 illustrates the interlinking between the three sub-programmes.

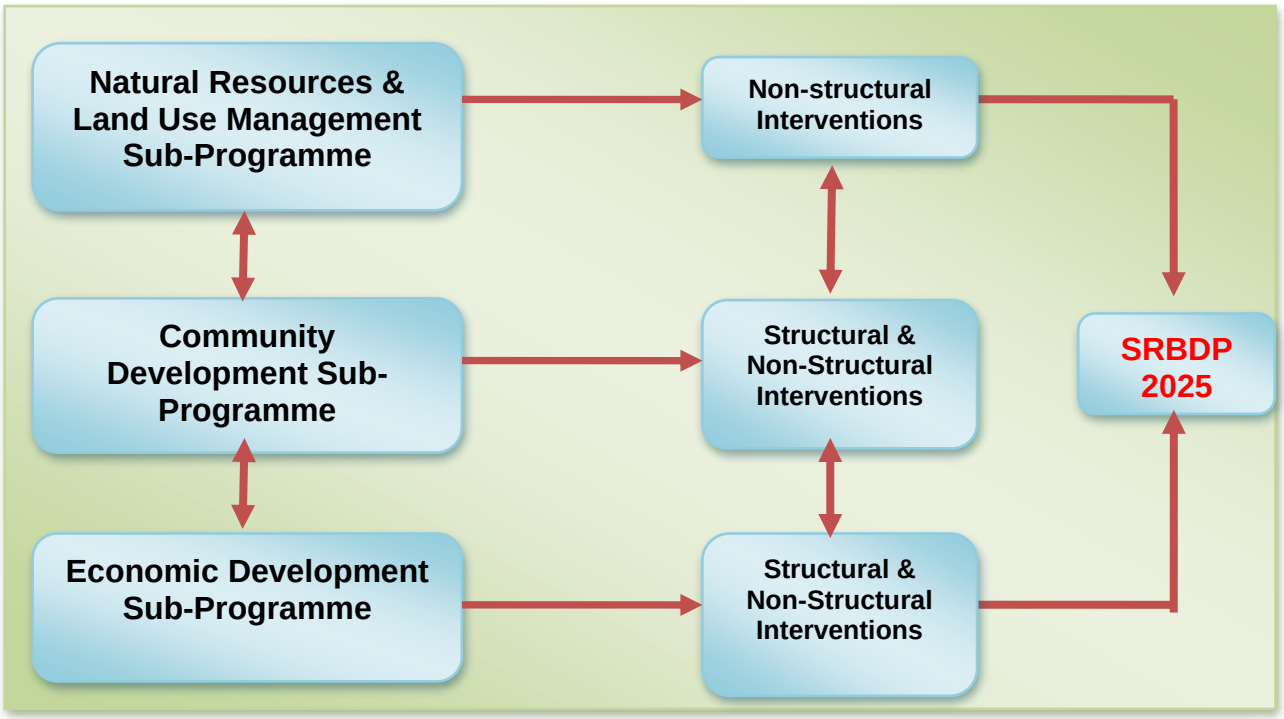


Figure 3-1: Interlink between the Three Sub-Programmes of the SRBDP

These sub-programmes are intended to complement each other in achieving the overall goal of the SRBDP, which is to contribute to the economic growth, improved health and living conditions and enhanced food security for the people of the Songwe River Basin (SRB) in the context of the overall economic development of the two countries.

Projects and programmes under all the sub-programmes are meant to benefit the communities in the basin directly or indirectly. Interventions that are targeted at specific beneficiaries will have long term impacts and be sustainable if the communities themselves are involved.

The three sub-programmes: the Community Development Sub-Programme, the Natural Resource and Land Use Management Sub-Programme and the Economic Development Sub-Programme, presented in Volume 2, Volume 3 and Volume 4, respectively, are summarised in the following Chapters.

4 THE COMMUNITY DEVELOPMENT SUB-PROGRAMME

4.1 OBJECTIVES

The stated objective of the Community Development Sub-Programme (CDSP) is to design an effective community development framework for efficient and sustainable management of the entire Songwe River Basin.

It focuses on poverty alleviation, community needs, health and education, water supply, roads and other aspects of communication networks and gender issues in the context of social development and the outcomes of the Strategic Environmental and Social Assessment (SESA).

In a more specific description, the CDSP will, among others:

- Encourage the communities within the Songwe River Basin through existing structures to engage in economically productive activities
- Support efficient and effective health delivery services among the population of the river basin
- Assist the local councils to reduce bottlenecks identified in the education sector within the basin population
- Facilitate and support provision of durable and reliable transport infrastructures within the river basin
- Support the creation of an equal opportunity environment among the Songwe River Basin population
- Promote the improvement of livelihoods of vulnerable groups of people within the Songwe River Basin

Basic data was collected from the districts in the basin through district visits by consulting team, baseline sample surveys and through various national survey reports and district reports such as socio-economic profiles. Comparing and disaggregating data and applying it to a basin-wide level assessment were challenges because most of the data in both countries is available only at district and regional level.

A fair assessment from the above sources of data shows that the SRB is characterized by the following:

(a) Rural poor people who depend on agriculture for over 85% of their livelihoods
(b) Low per capita income compared to national averages (28% and 67% in Tanzania and Malawi respectively living below poverty line in 2012)
(c) Low access to potable water (as low as 22% for some districts)
(d) Low women participation in decision making in all structures
(e) Medium levels of education in general but high illiteracy rates among women
(f) Farming system that is highly rain fed and dependent on government support

(g) Poor health of the people due to shortage of drugs and health personnel and accessibility problems
(h) Poor transport infrastructure

4.2 CONSULTATION

Priorities in the basin were identified during the preparation of the SRB 2050 Vision as consultations were done at community, district and regional levels and sector departments at the districts were also separately consulted at the time of data collection and update by the consultants. District officers were consulted at all level. The priorities reported in the CDSP document are based on District Sector Plans, which have been incorporated into the various interventions proposed in this sub-programme, taking into account the distribution of population, resources and infrastructure in the basin as a whole. Additional efforts have been made to reconcile community needs with national policies as reflected in the two countries' development strategies. Projects and programmes in this sub-programme therefore aim at achieving sustainable socio-economic development of the SRB.

4.3 INTERVENTIONS

Interventions under the CDSP have been divided into two types: structural and non-structural.

4.3.1 STRUCTURAL INTERVENTIONS

Structural interventions are construction projects, which will be implemented directly or indirectly by the SRBC while non-structural interventions are activities some of which are on-going and these will be implemented by respective district councils. In the latter interventions, the SRBC is expected to assist the local councils with funding, as local budgets are always inadequate to fund large impact interventions.

Table 4-1 below is a summary of structural projects for the SRB. See Volume 2, Community Development Sub-Programme, Chapter 9 for more details.

Other structural projects being implemented or those that already have funding commitments from other sources in the basin have also been highlighted in the main report.

Table 4-1: Structural Projects under the CDSP

Item No.	Project Description And Cost	Objective/Purpose	Proposed Location
1	Rehabilitation and construction of Water Supply Schemes: US$12.343 million	Improve access to potable water for the basin population	Various Districts
2	Rehabilitation and upgrading of existing roads: US$ $66.721 million	Improve movement of goods and people in the basin	Various districts
3	Rehabilitation of existing and construction of new health facilities: US$6.117 million	Improve health and general well-being of the basin population	Various districts
4	Rehabilitation and construction of new schools: US$14.117 million	Increase access to schools for all so as to reduce illiteracy among the basin population	Various districts
5	Rural Electrification: US$ 38.995 million	Increase access of SRB rural population from expected 49% in 2022 to 71% and increase access of SRB urban population from expected 64% in 2022 to 100%	Various districts

4.3.2 NON-STRUCTURAL INTERVENTIONS

In the CDSP, a number of non-structural interventions have also been proposed and these will be implemented by district councils because most of them are on-going and have already been embedded in the sector department's core functions. Below are major non-structural projects and programmes that are central to the community development of the SRB and will need additional support from the SRBC:

- Promotion of women participation in decision making; supporting women's economic empowerment and gender mainstreaming
- Increase girls enrolment and reduce rates of drop out among girls
- Reduce prevalence of diseases and reduce mortality
- Reduce incidence of malnutrition
- Increase ownership of productive assets
- Improving marketing of agricultural products
- Promoting income generating activities and access to credit

Implementation of non-structural interventions such as those in the agriculture sector, gender and women participation, population and migration, demographic and health delivery services, literacy improvements, support to credit access, extension and marketing services will be undertaken directly by the responsible sectors at district council level and have not been assigned costs. The role of the SRBC in these interventions will be to ensure that they are linked with interventions from other programmes and are integrated in the overall development strategies of the Songwe River Basin. Above all, it will also be the task of the SRBC to provide financial support for the implementation of some interventions of District Councils that do not have the capacity to do so. This will be one way of achieving equitable development within the Songwe River Basin.

It is intended that this first phase of the SRBDP will run for 10 years from 2015 to 2025 and all interventions proposed in the CDSP are expected to be implemented within this time frame. An implementation schedule has been recommended. For the structural measures the implementation schedule is shown in Table 4-2, and in Table 4-3 for the Non-Structural Interventions.

Table 4-2: Implementation Schedule for Structural Projects

Type Of Project	Time Frame	Likely Funding Source
Lower Songwe Dam access roads: Bituminizing	2017 - 2025	AfDB, Investment Partners, SRBC
Isongole – Ikinga Road: High Class Graveling	2016 - 2018	District Council, Donors and SRBC
Isongole – Tunduma Highway: Bituminizing	2018 - 2022	District Councils, Donors and SRBC
Chitipa –Songwe (Isongole) Road: Graveling	2015 - 2017	District Councils, Donors and SRBC
Chitipa – Songwe (Isongole) Road: Bituminizing	2020 - 2025	District Councils, Donors and SRBC
Rehabilitation of Existing Water Schemes	2015 – 2025	District Councils, Donors and SRBC
New Water Supply Schemes	2015 - 2025	District Councils, Donors and SRBC
Health and Education Facilities	2015 – 2025	District Councils, Donors and SRBC
Rural Electrification	2020 - 2025	TANESCO, ESCOM, Governments and SRBC

Note: Interventions at Community level shall be implemented within sector budgets and priority and the SRBC is expected to assist in identifying sources of funding.

Table 4-3: Implementation Schedule for Non-Structural Projects

Sector	Project Purpose	Implementing Agency	Time Frame	Likely Funding Source
Education	Facilitate the retention of girls in schools	District Education Office	2018 - 2025	District Council, Donors and SRBC
Health	Sensitize communities on HIV/AIDS	DHOs and NGOs	2016 - 2022	District Council, Donors and SRBC
Trade	Support communities in income	Trade Office and NGOs	2017 - 2020	District Council, Donors and SRBC

	generating activities and access to credit			
Gender and Community Development	Support gender mainstreaming in development	District Community Development Office, NGOs	2016 - 2020	District Council, Donors and SRBC
Community Development	Facilitate openness and reduce political interference in decision making	District Community Development Office, NGOs	2015 - 2018	District Council, Donors and SRBC
Water and Sanitation	Improve sanitation in communities	District Water Office and DHO	2017 - 2020	District Council, Donors and SRBC
Agriculture	Improve marketing of agricultural products	District Agriculture Office	2015 - 2025	District Council, Donors and SRBC
Livestock	Increase livestock production	District Agriculture Office	2015 - 2025	District Council, Donors and SRBC

The success of any development programme depends on a number of factors. For the implementation of the Community Development Sub-Programme, the following are the key preconditions:

(a) District Councils prioritize the proposed interventions. The interventions proposed in the CDSP are priorities of the SRB communities. They need to be visible, to appear on councils' priority lists in order to attract outside financial support. To this end, it is advised that councils' development plans should incorporate the proposed interventions where feasible.
(b) Priorities of communities do change with time for various reasons. With the ultimate long term goal of the CDSP to reduce poverty among the basin population, it is assumed that the specific community projects will be given priority by the basin communities themselves.
(c) Local communities' commitment towards implementation of local projects will be vital to ensure success of the interventions. An improved level of community participation is required. In this regard, NGOs can play a major role in sensitizing communities to embrace local projects and contribute to their success.
(d) Good governance is one of the pillars of community development. All governance aspects need to be observed starting with financial management, transparent

selection of committees, respect for citizens' rights in all spheres of development, land and natural resources governance and respect for democratic institutions at all levels.

(e) Collaboration between SRBC and District Councils is paramount.

The full discussion of the Community Development Sub-Programme is provided in Volume 2 of this document.

5 THE NATURAL RESOURCES AND LAND USE MANAGEMENT SUB-PROGRAMME

5.1 OBJECTIVES

The overall objective of the Natural Resources and Land Use Management Sub-Programme (NR&LUMSP) is to design a sustainable land resources development and management framework for the Songwe River Basin.

The specific objectives of the sub-component are:

1. To prepare a framework for the sustainable development and management of the natural resources;
2. To formulate a comprehensive land resources conservation framework for the basin.

In this context therefore, the Natural Resources and Land Use Management Sub-programme is focused on achieving the following specific objectives:

a) Identify natural resources in the Songwe River Basin that require co-management and establish or strengthen community natural resources management committees
b) Prepare a broad based land use plan for all land and enforce prohibition of environmentally unacceptable land use practices in the whole SRB
c) Prepare a land resources conservation framework for the basin
d) Develop guidelines for facilitating land consolidation and formalization in the basin
e) Develop a land information management system for the basin
f) Strengthen institutional and human resource capacity in sectors that deal with land and natural resource management at local, district and regional levels
g) Develop guidelines for preparation of participatory land use and natural resource management plans for possible use in high impact areas with strong emphasis on integrating needs of different socio-economic groups including women

It is important to note, in the context of the NR&LUMSP, that both Malawi and Tanzania are working toward improved land ownership and other aspects of land tenure and consolidation. Land consolidation and formalization of land tenure are both national issues, not international issues, and it would not be appropriate for the SRBC to become involved in this. With regard to the proposed major irrigation and drainage schemes proposed under SRBDP, land consolidation and redistribution will be necessary to accommodate the new irrigation infrastructure and management approach. It is recommended within this NR&LUMSP that the opportunity be taken to take land holding to full ownership with titles. This can be considered a pilot for other land in the SRB and across both countries. But there is no further discussion on SRBC involvement in land tenure issues because this is not an area in which the SRBC should be involved.

5.2 APPROACH

Background information has been obtained from a variety of sources such as updated and recently prepared SRBDP documents, district reports, reports under previous SRB projects and district field visits. Information from these sources was complemented by a review of relevant policies and legislations, including published national reports for the two countries.

The Songwe River Basin is predominantly rural in nature and over 80% of the population consists of subsistence farmers. Subsistence farming however is characterized by unsustainable land uses practices which contribute to environmental degradation. In some parts of the middle and upper basin especially in the districts of Chitipa, Karonga (Malawi) and Ileje (Tanzania), some farmers still practice shifting cultivation which results in deforestation due to indiscriminate bush clearing.

There is also extensive use of forest based energy such as charcoal and firewood which is contributing to deforestation and this is having a serious negative impact on the basin landscape and general environment. In brief, the SRB is experiencing the following environmental problems: Soil erosion, siltation, deforestation, overgrazing, bushfires, river bank cultivation, steep slope cultivation, poor drainage and flooding and fish resource depletion.

5.3 INTERVENTIONS

The various district councils within the basin are already addressing some of these challenges but their efforts are poorly funded and are limited in nature. Limited financial resources also mean that such interventions are short lived and not comprehensive enough to have visible positive impact. The interventions proposed under the NRLUM Sub-Programme therefore are aimed at addressing some of the challenges outlined above. The following projects are proposed to be carried out by the SRBC directly and the district councils are expected to offer their institutional support.

In all the proposed projects emphasis has been put on building and strengthening institutional and human resource capacity for major stakeholders in the sectors of land and natural resources management at district and local level with the purpose of achieving long term sustainability of project activities.

In recognition of the efforts being done by district councils in the natural resource management sector, it is recommended that the SRBC should support such programmes. In Karonga and Chitipa Districts, it is proposed that soil and water conservation strategies currently being practiced should be strengthened and the SRBC should collaborate with sectors at district level to expand these efforts. Four districts in Tanzania, namely Momba, Mbozi, Mbeya Rural and Ileje also reported that they are implementing various soil and water conservation activities and SRBC needs to support these initiatives in order to have broader impacts in the SRB.

Table 5-1: Summary of Projects under NR&LUMSP

No.	Project Description And Cost	Objective/Purpose	Proposed Location
1	Land Tenure Formalization in Irrigation Schemes: US$430,600	Reduce poverty and ensure socio-economic development of smallholder farmers	LSRM (Karonga), LSRT (Kyela), Mbozi and Ileje Districts
2	Improve Forestry Management: US$513,200	Ensure that forest reserves in the SRB are managed and used sustainably	Nambatata (Karonga), Mughese (Chitipa), Ntanzu (Mbozi) and Umalila (Mbeya Rural)
3	Integrated Soil and Water Conservation: US$406,900	Preserve the catchment of the Songwe River	Kameme, Chitipa
4	Catchment Area Protection: US$ 632,200	Preserve the catchment of the Songwe River	Iyula and Nyimbili Wards, Mbozi
5	Studies on Rain Water Harvesting and Assessment of Irrigation Schemes: US$146,200	Promote irrigation farming in the upper Songwe River Basin	Ileje, Mbozi and Chitipa Districts

Under the NR&LUM Sub-Programme, an effort has been made to prepare a broad based Land Use Plan whose land use categories are derived from assessment of existing broad land uses reported from the districts and also from the Songwe Atlas (2009). The proposed land use categories are moderate farming (39%), intensive farming (25%), village forests (23%), mixed uses (3.2%) and forest reserves (2.3%). Settlements are proposed to cover about 1.1% of the total area. The remaining percentage is for other uses such as water bodies. The major strategy on settlement pattern for the basin is to encourage nucleated settlements and this will be achieved through the promotion of local level land use planning as recommended below. Through this, it is recommended that local leaders should prevent opening of single and isolated settlements which in most cases are difficult to provide support services and are established in environmentally sensitive areas.

In order to achieve sustainable management and utilization of natural resources, it is highly recommended that local level land use planning and management should be encouraged and promoted but this could not be undertaken within the context of the current programme design. Therefore, some guidelines for the preparation of Participatory Land Use Plans have been formulated and it is recommended that these should be adopted and be used by all communities. The SRBC is urged to kick start this process by engaging communities around the Lower Dam to embark on participatory land

use planning. Other areas that are also recommended to have such land use plans are LSRM and LSRT Irrigation schemes and also towns and major rural settlements.

Major natural resources in the SRB are land, forests, water, soil and fish. Various projects and programmes proposed in this Sub-Programme are aimed at attaining an integrated and sustainable management and utilization of these resources. In addition, the framework shown below has been elaborated in the main report and broad based strategies for managing these natural resources are provided.

Figure 5-1: Natural Resources and Land Use Management for IWRM

The whole programme design has generated large volumes of spatial data which needs to be properly managed for future use. This, together with existing land information from previous projects and studies, are being harmonized and put together as a Management Information System (MIS), part of which is related directly to land and natural resources, though in the bigger picture, the MIS is being developed for all information generated by the DDIP-SRBDP for the SRBC. The full MIS is presented as part of the SRBC Business Plan.

The MIS has been developed in standardized way using the UTM Coordinate System so that manipulating them will be straightforward. Therefore, it is highly recommended that, for the future, all data sets should be kept in such formats. The SRBC should have a GIS expert in its organizational structure whose main responsibilities shall be to manage the data and assist district councils to access and use it.

The successful implementation of the NR&LUMSP depends on a number of factors, the principal ones being availability of financial resources, cooperation of local communities, prioritization of such projects by key stakeholders and their full participation. In this regard, it is highly important that the SRBC as a key player should take a leading role in ensuring that resources are available for the proposed projects and that there is high level collaboration among various stakeholders. Therefore, it is strongly recommended that the SRBC should have within its structure, technical expertise in the fields of forestry and natural resources and land use planning and management to coordinate the proposed projects and programme activities.

The full discussion of the Natural Resources and Land Use Management Sub Sub-Programme is provided in Volume 3 of this document.

6 THE ECONOMIC DEVELOPMENT SUB-PROGRAMME

6.1 OBJECTIVES

The objective of the Economic Development Sub-Programme (EDSP) is to develop viable economic and business development opportunities not present in the Basin today as well as opportunities for improving existing economic activities.

The EDSP also analyses the economic of the SRB to determine impacts of the main infrastructure and those interventions put forward in the SRBDP. It does this through a number of tools, described in the following sections.

6.2 SRB REGIONAL ACCOUNTING

The Economic Development Sub-Programme (EDSP) mobilises national accounting methodology to identify the characteristics of the Songwe River Basin (SRB) economy and then formulates, specifies and measures the impact of a proposed multi-sectoral programme of development initiatives under the SRBDP.

The centrepiece of SRBDP will be the construction of the Lower Songwe Dam and HPP, which is intended to generate bulk power for regional consumption and beyond. In addition to improving bulk power regionally, the Lower Songwe Dam generates revenues which can directly benefit the population of SRB through SRBDP interventions to exploit local opportunities for improved power supply, water control and other investments. Over the next decade, rural electrification, irrigation, potable water supply, aquaculture and improved road connectivity will all have a profound impact on the agrarian economy of SRB. Note though that the economic benefits from irrigation and roads will accumulate over several decades. The present low efficiency of economic activities, especially rainfed agriculture, forestry, fisheries and small industry, will need concomitant strengthening to allow the basin economy to adapt and respond to the changes expected. On the other hand, the development initiatives proposed under SRBDP need to be appropriately selected and sized in relation to the socio-economic conditions they are meant to support.

A thorough understanding of the SRB economy is a prerequisite to SRBDP design. Chapters 2 to 5 of the EDSP (see Volume 4 of this document) describe the application of national accounting methodology to identify the relative importance of different economic sectors in generating wealth and make an objective measurement of the productivity of labour in those sectors. The precise methodology must adapt to the challenges imposed by a trans-boundary basin that is relatively small (4,243 km^2) and fragmented between the

lowest strata of administrative areas in both countries. Also, river basins do not respect the administrative boundaries within which statistical data is collected. After scrutiny of the available statistics, an economic baseline was established for 2010: this baseline was chosen because of the availability of agricultural census statistics, such censuses can only be carried out periodically and an accurate estimate for later years was not available.

Despite the problems of preparing SRB accounts, the results are worth the effort. National accounting methodology provides the rigour required to measure annual changes in the regional gross domestic product (RGDP), the share of the Malawian and Tanzanian economies in SRB and the share of different types of activity in the economy. The methodology can also be used to identify economic growth areas in the basin and calculate labour productivity by sector. Economic accounts can also be manipulated to prepare environmental accounts, which include the real cost of unsustainable use of natural resources. The cost of depreciation of natural resources is deducted from the RGDP, just as depreciation of capital assets is deducted. In SRB this is a useful concept: the value of capital assets in the basin is very small (though this will change) but the use of natural resources greatly exceeds their regenerative capacity.

Referring then to Chapters 2 to 5 of the EDSP; the main features of the economy in 2010 (measured in current 2010 US$ prices) are:

- The value added of rainfed cropping in SRB was estimated at US$ 89 million over a cropped area of 102,500 ha
- The return to farm labour was about US$12 per labour day; over 7.3 million labour days were used in rainfed crop field operations
- The nutrient application from fertiliser was about 85 kg of NPK per cultivated ha per annum but at 2010 yields nutrient extraction was at least 150 kg of NPK per cultivated ha per annum
- Rainfed cropping produces 270% of the basin kilocalorie requirement indicating net food exports but some administrative areas in Mbozi and Chitipa may have been food insecure
- rainfed maize production accounted for 40% of crop RGDP
- Minor irrigation was less than 2,000 ha in the basin but value added was US$ 4.6 million and return to labour US$ 25 per labour day

For the livestock sector:

- Value added to the economy was about US$ 9 million in 2010 consuming 4.5 million labour days with a very low productivity of labour of US$ 2 per day
- There were about 120,000 Tropical Livestock Units (TLU) in SRB in 2010, suggesting that on average households own about 1.4 TLU – this is a moderate or low level of ownership
- At 0.3 TLU per basin hectare livestock density is also quite low
- Cattle account for 70% of TLU numbers

- At basin level, dry matter production is well in excess of consumption
- The livestock sector (including fisheries) produces only 4.6% of the basin's kilocalorie requirement so only about 55% of the animal food energy required is actually available. Shortages of animal protein have a negative impact on child nutrition.

In respect of forestry:

- The value added of the forestry sector was about US$ 11 million per annum, requiring 1.6 million labour days and with a return to labour of about US$ 7 per labour day
- The basin consumption of fuel was estimated as about 254,000 tons in fuel wood and 6,000 tons in charcoal, plus the use of about 11,000 tons of timber; the volume of exports from SRB are unknown
- Woody biomass stock is about 2 million tons with a mean annual increment of about 105,000 tons, so annual use of woody biomass appears to be well over double the replacement rate.

Housing is the main capital asset in SRB:

- housing stock is about 83,000 units and has an annual value added of about US$ 5.1 million in current 2010 prices with a return to labour (for construction of new stock and repair and maintenance) of about US$ 9 per labour day.

Water supply:

- contributed about US$ 4.1 million in value added to the basin economy in 2010 but the return to labour was only US$ 1.50 per labour day
- water collection accounted for about 6% of total labour time available.

Small and medium industry (SMI):

- is mostly dominated by milling and agro-processing units
- contributed only about US$ 3 million to the RGDP of the basin in 2010
- due to industry inefficiencies and low margins labour productivity was unexpectedly low, not exceeding US$ 8 per labour day.

Government administration is an important sector in the basin economy:

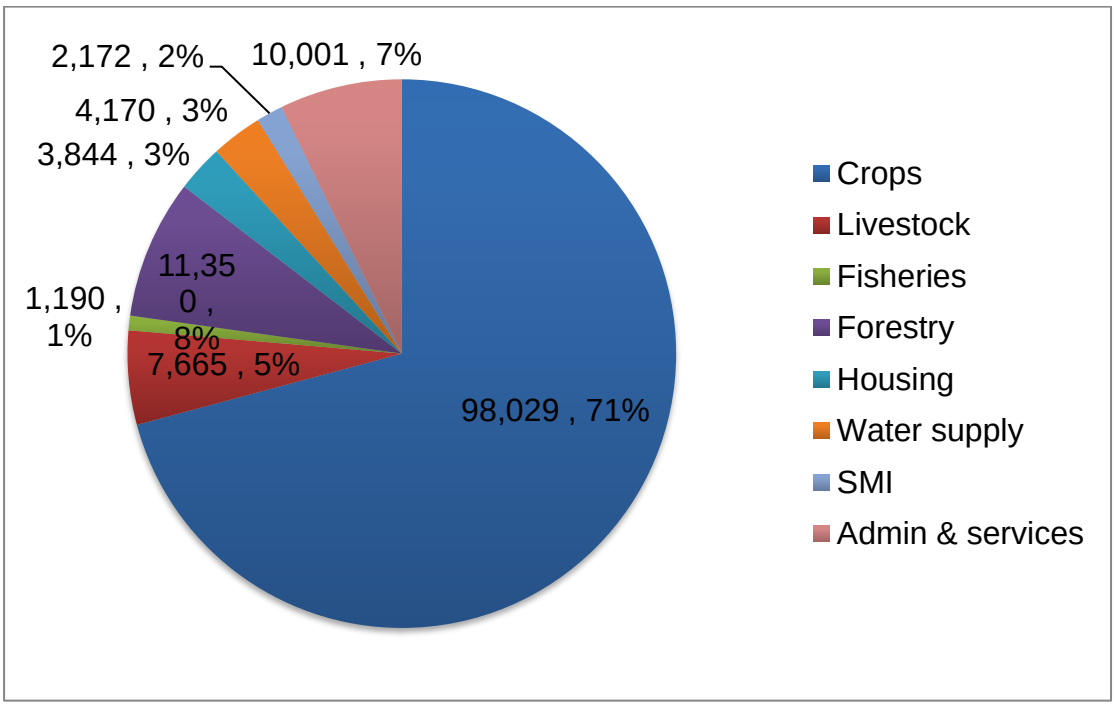
- The total expenditure on public services in SRB in 2010 was estimated to be about US$ 22 million per annum and US$ 60 per capita
- Government services contributed US$ 10 million in value added and comprised 7% of RGDP
- The Malawi sector had a greater proportion of administrative budget allocated to health while the Tanzania sector prioritised education.

General remarks on the SRB economy in 2010 can be made:

- The total RGDP of the SRB in 2010 was estimated to be US$ 134 million in current 2010 prices
- About 85% was from agriculture and allied activities but the natural resources sector accounted for only 26% of Tanzanian GDP and 30% of Malawi GDP in the same period: the obvious conclusion is that SRB is essentially rural
- Rainfed and irrigated cropping accounts for the largest proportion of RGDP, 71%, so productivity increases in the crops sector (particularly directed to rainfed maize) will have the biggest leverage for growth in the basin economy
- In 2010, SRB was only about 0.50% of the combined GDP of Tanzania and Malawi and the share of the Tanzanian and Malawian areas of SRB is 0.36% and 1.07% of the two nations' GDP respectively
- The SRB economy in 2010 was shared 59% to Tanzania and 41% to Malawi, the distribution of population in the basin between the two countries was similar, while the area is divided 55% to Tanzania and 45% to Malawi
- RGDP per capita in 2010 indicates that on average the labour of one person (man, woman or child) in the Basin added US$ 370 to the basin economy - little more than a dollar a day
- The overall occupancy rate as a proportion of the time available to the economically active population was only 0.34; while many important social actives were not measured (e.g. marketing, home food processing etc.) labour occupancy is very low
- Return to labour across all sectors was only US$ 7.12 per labour day
- Soil depreciation as measured by nutrient mining (and excluding the cost of loss from erosion) amounted to US$ 3.6 million, or 4.7% of the value added of crop production.

A schematic of the basin economy by sector is shown in Figure 6-1 below.

Figure 6-1 SRB Economy by Sector in 2010, current 2010 US$ '000



6.3 PROJECTIONS OF SRB ECONOMIC GROWTH

Chapter 6 of the EDSP (see Volume 4 of this document) describes an effort to update the RGDP estimate from 2010 to later years, in the hope of establishing a growth trajectory. This hope was not realised. SRB is a transboundary basin and dramatic annual changes in prices and exchange rates during the period caused fluctuations in the annual value of production that obscured the expected trend of steady increase in the value of production.

Consequently, an alternative approach to identifying economic change was adopted. This was based on the identification of the limits to growth under current technology and existing land and labour resources. All sectors were considered, but rainfed agriculture is the most important because it is the largest and most dynamic. But despite a 6% per annum increase in area cultivated and a similar increase in the rate of fertiliser application, SRB crop production (expressed in tons) grew in the period 2010-2012 only by about 3.7% per annum and the tons of crops grown per cultivated hectare did not increase at all from a SRB average yield of 3.24 tons of produce per cultivated ha in 2010. Food security also did not improve in the period 2010-2012: the percentage of food energy production remained at about 270% of basin kilocalorie requirement, so it can be assumed that the basin's agricultural trading position did not improve. Such economic expansion that can be observed was fuelled by an expansion of the maize-based rainfed cropping

system in quite limited and well defined medium altitude and medium rainfall areas of the basin where significant areas of low to moderately sloping land are still available. When suitable land of this type is used up under current technology, agricultural growth will falter.

Section 6 includes a description of an attempt to model when this might happen, balancing the uptake of new lands available in the basin with rural to urban migration that will reduce the ratio of population to cultivated land and slow the uptake of new lands. The model also takes into account likely increases in productivity during the period by postulating yield increases generated by intensification of input and labour use and translating those into changes in value added, value of intermediate goods and changes in labour use. As remarked above, observed yield changes are tiny in the period 2010-2012 but they cannot be neglected in longer-term projections.

The model output indicated that the rural population density per cultivated hectare would decline slightly up to 2021 as urbanisation takes place and new lands are taken into cultivation. Thereafter, with new lands no longer available, the rural population density begins to rise: urbanisation continues but not at a rate sufficient to hold down the increase in the rural population density. Yield increases will occur, but without significant technological change they will only have a modest effect on economic growth. Post 2022, expansion of cultivation onto marginal lands is expected, which would occur at the very time the Lower Dam comes into production and catchment quality becomes important. A future crisis in SRB economic growth might be too strong a description, but the prospects are not good.

The structural characteristics of other sectors were also examined. In respect of livestock, numbers grew from 119,000 TLU in 2010 to 126,500 TLU in 2012, an increase of 6%. But it was found that only 18% of basin area (six administrative areas) accounted for 78% of the growth in numbers. Here, livestock numbers grew much faster than the biological replacement rate and, if the statistics are accurate, in-migration of herds is the only explanation. Bearing this in mind, projections of TLU growth could be made by administrative area, but it was unnecessary to postulate any change in technical coefficients of production at basin level – these do not change unless the genetic composition of the herd changes. It is considered that TLU numbers may increase to about 170,000 in the long term. The dry matter requirement will increase by about 65% to 430,000 tons per annum, some of which will be provided by crop residues from the expanding cultivated area. On grazing lands, an increase in dry matter yield from about 0.5 tons per ha per annum now, to about 1.2 tons per ha in the future will be required. SRB grazing resources are estimated to be about 525,000 tons per annum, excluding the contribution of crop residues, so the off-take of dry matter is possibly sustainable.

There is no evidence to show that SRB fish production will expand without systemic reform, for which government assistance and private sector investment will be needed. The production statistics 2010-2012 show marked declines in fisheries value added that are commensurate with the decline in Lake fisheries due to over-fishing. This trend is projected to continue, resulting in fisheries reducing its share of basin RGDP from 0.4% in 2010-2012 to only 0.2% in 2022.

The preparation of drivers of economic growth from forestry was challenging. Urbanisation will reduce pressure on woody biomass and the population will make more use of alternative fuels including electricity and crop residues. Even so, annual use of woody biomass in future is projected to be about 390,000 tons in a basin with a mean annual increment of only about 100,000 tons. Private woodlots, already visible in SRB, will become much more common. The growth of these was modelled, on the assumption that private woodlots would supply 50% of the basin's woody biomass demand from 2025 or about 190,000 tons of wood per annum. About 30,000 ha of woodlots will be required, yielding at $10m^3$(6 tons)/per ha per annum. There will be about 80,000 rural farm families in the basin by 2025, which would lead to an average of 0.4 ha of woodlot per household.

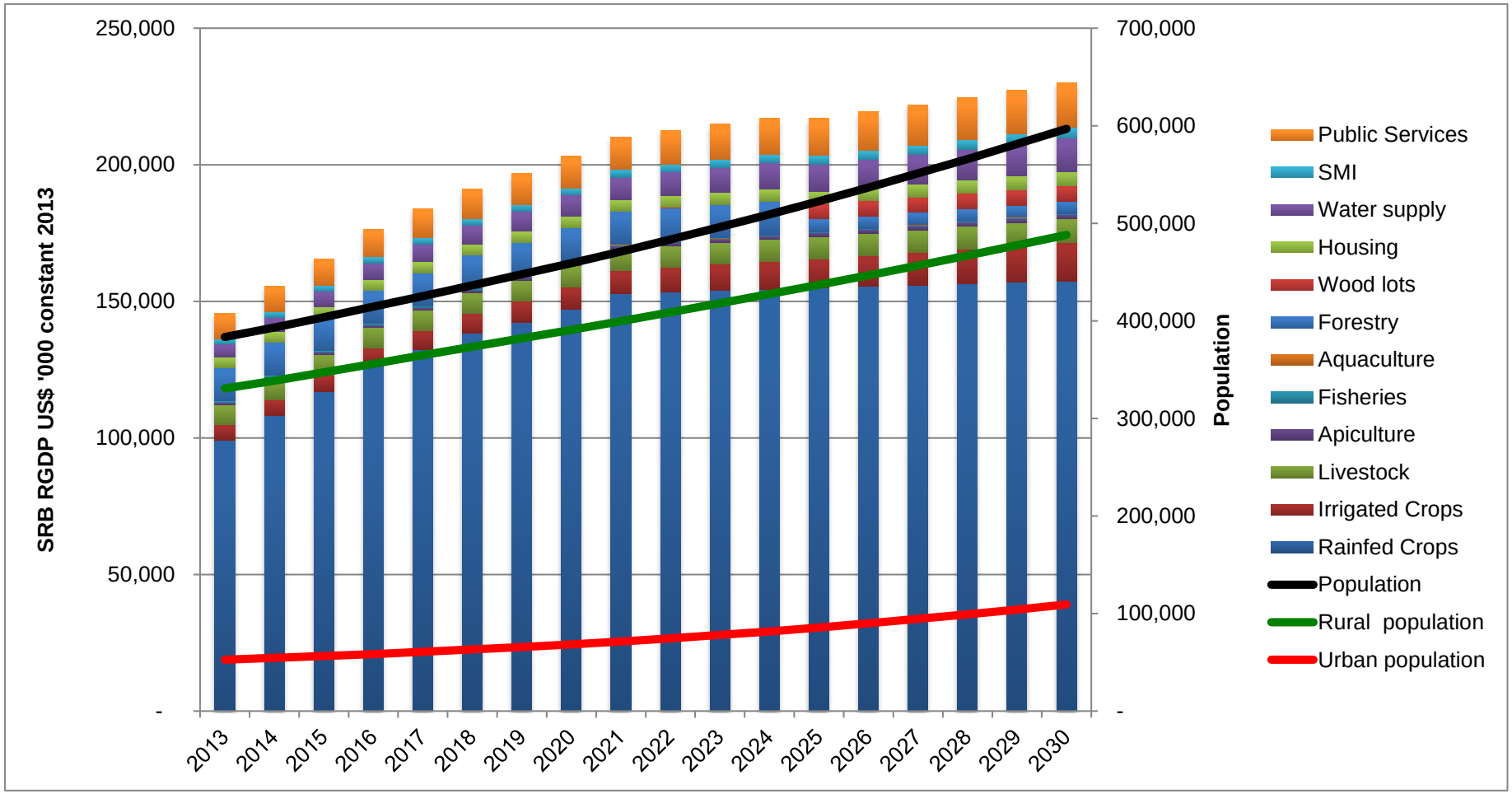
The contribution of the housing sector to the SRB economy was projected taking into account rural and urban population growth, changing household size and a slow improvement in the quality of the housing stock.

Change in the contribution of water supply to the basin's economy was modelled under assumptions of rural and urban population growth and the expectation that the Tanzania target cover of 75% by 2017 and the Malawi target cover of 87% will be achieved by 2015.

The contribution of government and social services to the economy was calculated with the help of data given in IMF country summaries to increase by 3.6% per annum for Tanzania and 3.4% per annum for Malawi.

The expected changes in real resource use by sector, summarised above, can then be translated into impact on the national accounts, thus establishing a "without project" scenario: a projection of the national accounts from 2010-2012 into the 2020s describing the economy which is likely without an SRBDP intervention. See Figure 6-2. The prognosis is not good; overall the RGDP is projected to expand only by about 3% per annum, slowing after 2022. As this is expected to be lower than the rate of population growth in 2022 it is inevitable that RGDP per capita will remain static, or worse.

Figure 6-2 SRB RGDP Projected to 2030, constant 2013 US$ '000



6.4 THE SOCIAL ACCOUNTING MATRIX

Chapter 7 of the EDSP (see Volume 4 of this document) covers the preparation and presentation of a Social Accounting Matrix (SAM) for the SRB. SAMs identify flows of value between socio-economic groups using bills and receipts for goods and services exchanged: this sort of documentation is usually obtained from VAT returns. In addition information is needed on exchanges in kind. The bigger the informal economy, the more important these are – and the more difficult to quantify. A third issue is the relationship of the household and the family farm. A well specified SAM would seek to distinguish transactions between them to uncover the difference between household consumption and farm productivity. Most smallholder farms do not keep such records. Therefore the preparation of the SAM was a challenge. The procedure followed was:

- Assume the social groups in SRB are farms, households, firms and governments
- Prepare a generalised SRB diet (using FAO Food Balance Sheets) and attribute food energy requirements to food products
- Assume that commodities will not be traded until all close food substitutes available locally are exhausted
- Calculate the requirement for basin consumption in tons of each commodity and subtract from production statistics allowing for feed and seed and obtain a production (implicitly tradable) surplus
- Estimate the financial value of the production surplus by multiplying by the farm gate price.

In value terms the crops with a production surplus are maize (42% of total value of basin surplus), rice (15%), beans (10%) and roots. If the production surplus is translated into sales outside the SRB (rather than carry-over stock, animal feed, wastage etc. within it) then it could have a value of nearly US$ 50 million per annum or 35% of RGDP in 2010. This is a very high proportion and emphasises the exposure of the basin economy to rainfed cropping conditions and price fluctuations, both within the basin and in the wider region.

It was then possible to prepare the SAM. The total payments made or imputed for value received in the SRB in 2010 was about US$ 228 million. The transfers of production from farms to households account for 27% of payments: this is a measure of the extent of subsistence use of smallholder farms by households. A further 27% of payments are attributed to farms selling production to firms.

Households acting as buyers account for 37% of the value of payments, but as sellers they account for only 22%: again, households are being subsidised by their farm enterprise. Firms have a similar balance between purchases and sales: firms buy surplus farm production in the basin and export it. Sales from

farms account for 59% of basin payments while farm purchases are only 17% of payments: the generation of SRB value added is obviously in the farming sector and the use of land. Government “sales” account for 10% of SRB receipts. Government has virtually no activity as a “buyer”: this means that the basin economy is paying negligible taxes (agricultural inputs and outputs are mostly zero rated for VAT and social contributions from salaries are limited for example) and relies on funding from other regions for its public administration and development costs.

6.5 THE ECONOMIC DEVELOPMENT PLAN

Chapter 8 of the EDSP (see Volume 4 of this document) describes the interventions recommended under the SRBDP and evaluates them so their impact may be included in the SRB accounts. Central to the Programme is an estimate of the contribution of the Lower Songwe Dam to the basin economy. The production statistics of the Lower Songwe Dam are well known and therefore not summarised here, but if all power generated were sold to TANESCO and ESCOM the value added to the basin economy would be in the order of US$ 65.8 million in 2013 prices, compared to the projected value of SRB RGDP in 2022 of US$ 213.4 million, also expressed in 2013 constant prices. Hydropower generation could comprise 24% of the SRB economy in 2022. Its export value would exceed food exports and increase stability in the basin economy. But the dam operator, Songwe River Basin Commission (SRBC) would be sole producer, and profits from production would accrue to the Malawian and Tanzanian Governments, not to the basin population. For that reason, SRBDP includes additional initiatives.

The most appropriate and probably most far reaching initiative will exploit the possibility of expanding electricity services in the basin. The SRBDP Electrification Plan, described in Chapter 8, recommends that by the mid 2020s, 71% of the rural population and 100% of the urban population (including all small industries) be connected. Spatial areas accounting for about 84% of basin RGDP would be powered and this would accelerate the momentum of economic development. The Plan takes into account the service expansion offered by TANESCO and ESCOM in the interim, but even if completed these would only supply 49% of the rural population, 64% of the urban population and areas accounting for about 59% of RGDP. Of course, it will be uneconomic to supply remote areas of the basin with low population density. Therefore the Plan targets settlements with (i) higher population densities, (ii) higher absolute population and (iii) a higher share of basin RGDP per capita to limit affordability of connection issues and increase opportunities for further growth.

The proposals for SRB electrification will modify the contribution of the Lower Dam to the economy. For convenience, it is assumed that the Lower Dam will generate power consumed in the basin: this provides a financial envelope to prepare a business plan for SRBC for its activities in the power sector which integrates the financial transactions required for running the dam and

supporting electrification in the SBR. The main features of the business plan are:

- profitable bulk power sales will be reduced: about 6.5% of power generated will be consumed in SRB by existing use, planned use by TANESCO and ESCOM and use expected under the SRBC Electrification Plan
- The costs of financing (variable, but possibly about US$ 12 million per annum between years 10-20 including repayment of principal) and operating the dam (US$ 6.15 million per annum) are introduced and distributed between bulk sales and SRB consumption
- transmission and connection charges will be incurred within SRB, much of which will have to be met from profits of bulk electricity sales
- TANESCO tariffs (in 2014) are only about 75% of expected operating costs while ESCOM has tariffs that are 115% of operating costs
- Overall the SRBC Electrification Plan, if implemented in current prices, would be a loss making operation.

The total incremental value added from large scale irrigation supplied from the Lower Songwe Dam is expected to exceed US$ 11 million in constant 2013 prices over an irrigated area of about 6,200 ha. Value added is rather greater from Malawian irrigation than Tanzanian irrigation; partly this is to do with higher crop prices. Incremental return to labour is greater from Tanzanian irrigation; this is because present productivity is comparatively lower. Incremental value added from these major irrigation schemes will increase the size of the SRB economy from 2022, but slowly. Irrigation cannot begin until the Lower Songwe Dam is commissioned. After that, incremental benefits will slowly build up to approaching US$ 7 million per annum by 2030 at which time these large-scale irrigation schemes will account for about 5% of the basin economy.

Water policy in both Malawi and Tanzania states that every household should have access to potable water within 500 metres of the dwelling place. However, at the very best, no more than 60% of the basin population have this level of access – and a high proportion of those that do only have access to non-functioning supply. Works to provide potable water to Kasumulu and Songwe towns, as well as potable water supply to areas elsewhere in the basin, will be carried out directly using funding from SRBC. These interventions are still under design. In addition, SRBDP will provide support to the water supply and sanitation sector to be carried out through District Administrations, as specified in the Community Development Sub-Component report. The value of this support to the basin economy is estimated in the EDSP and suggests that as a result the value added of the water sector would increase by about 22% from the predicted US$ 5 million per annum in 2013. Intermediate costs of operation and maintenance would rise by 10%.

While noting that the role of the small and medium industry (SMI) sector in SRB – to provide employment for rural to urban migrants and increase labour productivity – is not yet on the critical path for the basin's economic development, the poor performance of the sector and its need for support is defined. Recognising the potential benefits, a SMI development facility was

designed to be implemented under SRBDP and to achieve specific growth targets in the sector. At an estimated project cost of US$ 1.25 million, value added by SMI was expected to increase by 50%, the industrial workforce would increase by 30% and return to labour would increase by 15%. Overall, gross value of production by SMI will increase by 10% as a result of the project and additional jobs would be created for about 1,000 workers.

The SRBDP report Water Related Social Infrastructure - Tourism suggests that organised tourism can create 3,000 jobs in tourism in SRB. The UN World Tourism Organisation statistics show that as a result 1,000 international and 3,500 local visitors may be taking part in organised tourism activities. This report estimates the services that the target group will require distinguishing between investment and recurrent costs and estimating staffing requirements. Then, on the basis of typical tourist expenditure levels, enterprise budgets for potential tourist facilities identified in the Tourism Report are prepared and introduced into the basin accounts. Tourism gives a very satisfactory return to labour but the biggest proportion of value added comes from room charges. At US$ 2.6 million per annum the value added from even a modest tourism campaign in SRB is reasonably attractive but it will require a determined approach to attracting visitors, and at the prices assumed in the EDSP calculations the visitors will have to be affluent and the services offered must be high-quality.

Chapter 8 also examines the economic impact of the interventions proposed in the Natural Resources and Land Use Management Sub-Programme (Volume 3). One of the higher profile projects proposed is the Community Forestry for Stabilisation of the Lower Songwe River Project, to address the river's unstable course and damaging flood regime. The contribution to the RGDP at full development in project year 13 (2028) would be an annual net value added of US$ 107,500 with intermediate costs of US$ 12,500 and a return to labour of about US$ 8.60 per day. The project has satisfactory financial characteristics and is environmentally sound but it would have an almost immeasurably small impact on the basin economy.

Growth in rainfed agriculture, which is the mainstay of the SRB economy, is driven at present by rapid take-up of new lands for cultivation. In the early 2020s the supply of suitable land will be extinguished and without productivity increases unsuitable marginal land will be taken in by an increasing rural population. As well as being environmentally damaging and prejudicing catchment quality, returns per cultivated hectare will begin to fall and the basin's principle source of economic growth will be removed. Even now, intensification of rainfed agriculture is urgently required. At about 3.1 tons per ha, maize yields are below generally accepted target yields in 90% of the basin area. If target yields were achieved they would be in the order of 4.1 tons per ha, boosting production by 24% to 219,000 tons per annum compared with the reported production in 2012 of 166,000 tons. Value added specifically to maize could have risen 33%, from US$ 34 million to US$ 45 million.

Chapter 8 scopes a project to address this productivity gap; on the assumption that soil and water conservation (SWC) in conjunction with increased input use (fertiliser and improved seed) will together provide a formula for rainfed agricultural intensification. The analysis is quite detailed and carried out at settlement level but in short:

- Projected cropping patterns and areas for 2022 were superimposed on land availability by slope class within each settlement area (212 in the basin in total)
- SWC measures were roughly determined and costed for the area within each slope class that is expected to be under cultivation in 2022
- Settlements were prioritised for SWC by selecting larger villages with adequate labour resources and a relatively large proportion of their cultivated area on land requiring SWC measures (32 settlements)
- For each of the 212 basin settlements, the required tonnage of basal fertiliser, top dressing and improved seed to achieve target yields of maize in the 2012 cropping season was compared with estimated actual input use during that year
- Settlements were prioritised by identifying those with an input : production ratio of over 2.0 and which would be expected to achieve at least US$ 100,000 worth of incremental maize production per annum (35 settlements)
- The prioritised settlements were compared and combined into a priority list of settlements expected to be responsive to SWC and input supply interventions (52 settlements).

With SWC and input supply, maize production in the priority settlements might be about 347,000 tons in 2022, compared with only 303,000 tons without the interventions and assuming yields remain static. This would represent a significant impact at basin level; maize production might increase by 13% and in current prices might add about US$ 13 million to the RGDP. The cost of achieving this might be in the order of US$ 4.5 million for capital expenditure in SWC and incremental expenditure on inputs that would probably not exceed US$ 1.3 million per annum. The cost of extension effort by District agricultural offices would have to be added. SWC costs are based on the entire cultivated area of each village, not just the maize lands. This is because a piecemeal approach to SWC on agricultural land can do more damage than good. So because maize typically occupies about 50% of the cropped area, SWC should contribute to productivity of other rainfed crops as well.

Large-scale aquaculture development of 50 ha of ponds downstream of the Lower Dam may have a gross value of production at full development of US$ 1.43 million per annum with intermediate costs of US$ 358,500 per annum and the value added of fish production will therefore be about US$ 1,070,000. With around 25,000 labour days required each year the return to labour is about US$ 42 per labour day. The contribution of aquaculture to the basin economy will therefore be small but significant. The enterprise will produce about 400 tons of fish annually, or about 20% of the estimated 2,000 tons per annum consumption

of the SRB population (though in all likelihood the marketing strategy for this tonnage of fish would be to direct it to main centres of population).

Chapter 8 of the EDSP also examines the economic impact of the interventions proposed in the Community Development Sub-programme (Volume 2). The expansion of health and education facilities are recommended which would add value to the basin economy of about US$ 0.32 million per annum and US$ 1.02 million per annum respectively.

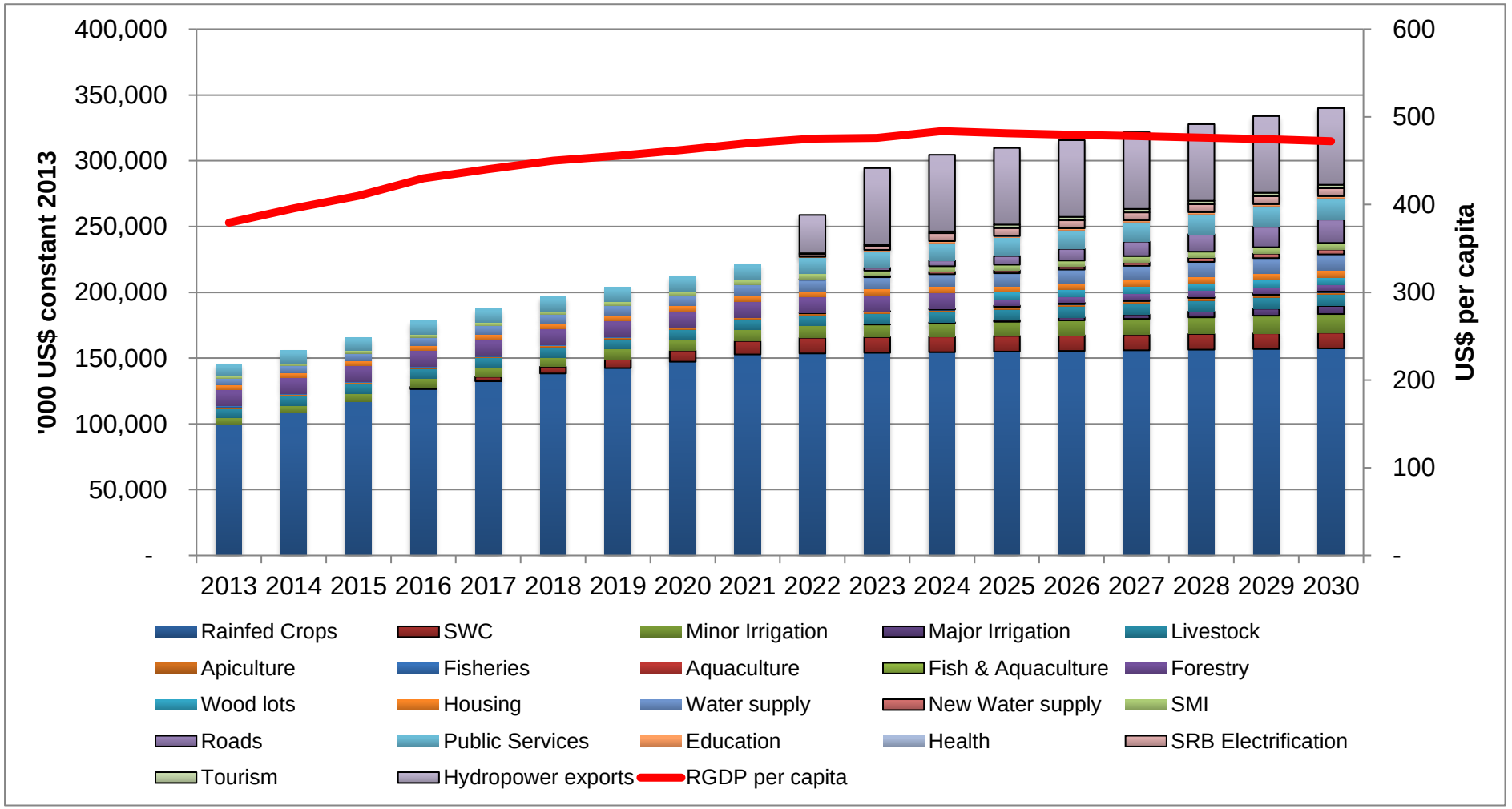
More challengingly, the sub-programme recommends extension and up-grading of about 217 km of roads in the basin (including the access roads to the Lower Dam, 38 km) at a cost of about US$ 75 million. This investment should have a slow but significant accelerating effect on SRB RGDP; the problem was demonstrating it. The basin road density now is 0.68 km per km^2 but overall there is only 0.12 km per km^2 of classified roads. Road density in administrative areas is as expected correlated with area RGDP: a 0.1 km/km^2 increase in road density in an administrative area leads to an increase in RGDP of US$ 153,000 per annum. But this measure does not help to demonstrate an increase in RGDP by a few kilometres of major road up grading and length increases. Such improvements have negligible impact on road density. Analysis shows that RGDP appears to be explained by the interconnectivity of tracks and other roads, which is in turn explained by the density of major roads. Using the coefficients obtained, an additional 217 km of major roads will increase the SRB unclassified road network by 969 km. In turn these unclassified roads will allow a change in economic activity equivalent to an increase in RGDP of US$ 209,000 per annum for every 0.1 km/km^2 increase in unclassified road density achieved. Overall, the increase in RGDP from the recommended road development is expected to be about US$ 18 million per annum, and the SRB road density is expected to grow from 0.68 km/km^2 now to 0.97 km/km^2 when the full impact of the roads programme is realised. Of course, this may take many years.

6.6 SRBDP INVESTMENT PROGRAMME

Chapter 9 of the EDSP collates the value of the initiatives proposed though the SRBDP into a projection of the basin RGDP accounts from the 2010 baseline estimate, through 2011 and 2012 (which are partly validated with District level statistics) and thereafter to 2030. SRBDP projects are expected to come on stream from 2016 and these are distinguished in the projection. The projection (see Figure 6-3) suggests that the SRB economy will grow rapidly at around 7% per annum up to 2024 as a result of SRBDP initiatives compared with a much lower rate of growth, about 2%, if the economy develops without the SRBDP investment scenario (see Figure 6-2). Without SRBDP, RGDP growth is projected to falter after 2022 and may not achieve US$ 230 million by 2030. With SRBDP strong growth occurs, particularly after 2022 when the Lower Songwe Dam will be commissioned, and the value of RGDP is expected to approach US$ 350 million by 2030.

RGDP per capita does not show such convincing improvement. Up to 2020 there will be little change (about US$ 440 per capita) between the scenarios. This is intuitively reasonable: no investment programme starting in 2016 could be expected to make a difference to such a fundamental statistic in only five years. Nevertheless, what is avoided with the SRBDP scenario is the impoverishment of SRB expected after 2022 when population growth outruns land resources. With SRBDP, diversification and capitalisation of the basin economy will lower dependence on rainfed agriculture and thereby maintain medium term growth. The same initiatives will reduce the population's dependence on the basin's trading surplus of rainfed crops (principally maize) and the exposure to price and weather fluctuations that increases risk to livelihoods and discourages investment.

Figure 6-3 Projected SRB RGDP with Highlighted SRBDP Interventions



6.7 SRBDP INVESTMENT

Chapter 9 of the EDSP summarises the SRBDP investment proposed as shown in Figure 6-4. Total investment in the EDSP is estimated to be US$ 714.33 million, the SRBDP as a whole has an investment value of US$ 726.7 (including studies which do not contribute directly to the expansion RGDP and the investment and operating costs of SRBC). The investment for hydropower accounts for 66% followed by major irrigation (12%), rural electrification (5%) roads (9%) and water supply (3%)

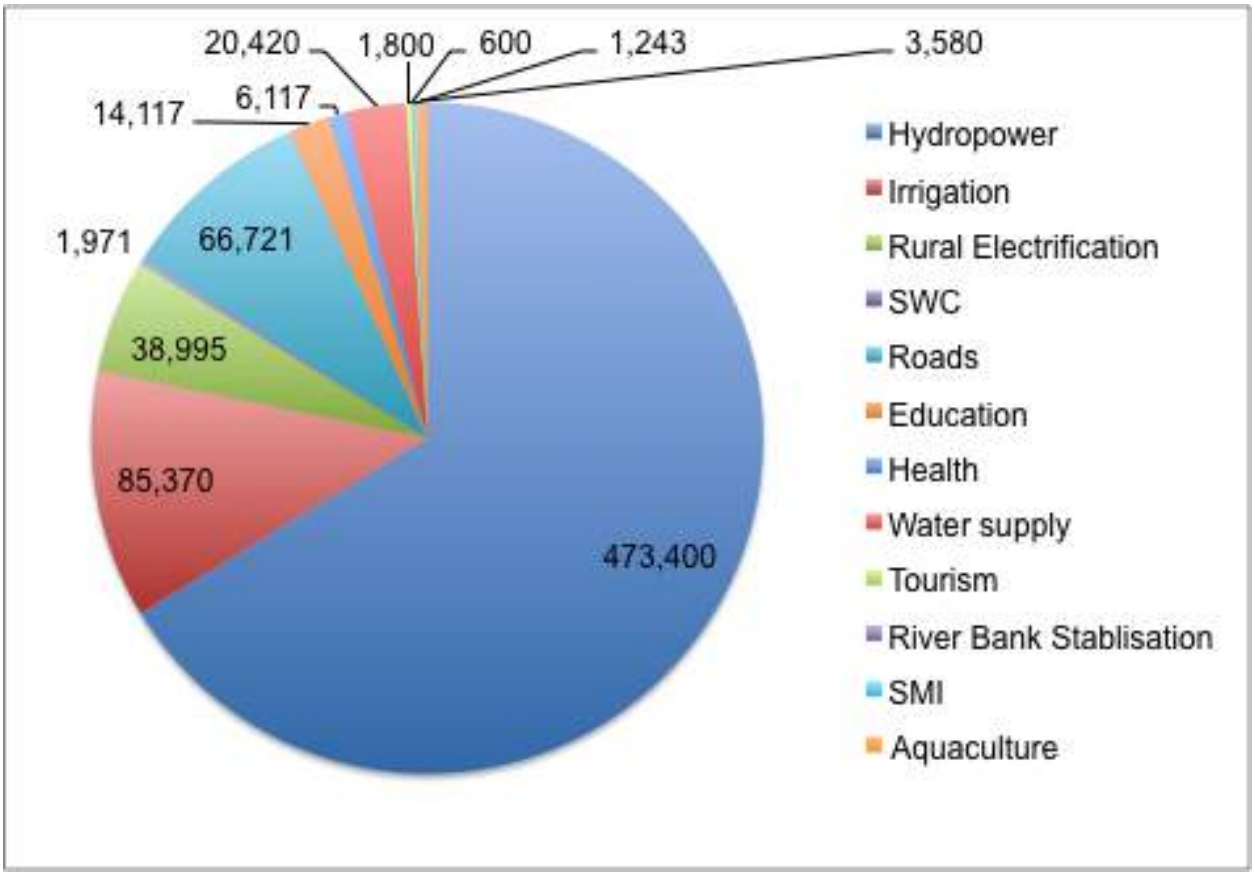


Figure 6-4 Proposed SRBDP Investment in the SRB Economy, US$ '000

Of the total investment plan of US$ 709.89 million, 52% will be directed towards Tanzania and 48% to Malawi.

Administrative areas have been ranked by level of investment: per area, per unit area and per capita. Higher investment areas include 30% of the SRB population and 19% of the basin area. Moderate investment areas include both 48% of the population and 48% of the basin area. Lower investment areas include 22% of the SRB population and 33% of the basin area. The classification suggests that administrative areas with high population densities are favoured for investment, but not unusually so.

6.8 FINANCING PLAN FOR THE SRB

Table 6-1 summaries the costs of projects and studies included both in the EDSP and the SRBDP as a whole. The projects additional to EDSP projects (highlighted in yellow) are nearly all studies. As such they are relatively small, time-bound, have little or no recurrent costs and are not expected to contribute measurably to SRB RGDP.

Table 6-1: Summary of Investment and Recurrent Costs of SRBDP Projects

SRBDP Project Name	TOTAL, US$	TANZANIA, US$	MALAWI, US$	TANZANIA %	MALAWI %	Recurrent costs (US$ p/a)	Proposed Implementation schedule
Lower Songwe Dam and Hydropower Plant	473,400,000	236,700,000	236,700,000	50%	50%	6,154,222	2017-2022
Rural Electrification	38,995,000	20,518,754	18,476,246	53%	47%	1,481,178	2020-2028
Detailed Design for Middle Songwe Dam and HPP	2,000,000	1,000,000	1,000,000	50%	50%		2019
LSRT Irrigation and Drainage Scheme	39,120,000	39,120,000		100%	0%	1,222,216	2019-2022
LSRM Irrigation and Drainage Scheme	46,250,000		46,250,000	0%	100%	1,150,670	2019-2022
Land Tenure Formalization in Irrigation Schemes	513,200	256,600	256,600	50%	50%		2017-2020
Studies on Rain Water Harvesting and Assessment of Irrigation Schemes	146,200	73,100	73,100	50%	50%		2020-2021
Village Water Supply	12,343,037	6,075,167	6,267,870	49%	51%	302,982	2015-2025
Urban Water Supply Kasumulu Town	5,400,000	4,038,500		100%	0%	407,344	2022 – 2023
Urban Water Supply Songwe Town	2,260,000		4,038,500	0%	100%	407,344	2022 – 2023
Community Forestry for the Stabilization of the Lower Songwe River	600,000	300,000	300,000	50%	50%	38,393	2015-2018
Integrated SWC and Fertility Management for Rainfed Maize production	1,970,861	1,698,535	272,326	86%	14%	1,011,461	2015 – 2022
Upper Catchment Area Protection Project	569,800	284,900	284,900	50%	50%	8,914	2018-2020
Improved Forestry Management	513,200	256,600	256,600	50%	50%		2015-2018
Rehabilitation and Construction of New Schools	14,116,574	9,548,580	4,567,994	68%	32%	1,835,745	2015 – 2018
Rehabilitation of existing and construction of new Health Facilities	6,116,506	3,992,719	2,123,787	65%	35%	727,117	2015 – 2018
Rehabilitation and upgrading of existing Roads	66,720,713	40,673,114	26,047,599	61%	39%	500,405	2016 – 2030
Institutional Development, Support and Capacity Building for SRBC [1/]	7,000,000	3,500,000	3,500,000	50%	50%		2016-2022
Lower Songwe Floodplain Early Warning and Response System	770,000	385,000	385,000	50%	50%		2016-2021
Hydrometeorological Monitoring System	425,000	212,500	212,500	50%	50%		2015-2018
Small and Medium Industry (SMI) Development Facility	1,242,500	621,250	621,250	50%	50%		2018 – 2022
Trial stocking of Lower Songwe Dam reservoir	250,000	125,000	125,000	50%	50%		2022- 2024
Development of Fish Ponds in Lower Songwe Basin	3,580,043	1,790,021	1,790,021	50%	50%	550,445	2023- 2026
Promotion of Tourism in SRB	47,000	23,500	23,500	50%	50%		2018-2020
Tourism Development - Tanzania and Malawi	1,800,000	900,000	900,000	50%	50%	606,464	2022-2025
Training for Tourism	130,000	65,000	65,000	50%	50%		2020-2022
Total	**726,279,634**	**372,158,840**	**354,537,793**	51%	49%		

The basis of the SRBDP financing plan is the business plan for electricity production and sales from the Lower Dam. This, along with other water management initiatives, including the Irrigation and Drainage Schemes downstream, will comprise the core business of SRBC. It is convenient to pursue the logic further and divide all SRBDP projects listed in Table 6-1 between:

- SRBC core business; i.e. including projects for which SRBC incurs costs and revenue
- SRBC peripheral business; including projects for which SRBC is no more than a conduit for funding i.e. SRBC receives investment funds, or possibly even generates investment funds (post 2022) and passes them on to an implementing agency which then itself incurs costs and revenues in project execution
- Non SRBC business; where (for example) agencies fund SRBDP/EDSP projects directly, by making investment capital available to an appropriate government institution (e.g. a donor partly funds a road construction programme implemented by TANROADS or Malawi's National Roads Authority) or a private investor establishes and operates a business (e.g. aquaculture or tourism).

SRBC core business will be a substantial proportion of the SRBDP (83%) while peripheral business is rather small, as it should be. Projects excluded from the SRBC Business Accounts include the large investments required for road infrastructure in SRB, aquaculture and tourism projects that may best be implemented by private investors and private investors, and a number of studies which may be funded by donors.

A key feature of both the SRBC Business Accounts and the SRBDP Financing Plan will be accounting for the obligation to service investment financing. This financing will probably include:

- The Lower Dam
- The Irrigation and Drainage Schemes
- Financing for SRBC investment and operation costs before bulk power sales are realised from 2022.

The terms of this financing are not yet known, so standard ADF terms have been assumed for all three financing packages in respect of grace period (10 years) and repayment period (50 years), service charge on outstanding balance (0.75%) and commitment fee on undisbursed funds (0.5%). It is assumed that SRBC will undertake all financing obligations in respect of the implementation of SRBDP. The financial charges and repayments will pass through the SRBC Bank Account.

The proposed phasing of SRBDP initiatives are shown in Table 6-1 and can mostly be defined by common sense:

- The Lower Dam construction schedule is fixed: 2017-2022
- The SRBC Electrification Plan will rely on an operational surplus from dam operation; TANESCO and ESCOM may pursue their own investment plans in the meantime: 2020-2028
- SWC and input supply needs to be implemented in the period 2015-2022; it is a relatively small project and therefore not dependent on subsidy from bulk power sales, it needs to be done as soon as possible to avoid an anticipated crisis in land resource

availability and early implementation will maximise environmental benefits in time for the commissioning of the Lower Dam

- River Bank Stabilisation (2015 onwards) is also a small project and will raise awareness of the future impact of the Lower Dam in advance of its construction; spending small sums on biological protection now may avoid unnecessary expenditure on structures, especially if the Lower Dam attenuates destructive flows as expected; the value of the environmental flow from the Lower Dam will be enhanced if there is a good downstream environment to conserve
- Large scale aquaculture (2023-2026) cannot take place without reliable water supply from the feeder canals which will not be available before 2022; nevertheless some trials of the feasibility of the project could be done beforehand in areas with water supply
- Large Scale irrigation is obviously time bound by the construction of the Lower Dam: 2019-2022
- SMI support is a small project and need not be dependent on subsidy from bulk electricity sales, particularly with interest from financial partners: 2018-2022
- Tourism development will to some extent depend on there being a dam to visit (though the Lower Dam will be a structure with an unappealing hydrological regime) so it has been scheduled post 2022
- Road development will be a large scale public investment with good but long term benefits; so road construction can start early and finish late: 2016-2030
- It is important to bring tangible benefits from SRBDP to the SRB population as early as possible, so health and education investment is scheduled 2015-2018
- Scheduling of new investment in water supply is conjectural: many areas will require groundwater development and this will need trial boreholes; it is scheduled 2015-2025 for semi-urban and village supply, but the Kasumulu and Songwe water supply schemes (which will be supplied from the irrigation feeder canals) are scheduled for 2022-2023.

The performance of the SRBC core business is critical to the successful implementation of SRBDP: it will carry 83% of investment costs. To evaluate this performance, outline business accounts were prepared for SRBC, which include bank account, profit and loss and balance sheet which summarise the financial performance of the core activities: bulk electricity supply, tariffed sales of electricity within SRB and the costs of river bank stabilisation.

Table 6-2 shows a schedule of operational and investment costs for SRBC estimated for the period 2015-2030. The costs are based on staffing levels at full development specified in the Business Plan; in short SRBC will comprise about 18 professional staff and 45 support staff. Salaries have been costed accordingly and projected to rise to 100% of requirements at 2018. A social cost element (taxes, social security etc.) of 30% has been added.

The requirement of office facilities appropriate for such an organisation and its activities is suggested in the bottom section of Table 6-2. At full development SRBC is expected to be operating nine vehicles from five fully equipped site offices. Training and workshops are budgeted to account for about 12% of operational costs. Assets are calculated on the basis of investment and replacement costs and depreciation is deducted annually based on asset age before replacement.

The Table has several lines to be carried into SRBC's business accounts: annual operating and investment expenditure and depreciated value of assets. In addition SRBC will require funding for the first seven years of operation, before bulk electricity sales can be made. It has been assumed that financing of US$ 7.0 million will be available on ADF terms described above. These costs are introduced directly into the business accounts: loan servicing is made from the Bank Account and the loan (the principal of which does not begin to diminish until 2030) is a liability on SRBC's Balance Sheet.

Table 6-2 Estimated SRBC Operational and Investment Costs

	2015	2016	2017	2018	2019	2020	2030
TOTAL OPERATING COSTS							
Salaries and Social costs	167,700	419,250	628,875	838,500	838,500	838,500	838,500
Vehicle operational costs	13,500	13,500	27,000	27,000	40,500	40,500	49,500
Board expenses	8,385	20,963	31,444	41,925	41,925	41,925	41,925
Training	20,790	51,975	77,963	103,950	103,950	103,950	103,950
Workshops	31,500	31,500	31,500	31,500	31,500	31,500	31,500
TOTAL	241,875	537,188	796,781	1,042,875	1,056,375	1,056,375	1,065,375
TOTAL INVESTMENT COSTS							
Vehicles	54,000	-	54,000	-	54,000	-	-
Computers	5,000	-	4,000	4,000	4,000	5,000	5,000
Office equipment	31,250	31,250	31,250	31,250	-	-	-
Site Offices	210,000	-	140,000	-	-	-	-
TOTAL	300,250	31,250	229,250	35,250	58,000	5,000	5,000
Unadjusted office asset value	300,250	331,500	560,750	596,000	654,000	654,000	690,000
Depreciation of office assets	-	27,701	26,260	46,581	43,459	51,871	44,964
Value of office assets	300,250	303,799	534,490	549,419	610,541	602,129	645,036
Stock on hand							
Staff days per annum	2,772	6,930	10,395	13,860	13,860	13,860	13,860
Vehicles	3	3	6	6	9	9	11
Computers	10	10	18	26	34	34	34
Office equipment	0.25	0.5	0.75	1	1	1	1
Site Offices	3	3	5	5	5	5	5
Training days	208	520	780	1,040	1,040	1,040	1,040
Workshops	7	7	7	7	7	7	7

Table 6-3 summarises the activities within the core business of SRBC. Bulk sales of electricity, at over US$ 60 million per annum obviously exceed the operational costs of the Lower Dam (US$ 6.2 million per annum) by a substantial amount, but this is not forecast to happen until 2023. In the meantime there is the period during which the Lower Dam must be constructed during which financing charges and SRBC operating costs are being incurred.

Note also that no income is expected from river bank stabilisation, though a small sum in operational costs is incurred from this activity.

AfDB have already noted that in practice SRBC would not be involved in the retailing of electricity in SRB – this would be done by TANESCO and ESCOM. However, the outline accounts presented here assume that SRBC would fund the operational costs of managing the extension of low tension distribution and connection in SRB that is envisaged to raise rural and urban connections in the basin to 87% and 100% respectively and would also collect the tariff revenue. The operating costs of rural electrification in SRB actually exceed the tariff revenue; consequently the net benefit stream for the rural electrification business is negative because TANESCO tariffs do not cover operating costs. This business loss should be identified in the SRBDP financial analysis presented in the next section. Rather than introduce additional accounts to demonstrate the business loss to TANESCO and ESCOM, which would be confusing, it is preferred to internalise the transactions in the SRBC business accounts.

Finally, note that the operational costs of the Irrigation and Drainage Schemes exactly equal the expected income from water charges. There may be latitude to operate these gravity irrigation schemes at a profit (for example to cover the costs of river bank stabilisation) because the cost of water to users will be relatively low compared with other forms of irrigation. But it is inescapable that such a strategy is impossible until 2022 when the irrigation schemes begin operation.

Table 6-3: SRBC Sales and Operation Accounts

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
SALES										
Bulk electricity sales									68.25	66.52
Tariffed electricity sales									0.48	2.86
Water sales to LSRT I&D Scheme								0.14	0.27	0.59
Water sales to LSRM I&D Scheme								0.16	0.32	0.69
OPERATING COSTS										
Lower Dam									6.15	6.15
LSRT Irrigation and Drainage Scheme								0.14	0.27	0.59
LSRM Irrigation and Drainage Scheme								0.16	0.32	0.69
Transmission and connection in SRB										2.93
Stabilisation of the Lower Songwe River			0.00	0.01	0.02	0.03	0.04	0.05	0.05	0.05
SRBC operating costs	0.24	0.54	0.80	1.04	1.06	1.06	1.07	1.07	1.07	1.07
FINANCING COSTS										
Lower Dam										
Commitment fee			2.27	1.73	1.02	0.38				
Repayment of principle										9.47
Service charge										3.27
LSRT Irrigation and Drainage Scheme										
Commitment fee					0.15	0.10	0.06			
Repayment of principle										0.78
Service charge										0.28
LSRM Irrigation and Drainage Scheme										
Commitment fee					0.18	0.13	0.07			
Repayment of principle										0.93
Service charge										0.33
Institutional Development, Support and Capacity Building for SRBC										
Commitment fee		0.03	0.03	0.02	0.02	0.01	0.01			
Repayment of principle										0.14
Service charge										0.05

Table 6-4 shows SRBC's capital investment, depreciation costs and liabilities and assets. Capital costs obviously include the construction of major engineering structures: the Lower Dam and the Irrigation and Drainage Schemes, as well as smaller investments to provide low tension transmission and connections in SRB. In addition there are relatively small annual sums for river bank stabilisation and investment expenditure for the SRBC office.

Depreciation is not incurred until the major structures are completed, though there are small sums to be allocated to depreciation of SRBC assets (vehicles, office equipment, offices etc.) in the early stages of SRBC operation. SRBC assets are clearly the full value of major structures, less depreciation progressively incurred after their construction. Note though that SRBC assets are very small in value until these structures are actually constructed.

Not so small are SRBC liabilities, which are the full value of the loans taken out for construction until repayment of the principle begins after the ten-year grace period. Note though that no loan needs to be taken out for the extension of transmission and connections in SRB: this can be financed directly from revenue from bulk sales.

Table 6-4: SRBC Assets and Liabilities

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
CAPITAL INVESTMENT										
Construction of Lower Dam			18.94	108.88	142.02	127.82	75.74			
LSRT Irrigation and Drainage Scheme					9.11	9.11	9.11	11.78		
LSRM Irrigation and Drainage Scheme					10.55	10.55	10.55	14.60		
Transmission and connection in SRB									6.50	
Stabilisation of the Lower Songwe River	0.03		0.06	0.08	0.10	0.10	0.10	0.07	0.05	
SRBC Offices and equipment	0.30	0.03	0.23	0.04	0.06	0.01	0.04	0.06	0.00	0.01
DEPRECIATION										
Lower Dam									10.41	8.91
LSRT Irrigation and Drainage Scheme									3.44	1.81
LSRM Irrigation and Drainage Scheme									4.07	2.14
Transmission and connection in SRB										0.62
SRBC Offices and equipment		0.03	0.03	0.05	0.04	0.05	0.04	0.04	0.05	0.04
LIABILITIES										
ADF for Lower Dam		473.40	473.40	473.40	473.40	473.40	473.40	473.40	473.40	435.53
ADF for LSRT Irrigation and Drainage Scheme				39.12	39.12	39.12	39.12	39.12	39.12	37.56
ADF for LSRM Irrigation and Drainage Scheme				46.25	46.25	46.25	46.25	46.25	46.25	44.40
ADF for transmission and connection in SRB										
ADF Institutional Development, Support and Capacity Building for SRBC	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.86
ASSETS ADJUSTED FOR DEPRECIATION										
Lower Dam								473.40	462.99	396.22
LSRT Irrigation and Drainage Scheme								39.12	35.68	18.72
LSRM Irrigation and Drainage Scheme								46.25	42.18	22.13
Transmission and connection in SRB									6.50	36.11
SRBC Offices and equipment	0.30	0.30	0.53	0.55	0.61	0.60	0.65	0.65	0.64	0.65

Table 6-5 shows the SRBC Bank Account. The beginning of the year obviously accumulates the balance of the preceding year. Cash in is comprised of the principals of the loans taken out by SRBC for construction of major structures and SRBC operation and investments, plus income from power and water sales. Cash out are disbursements for investments, operating costs and loan servicing payments. Shaded out are any payments for peripheral activities: if any were incurred they would draw down the Bank Account. Note the Bank Account is almost constantly in credit except for one year; 2022. Even if all peripheral activities were the Bank Account would still be positive up to 2022, though in that year an overdraft would have to be sought for over US$ 35 million instead of the US$ 7.5 million overdrawn balance incurred with core activities only.

Table 6-6 shows the Profit and Loss Account and Balance Sheet. Both show annual, not cumulative balances. The Profit and Loss account demonstrates the very long gestation of profits from the SRBC core business. On the other hand it promises substantial future profit when the Lower Dam is built. Note that the Profit and Loss account is devoid of entries related to peripheral activities: it summarises what SRBC actually does: build and operate water infrastructure and take in revenue from the sales of power and water. The Profit and Loss account demonstrates SRBC does this well, if the long period of comparatively small net losses from operations required to get the Lower Dam and Irrigation and Drainage Schemes built can be withstood.

The Balance Sheet lists annual assets (less depreciation) and liabilities (the value of loans taken out for accumulating those assets). It makes uncomfortable reading during the construction period – but the deficits could be substantially reduced with more attention to loan scheduling.

Table 6-5: SRBC Bank Account

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2030
BANK ACCOUNT										
Cash in										
Fund in for Institutional Development, Support and Capacity Building for SRBC	7.00									
Fund in for Lower Dam		473.40								
Fund in for LSRT Irrigation and Drainage Scheme				39.12						
Fund in for LSRT Irrigation and Drainage Scheme				46.25						
Receipts from power and water sales								0.29	69.32	70.66
Cash out										
Disbursements for capital investment	0.33	0.03	19.22	109.00	161.84	147.59	95.54	26.51	6.55	0.01
Disbursements for operating costs	0.24	0.54	0.80	1.05	1.07	1.08	1.10	1.41	7.86	11.48
Disbursements for loan servicing		0.03	2.30	1.75	1.36	0.62	0.14			15.24
Support operational costs to Peripheral Activities										
Support investment costs to Peripheral Activities										
Cash on hand, year end	6.42	479.22	456.90	430.47	266.19	116.90	20.11	-7.51	47.40	382.92

Table 6-6 SRBC Profit and Loss and Balance Sheet

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
PROFIT AND LOSS ACCOUNT										
Sales								0.29	69.32	70.66
Production costs			0.00	0.01	0.02	0.03	0.04	0.34	6.79	10.42
Gross profit			-0.00	-0.01	-0.02	-0.03	-0.04	-0.05	62.53	60.24
SRBC operating costs	0.24	0.54	0.80	1.04	1.06	1.06	1.07	1.07	1.07	1.07
Net profit before interest and tax	-0.24	-0.54	-0.80	-1.05	-1.07	-1.08	-1.10	-1.11	61.46	59.17
BALANCE SHEET										
Assets										
Cash at bank	6.42	479.22	456.90	430.47	266.19	116.90	20.11	-7.51	47.40	382.92
Fixed assets less depreciation	0.30	0.30	0.53	0.55	0.61	0.60	0.65	559.42	547.98	473.84
Total assets	6.72	479.53	457.44	431.02	266.80	117.50	20.76	551.91	595.38	856.76
Liabilities										
Loans	7.00	480.40	480.40	565.77	565.77	565.77	565.77	565.77	565.77	524.34
Assets less liabilities	-0.28	-0.87	-22.96	-134.75	-298.97	-448.27	-545.01	-13.86	29.61	332.41

7 REFERENCES

1. Lahmeyer International, ACE, 2014a, Songwe River Basin Development Programme, Shared Vision 2050.

2. Lahmeyer International, ACE, 2014b, Songwe River Basin Development Programme, Strategic Environmental and Social Assessment, Final Report.

3. Lahmeyer International, ACE, 2014c, Songwe River Basin Development Programme, Update of the 2003 Feasibility Study.

4. Norplan, 2003, Feasibility Study (FS) for the Stabilisation of the Course of the Songwe River Basin.

5. WWF, 2004, Songwe River Transboundary Catchment Management Project (SRTCMP), Legal and Institutional Baseline Report.

6. United Republic of Tanzania, 2009, Water Resources Management Act.

7. WWF, 2009, Songwe River Transboundary Catchment Management Project (SRTCMP), Atlas of the Songwe River Basin.

8. United Republic of Tanzania, 2009, Water Resources Management Act.

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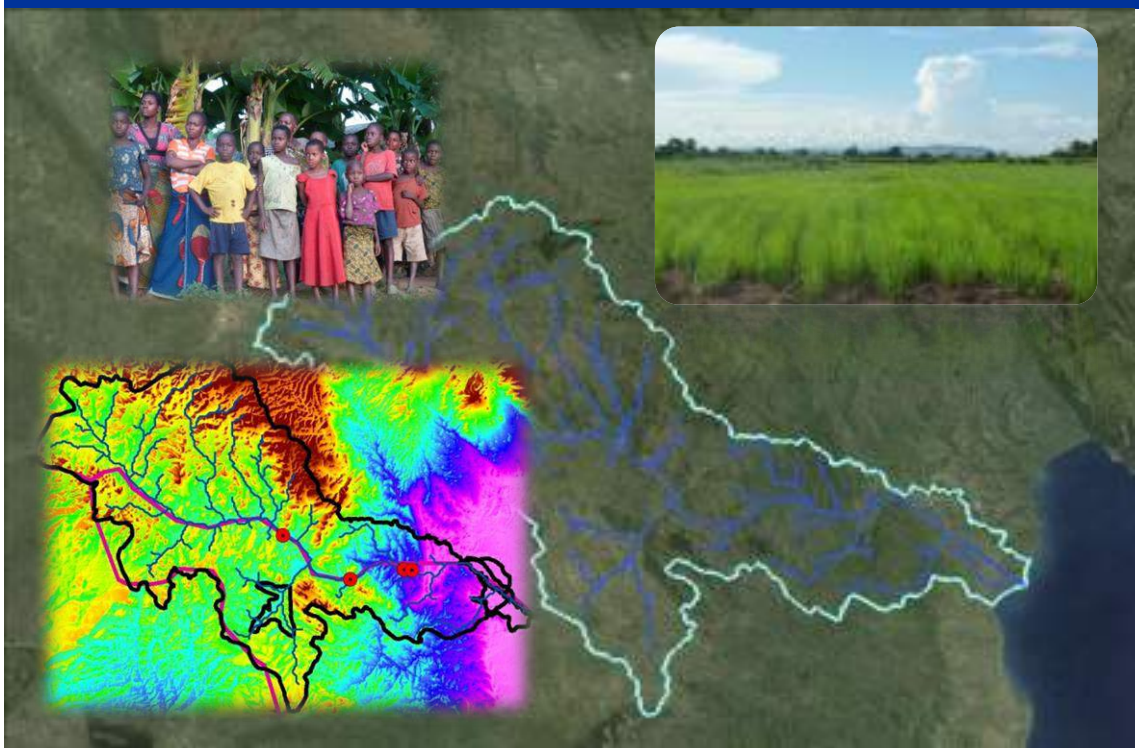
DETAILED DESIGN AND INVESTMENT PREPARATION PROJECT FOR THE SONGWE RIVER BASIN DEVELOPMENT PROGRAMME

SRBDP VOLUME 2

COMMUNITY DEVELOPMENT SUB-PROGRAMME



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FINAL

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Acronyms and Abbreviations

ADC	Area Development Committee
ARIs	Aids Related Infections
CADECOM	Catholic Development Commission
CDSP	Community Development Sub-Programme
CBO	Community Based Organizations
COMSIP	Community Savings and Investment Promotion
DADO	District Agricultural Development Officer
DDIP	Detailed Design and Investment Preparation
DEC	District Executive Committee
DED	District Executive Director
DHS	Demographic and Health Survey
DFID	Department for International Development
DRC	Democratic Republic of Congo
ESCOM	Electricity Supply Corporation of Malawi
FBO	Faith Based Organizations
FISP	Farm Inputs Subsidy Programme
GDP	Gross Domestic Product
IHS	Integrated Household Survey
LDF	Local Development Fund
LGCDG	Local Government Capital Development Grant
MAREP	Malawi Rural Electrification Programme
MDG	Millennium Development Goals
MGDS	Malawi Growth and Development Strategy
MKUKUTA	National Strategy for Growth and Poverty Reduction (Kiswahili Version)
MVA	Malawi Vulnerability Assessment
NGO	Non-Governmental Organization
NBS	National Bureau of Statistics
NSO	National Statistical Office
NSGRP	National Strategy for Growth and Reduction of Poverty
PHSDP	Primary Health Services Development Programme
PWP	Public Works Programme
SCTS	Social Cash Transfer Scheme
SRBDP	Songwe River Basin Development Programme
SRBC	Songwe River Basin Commission
TA	Traditional Authority
TANESCO	Tanzania Electricity Supply Corporation
TASAF	Tanzania Social Action Fund
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WVI	World Vision International

1 INTRODUCTION

1.1 REPORTING

This document is Volume 2, Community Development Sub-Programme of the four volume Songwe River Basin Development Programme Final Report. It is prepared as part of the Detailed Design and Investment Preparation (DDIP) – Songwe River Basin Development Programme (SRBDP) project.

Volume 1 is the summary of the three Sub-Programmes with an Introduction to the SRBDP as a whole; Volume 2 is the Community Development Sub-Programme; Volume 3 is the Natural Resources and Land Use Management Sub-Programme; and Volume 4 is the Economic Development Sub-Programme. This, Volume 2, is intended to be read in conjunction with the other three volumes.

Additionally, the DDIP-SRBDP project has produced several reports over the two years of the project. The documents with the closest links to this report are:

- Update of the 2003 Feasibility Study: April 2014
- Shared Vision 2050: April 2014
- Water Related Social Infrastructure: April 2015
- Business Plan for the SRBC: April 2014

The other documents prepared under this project are:

- Inception Report: May 2013
- Strategic Environmental Assessment for the SRBDP: April 2014
- Convention for the Songwe River Basin Commission (SRBC): September 2014
- Songwe River Basin Development Programme: April 2015
- Detailed Design for the Stabilisation of the Lower Songwe River: April 2014
- Detailed Design for Water Supply for Kasumulu Town and Lower Songwe Communities: June 2015
- Detailed Design for Water Supply for Songwe Town and Lower Songwe Communities: June 2015
- Detailed Design and Tender Documents for the Lower Songwe Dam and HPP: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Tanzania Irrigation and Drainage Scheme: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Malawi Irrigation and Drainage Scheme: June 2015
- Environmental and Social Impact Assessment: April 2015
- Resettlement Action Plan for the Lower Songwe Dam and HPP: April 2015

- Resettlement Action Plan for the Lower Songwe River Irrigation and Drainage Schemes: April 2015

1.2 OBJECTIVES

The Community Development Sub-Programme focuses on poverty alleviation, community needs, health and education, water supply, roads and other aspects of communication networks and gender issues in the context of social development and the outcomes of the Strategic Environmental and Social Assessment (SESA).

Therefore, the overall objective of the community development sub-programme is to improve the social and economic status of the population of the Songwe River Basin in the context of the Strategic Environmental and Social Assessment. The Community Development Sub-Programme will among others:

a) Encourage SRB communities to engage in economically productive activities through existing structures (Outcome: Reduced poverty levels within the basin).
b) Support effective health delivery services among the population of the river basin (Outcome: Improved health and lower mortality rates).
c) Assist the local councils to reduce bottlenecks identified in the education sector (Outcome: Increased literacy rates among the basin population).
d) Facilitate provision of durable and reliable transport infrastructure within the SRB (Outcome: Increased mobility of people and goods within and outside the basin).
e) Support the creation of an equal opportunity environment among the SRB population (Outcome: Reduced gap between men and women in access to economic opportunities and productive resources).
f) Promote the improvement of livelihoods of vulnerable groups of people within the SRB (Outcome: Self-sustaining communities with reduced vulnerability among at risk groups of people).

The consulting team undertook consultations with various groups of people at all levels as the 2050 Shared Vision was being formulated. Consultations were done at community, district and national levels where issues/challenges that have a negative impact on the lives of people in the Songwe River Basin were identified. Further to that, the Shared Vision has clearly articulated the aspirations of the people in the river basin and spelt out where they want to be by 2050. The Community Development Sub-Programme seeks to build on this vision and attempts to address the challenges facing the Songwe River Basin population. In this regard, the Community Development Sub-Programme, which is a framework aimed at contributing towards the improvement of the social and economic status of the people in the basin has suggested short and medium term proposals and strategies based on sector plans.

The Community Development Sub-Programme framework therefore highlights issues/challenges identified and interventions' objectives. It also contains strategies of overcoming those challenges and where feasible, performance indicators.

Figure 1-1 is an administrative map of the SRB which shows the traditional areas (TAs) for the Malawi side of the basin and Wards for districts on the Tanzania side.

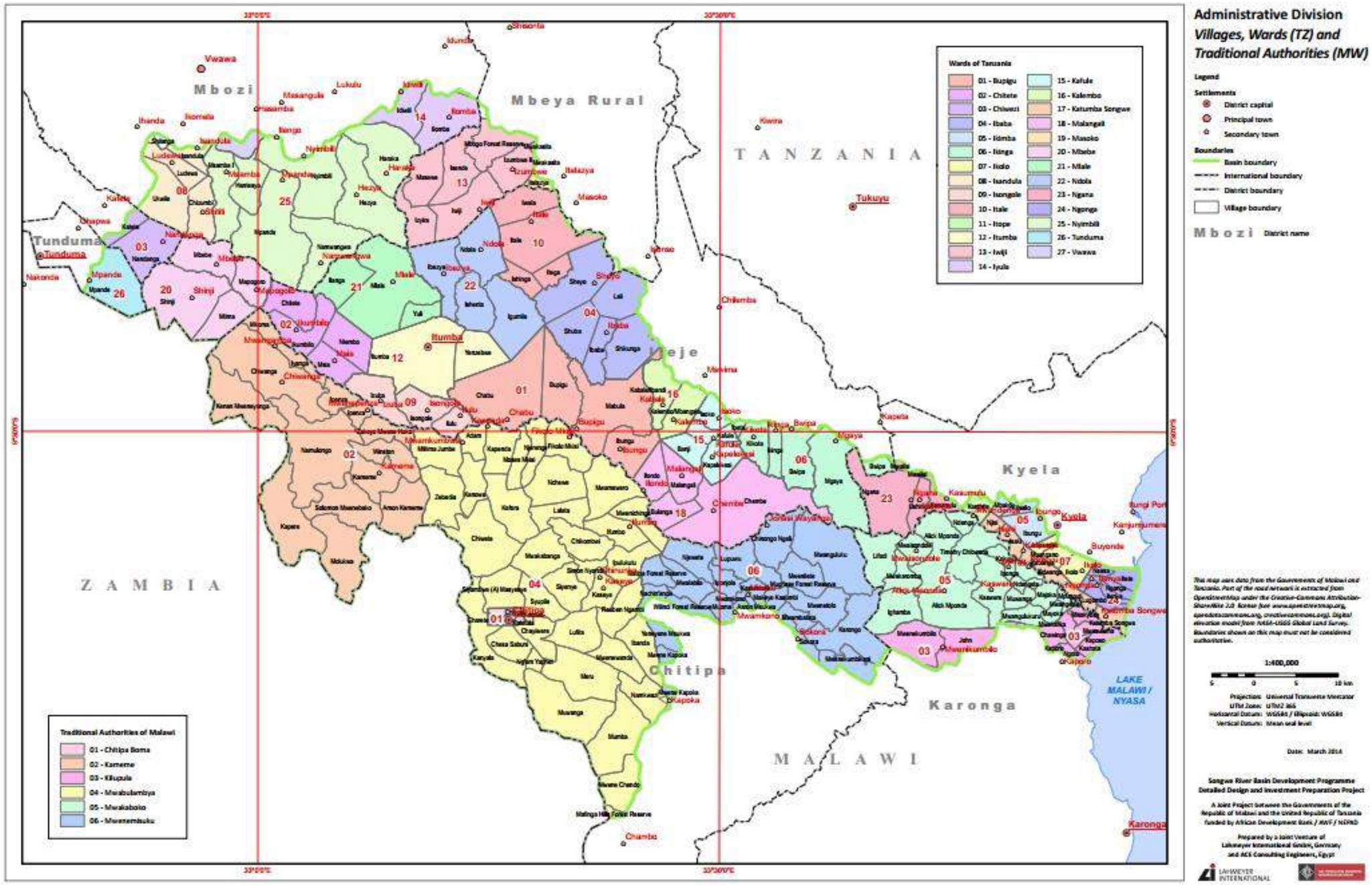


Figure 1-1: Administrative Map of the Songwe River Basin

1.3 APPROACH

1.3.1 Sources of Information

Information has been obtained from various sources such as official surveys for both countries, raw data collected from the districts by a team of consultant and counterpart staff, results of sample surveys conducted in the basin, bottom up consultative workshops held in all districts except Momba during the preparation of the Shared Vision 2050, the Strategic Environmental and Social Assessment (SESA) and also some published reports from international organizations. Additional data was also collected when consultants visited the three districts of Karonga and Chitipa in Malawi and Ileje in Tanzania in November 2013 and all districts in the basin during the second phase in March 2014. Comparing and analyzing data to make reasonable conclusions has been difficult because of the following reasons:

- Absence of area level and in some cases, district level data. Tanzania is spatially much bigger than Malawi and most data is at regional level
- Lack of disaggregated data applicable to basin wide area.
- Difference in base years or years of reference as surveys are conducted at different times in the two countries.
- Non uniform and/or absence of agreed indicators on some data on various social issues such as poverty incidences

Despite the above challenges, it has been possible to make a fair conclusion that the social status of the Songwe River Basin is characterized by the following among others:

a. Dominated by rural poor people who depend on agriculture for over 85% of their livelihoods
b. Low per capita income compared to national averages
c. Medium levels of education in general but high illiteracy rates among women
d. Farming system that is highly rain fed and dependent on government support
e. Poor health of the people due to shortage of drugs and health personnel and accessibility problems
f. Very poor transport infrastructure

The above status creates an opportunity for the proposed projects in the Songwe River Basin Development Programme to bring positive impacts on the lives of the basin population so as to achieve sustainable socio-economic and environmental development of the whole region.

1.3.2 District Sector Plans and Priorities

The Community Development Sub-Programme has drawn its projects from the sector plans obtained at district level and also community aspirations as reflected in the SRB 2050 Vision. As indicated in Section 1.3.1, consultations were made with heads of departments/sections or their representatives who ably provided their short, medium or long term development plans. Development strategies and specific projects contained in this Sub-Programme were derived from these sector plans. All district councils have in their sector plans, infrastructure development projects such as schools, health facilities, roads and water supply. As seen in Appendix 3, Appendix 5, Appendix 8 and Appendix 9, some sector construction projects have no funding commitments and some of these have been costed and recommended to be implemented with direct funding from or sourced by SRBC. In addition, some roads construction projects proposed go beyond one district such as the Tunduma - Isongole and decision to upgrade this road is made to serve broad regional interests. As priorities do change over time, it is recommended that there should be close cooperation between the SRBC and all district councils in the basin.

The districts councils are expected to continue financing other construction projects using their budgetary funding and other sources and such projects do not appear on a summary of projects in Table 9-1 but are appearing in appendices. District Councils also have on-going and future non-infrastructural interventions in sectors such as education, health and gender and women participation. These need to be supported by the SRBC as and when financial resources are identified. However, the SRBC shall only provide facilitation role on such interventions as the district councils already have the requisite institutional framework and human resources to implement them. Appendix 6 and Appendix 7 contain lists of district officials who were consulted at different times during the process of preparing the Community Development Sub-Programme.

1.3.3 Community Development Overview

Community development in this context will be looked at from the perspective of the definition that has been generally adopted by the United Nations as referring to a process whereby government efforts are reconciled with those of people to improve social, cultural and economic conditions of communities. In this respect, there is need for participation of representatives of interest groups and governments are obliged to form partnerships in order to achieve the objectives of various interventions targeting the communities. In the end, community development is seen as being both a process and a product.

The cardinal principle therefore is that community change can be achieved through a model of public participation where people are mobilized to plan, make decisions and sit in partnership with governments and other development agencies to find solutions to social and economic issues facing the community. The community development sub-programme under the Songwe River Basin is built under the strength of participatory approach to development. As it will shown in subsequent sections, development in the basin is based on the bottom up approach and local communities are highly involved in deciding the type of development that is required in their communities. Any interventions

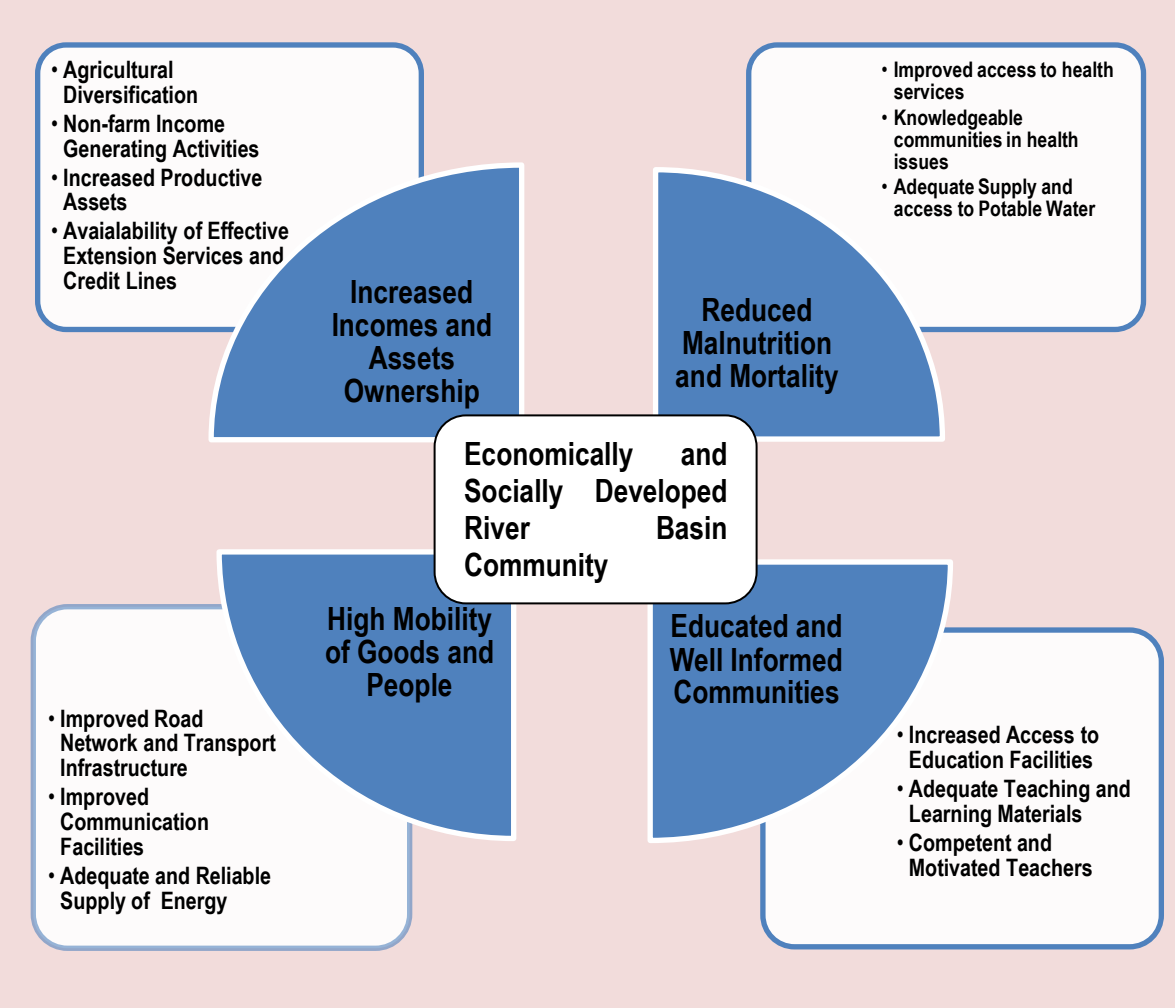
in various sectors of development in the Songwe River Basin will be based on local contribution and participation.

A quick analysis of the profile has revealed that the Songwe River Basin has some problems/challenges that are affecting the lives of the population. As such, interventions directed at those problems will contribute significantly towards transforming the lives of the basin population for the better. Strategies on how to deal with identified challenges and other sector specific plans have been recommended whose overall purpose is to achieve social and economic development of the Songwe River Basin in the next 10 years.

1.3.4 Community Development Framework for the SRB

Development in the Songwe River Basin shall be carried out with the overall goal of achieving an economically and socially developed community and the framework shown in Figure 1-2 below is a summary outlining major objectives and the expected outcomes/results of all initiatives under this sub-programme. This is in line with community development indicators suggested in the Community Development Policy for the United Republic of Tanzania.

Figure 1-2: Community Development Framework for the SRB



2 POPULATION PROFILE

2.1 POPULATION UPDATE

Songwe River Basin had an estimated population of 391,437 as of 2013. The Tanzanian side had about 226,253 people representing 64.7% while the Malawian side had a total population of 165,184. Table 2-1 and Table 2-2 overleaf show the distribution of the population within the river basin in 2013.

Table 2-1: Population for the SRB in Malawi in 2013

District	TA	Population
Chitipa	Mwabulambya	69,029
	Mwenemisuku	15,973
	Kameme	22,496
	Chitipa Boma	17,184
	Sub-Total	**124,682**
Karonga	Kilipula	17,952
	Mwakaboko	22,550
	Sub-Total	**40,502**
Total Population SRB Malawi		**165,184**

Table 2-2: Population for the SRB in Tanzania in 2013

District	Ward	Population
Kyela	Ikolo	19,492
	Katumba Songwe	14,228
	Ngana	6,508
	Ngonga	8,509
	Ikimba	10,837
	Itope	1,101
	Sub-Total	**60,675**
Mbeya	Iwiji	14,646
	Masoko	865
	Sub-Total	**15,511**
Mbozi	Iyula	13,555
	Nyimbili	22,519
	Mvawa	6,913
	Isandula	7,151
	Sub-Total	**50,138**
Ileje	Itumba	10,430
	Itale	7,714
	Ibaba	8,169
	Mlale	5,014
	Ndola	6,984
	Ikinga	4,887
	Kafule	6,637
	Malangali	6,641
	Bupigu	6,292
	Kalembo	3,622
	Isongole	10,130
	Chitete	8,881
	Mbebe	9,505
	Sub-Total	**94,906**
Momba	Tunduma	2,200
	Chiwezi	2,823
	Sub-Total	**5,023**
Total Population SRB Tanzania		**226,253**

Source: GIS Calculation, SRBDP 2014

As Table 2-3 below shows, the river basin has an average population density of 92 persons per sq. km. However, the density is highest in Kyela at 332, followed by Karonga at 122 and lowest being Momba with 64 persons per sq. km. Interestingly Chitipa and Ileje districts that have a combined share of the basin at 71%, has a population density of only 72. This indicates that the upper and middle basins are less populated.

Table 2-3: Population Density and Distribution in 2014

District	Area in Basin Size (km^2)	Percent Share	Population	Pop. Density/km^2
Chitipa	1,590	37	124,682	78
Karonga	335	8	40,502	122
Mbeya Rural	136	3	15,511	98
Ileje	1,500	35	94,906	66
Kyela	118	3	60,675	332
Mbozi	484	11	50,138	104
Momba	80	2	5,023	64
TOTAL	**4,243**	**100.0**	**391,437**	**92**

Source: GIS Calculations, SRBDP 2014

Two major implications should be anticipated from this scenario. Firstly, the two districts of Chitipa and Ileje are already difficult to access due to topography. Therefore, social services will need to be provided to communities that are sparsely distributed within the basin and this will be done at an enormous cost. Secondly, mobility of people and goods within these districts is costly and may remain so unless huge investment in transport infrastructures is made. On a different note, high population densities in Kyela and Momba require strategies that will ensure sustainable utilization of existing and future natural resources and social infrastructures.

2.2 SOCIO-CULTURAL AND HISTORICAL CONTEXT

2.2.1 Assessment of Selected Districts

2.2.1.1 Mbozi District

The major ethnic group in terms of their number is the Nyiha who account for over 50% of the total population. The other ethnic groups are Nyamwanga, Wanda, Nyakyusa, Ndali, Lambya, Malila, and Safwa. The Ndali originally came from Undali Division of Ileje District. There is no conflict among the ethnic groups found in Mbozi district. However, pastoralists who have migrated recently in the area and whose livestock graze freely have greatly contributed to soil erosion.

2.2.1.2 Ileje District

The main ethnic groups found in Ileje District are Ndali, Lambya and Malila. It must be noted that census in Tanzania does not collect data on ethnicity and religion. The only

information available on ethnicity was provided by two district councils and it could not be compared with the other districts in the river basin or national data.

2.2.1.3 Chitipa District

Chitipa is one of the districts that display a diversity of tribes and languages. The dominant ethnic groups in the river basin are Sukwa, Ndali and Nyika in Mwenemisuku, while the Lambya dominate in Mwaubulambya. The other groups are Tumbuka, Bemba, Senga, Chewa, Phoka and Henga. There are also minor groups such as the Nyamwanga, Wandia, Mambwe and Swahili. About 98% of the total population of Chitipa consists of Christians and the remaining percent is for other religions (NSO, 2008).

2.2.1.4 Karonga District

Karonga District has two main distinct ethnic groups: the Ngonde and the Tumbuka and the major languages spoken are Chi Tumbuka and Kya Ngonde. As a border district that lies along the major trade route, other languages, mainly Swahili from Tanzania and Chichewa from Malawi, are also spoken in the district. The main religious groups in the district are Christians (97.4%) while the remainder is for other religions.

2.2.2 Summary of Social and Cultural Features of the Basin

The sample baseline survey report showed that the basin population perceives the household head as the owner of family wealth in both countries (62% in Tanzania and 86% in Malawi). On inheritance after this owner dies, the majority on the Tanzanian side felt that the daughter or son inherits it (62%) while in Malawi, the majority (47%) was of the view that a spouse should inherit it. Both countries practice a patrilineal system of marriage and generally, polygamy is highly practiced in Malawi than in Tanzania. In addition, most of the people (about 98%) are Christians.

As seen above, there are no significant cultural or social features of the people in the basin that would significantly impede implementation of the Songwe River Basin Development Programme (SRBDP) and the associated projects. Two ethnic tribes with similar cultures, the Ndali and Lambya are found in three districts of Ileje and Mbozi in Tanzania and Chitipa in Malawi. However, the arrival and presence of pastoralists in Mbozi is bringing social conflicts among the population and the impact of free range grazing is partly being blamed for increasing rates of erosion in the district.

On the natural resource management however, there is a threat of age old practice among some communities in Karonga District called shifting cultivation. Families cut trees and burn them together. After that millet is planted on burnt ground. During the following year, the practice shifts to a new parcel of land. The process of burning the cut vegetation does not allow regeneration. This is a cause of great worry to conservationists and efforts to stop this practice are not yielding desired results.

2.3 MIGRATION IN THE BASIN

2.3.1 Migration in the Basin on Tanzania Side

Although there are no specific statistics, migration has brought a significant impact on social life of people in Mbozi District such as inter-marriages and general conflicts between farmers and pastoralists. Of late, the district has experienced an influx of pastoralists searching for green pastures for their livestock. Livestock keepers, mainly pastoralists from Mwanza and Shinyanga who have invaded the district especially in Igamba Division bringing with them large numbers of livestock have aggravated the soil erosion problem, thereby causing land degradation which in turn has led to low productivity. In addition, fertile soils and reliable rainfall which are suitable for agricultural production are also a source of attraction of people into Mbozi District

2.3.2 Migration in the Basin on the Malawi Side

Data collected through village action planning process shows that for a period of 10 years, 74% of Karonga's 50 Village Development Committees reported a net increase in migration, while 4% reported a net loss while 17% reported no change. The area of Traditional Authority Kilipula which is apparently within the Songwe River Basin is one of the areas that reported a net loss. This data however, does not give an indication of where the people from Kilipula emigrated to.

Chitipa District does not attract large number of migrants due to lack of opportunities in the employment sector but people move out of the district in search of employment elsewhere. Movement to a number of trading centres accounts for internal migration within the district. Trading centres that attract such migrants include Chitipa Boma, Misuku, Nthalire, Kapoka, Lufita and Chisenga. People migrate to these centres mainly for trading purposes.

2.4 DEMOGRAPHIC SITUATION

Table 2-4 gives an overview of the demographic indicators for the districts in the basin on the Tanzania side as of 2012.

Table 2-4: Demographic Indicators in the Basin in Tanzania

District	Total Pop.	Male	Female	H/Hold Size	Sex Ratio
Kyela	221,490	106,012	115,478	4.1	92
Mbeya Rural	305,319	143,779	161,540	4.1	89
Mbozi	446,339	213,217	233,122	4.3	91
Ileje	124,451	58,463	65,988	4.0	89
Momba	196,818	94,257	102,561	4.6	92
Total	**1,294,417**	**615,728**	**678,689**	**4.2**	**90**

Source: Tanzania Bureau of Statistics, 2012

The sex ratio for Mbeya Region was 92, slightly higher than the average for the basin districts while average household size for the basin is lower than that of the whole Mbeya Region which stood at 4.2. Currently, there are no district specific data on annual growth rates. However, overall the region's annual population growth rate has been increasing from 2.4% between 1998 and 2002, to 2.7% from 2002 to 2012. This generally, is a worrying development considering various efforts that have been directed at reducing population growth. If this trend continues, it may have negative impact on the natural resources and other services and facilities in the Songwe River Basin.

2.5 ASSET OWNERSHIP IN THE SRB

The 2008 Malawi Population and Housing Census lists down key assets that were recorded at household level and it shows that most households had radios, bicycles and ox-carts as shown in the table below. Data on land ownership is not available but housing occupancy shows that majority (93% for Chitipa and 89% for Karonga) of the population lived in owner/family houses.

Table 2-5: Asset Ownership on Malawi Side in 2008

District	Type Of Asset	Pop Owning Them	Percentage
Chitipa	Radio	107,907	62.7
	Bicycle	67,557	39.2
	Ox-cart	3,624	2.1
Karonga	Radio	156,850	61.1
	Bicycle	119,849	46.7
	Ox-cart	9,673	3.7

Source: NSO, 2008

The 2012 Tanzania Census does not provide data on assets ownership at district level. However, according to the baseline sample survey carried out in 2013, common assets owned by households in the Songwe River Basin are radios, mobile phones, bicycles, poultry, cattle and goats. Some households also possess pigs. As shown in the figure below, the reliable means of transport is cycling and use of motor bikes. Motor bikes are, however very common in Tanzania.

The 2012 census data shows that households in Mbeya Region owned various assets in the percentages as shown in Table 2-6 below.

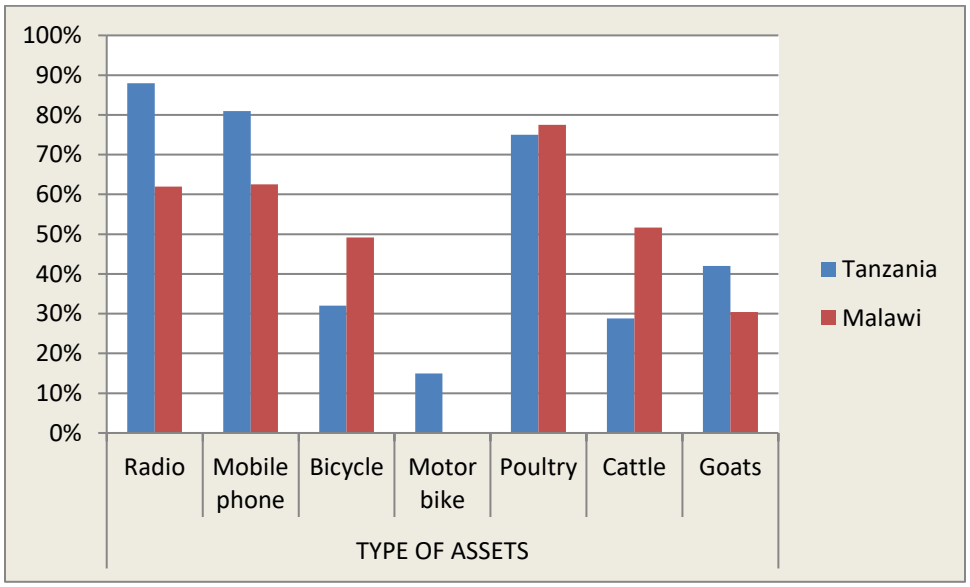
Table 2-6: Ownership of Assets in Mbeya Region in 2012

Total H/Holds	Percentage Of Households Owning Assets								
	House	Land	Radio	Mobile phone	Hand hoe	Bicycle	Plough	Oxen	Charcoal Iron
630,593	79.0	75.6	62.6	58.5	82.3	40.1	10.7	10.9	25.8

Source: NBS, 2014

The high number of families owning a hand hoe in Mbeya Region shows the dominance of farming as major activity, a trend that is typical of the Songwe River Basin. It is also important to acknowledge that most households live in their own houses and also own land which is a valuable asset for rural communities. An overview of asset ownership in the SRB is shown in Figure 2-1.

Figure 2-1: Ownership of Selected Assets in the Basin 2013



Source: Baseline Survey Report, 2013
Note: Assets such as farmland and houses were not captured in the sample survey

About 87.2% of the basin's population depends on selling food grain/crops and vegetables for their incomes with a small percentage supplementing their livelihoods with livestock production and some businesses. Some households reported that there is no significant increase in levels of income while others indicated a total decline in annual incomes.

2.6 ANALYSIS OF CIVIL AND TRADITIONAL POLITICAL BACKGROUND

Malawi, which is a democratic republic, has a political system that is pluralistic in nature. There are three arms of government comprising the executive, parliament and judiciary. The executive arm is responsible for implementing development programmes and projects while the legislature and judiciary provide a complementary role of passing enabling legislations and the administration of justice, conventions and agreements respectively. The critical area of consideration in Malawi's political system is the prevalence of many political parties to which citizens are free to belong.

Membership to formal development structures at district council, traditional area and village levels incorporates members from different political parties, a practice that ensures that divergent views are taken on board during decision making. The role of agencies implementing various interventions in the Songwe River Basin will be to ensure development committees are as inclusive and diverse as possible to ensure that no sections of the communities feel marginalized.

Tanzania is a democratic unitary republic with central government and a devolved government of Zanzibar which has autonomy on non-union matters. From the Central Government, the next level of administration is regions, followed by districts, wards and villages. In terms of urban authority, the highest is the city, followed by the municipality and then town councils. All the districts in the Songwe River Basin are within Mbeya Region. For administrative purposes, districts are also divided into divisions. Decentralization in Tanzania is strongly entrenched such that local government reforms focusing on political, financial and administrative decentralization are still ongoing. The main aim is to promote democratic, accountable and autonomous local government authorities. This is one of the conditions that would contribute to the successful implementation of various programmes and projects in the districts within the SRB.

3 POVERTY PROFILE

3.1 INCOME AND SOURCES OF LIVELIHOODS

3.1.1 Chitipa District

Data collected from the district in 2013 shows that poverty in rural areas is high compared to the national average. Assessed based on income of household heads and by type, the annual average income of people in Chitipa rural is estimated to be K36,280.80 ($99) disaggregated into agriculture, salaries and wages, enterprise and others as shown in the Table 3-1 below. In dollar terms, the average annual income has decreased drastically mainly because of the unstable kwacha value against the US dollar.

Table 3-1: Sources of Income in Chitipa

Average Annual Income By Sources, 2012		
Item No.	**Source**	**Income (MKW)**
1	Agriculture	17,154.80
2	Wages/Salaries	8,193.40
3	Enterprises	6,292.30
4	Others	4,640.30
Total		**36,280.80**

Source: Chitipa Basic Data Collection 2013

As it can be seen from the above table, agriculture is the main source of income. However, the main challenge in the agriculture sector is non-availability of farm inputs due to poor road network. The majority of people experience food shortages between November and March and resort to selling livestock as a coping mechanism.

3.1.2 Karonga District

Agriculture is the main source of income with a variety of crops such as maize, cassava, rice, cotton, ground nuts, sweet potatoes and pigeon peas being grown mainly by smallholder farmers. There is also a thriving and organized fishing industry in Karonga, being a lakeshore district. In addition, a significant number of people are involved in cross border trade whereby various goods are traded between Malawi and Tanzania although some of these trading activities are illegal as goods do not pass through the official border. This makes it difficult to quantify the incomes generated from such trade.

Some groups of people are also involved in organized and group based enterprises with financial assistance from Community Savings and Investment Promotion (COMSIP) and technical support from the Ministry of Industry and Trade. Currently, there are 102 groups being assisted by COMSIP in Karonga district.

3.1.3 Ileje and Mbozi Districts

Just like districts in Malawi, agriculture is the economic main stay for the two districts. On average, the agriculture sector employs about 90% and 88% of the population of Ileje and Mbozi respectively. The economic assessment done under Economic Development Sub-Programme shows that agriculture contributed about 68% of the basin's gross domestic product (GDP) for the year 2010.

The sample survey also confirmed the dominance of agriculture as a main source of livelihood with about 68% of households reporting it as their first choice occupation. Other means of livelihoods were small scale enterprises that were also dealing in the sale of agriculture produce.

3.2 DEMOGRAPHIC INDICATORS FOR MALAWI DISTRICTS

3.2.1 Chitipa District

Demographic and health indicators at district level in Malawi are not disaggregated up to local administrative unit such as TA's, ward or enumeration area. Current projections therefore are available only at district level. A quick look at estimated fertility rates for Chitipa District shows that the rate was 6.52 in 2010 and this is higher compared to the national average of 5.78 for the same year.

Chitipa's life expectancy at birth for 2012 was projected to be 55.87 and 60.95 for men and women respectively. This is an improvement from the 2010 figures which were 53 and 59 for men and women respectively. Total fertility rate for the same year for Chitipa was estimated at 6.40 and the net migration rate, which indicates the contribution of migration to the overall level of population change for Chitipa was estimated to be between -10.51 and -10.98 in 2012 and 2026 respectively. These rates though applicable at district level, are likely to represent the basin population within the 14 year period because a large part of Chitipa falls within the Songwe River Basin.

3.2.2 Karonga District

Demographic and health indicators for Karonga are not disaggregated up to local administrative unit level such as Traditional Authorities or enumeration areas. Current projections therefore are only available at district level. The estimated net migration rate for 2012 and 2026 for Karonga District was estimated to be -2.08 and -2.01 respectively.

Karonga District's life expectancy in 2012 was projected to be 58.14 and 60.84 for men and women respectively while total fertility rate for the same year was projected to be 5.78. This rate is higher than the national rate for the same year.

3.3 DEMOGRAPHIC INDICATORS FOR DISTRICTS IN TANZANIA

Demographic indicators in Kyela District show that the under-five mortality is estimated to be 167 per 1000 while maternal mortality is 122 per 100,000 per women. At the same time, prevalence of HIV incidence was 9.2% while that of TB stood at 102 per 100,000 people. While average life expectancy at birth for Kyela is 45 years, fertility rate is estimated to be 5.1

A general picture of demographic situation of the population of Mbozi indicates that life expectancy averages 57 for males and 58 for females while the total fertility rate is as high as 7 per woman falling in the child bearing age. Under five mortality stands at 5 per 1000 while maternal mortality rate is estimated to be 59 per 100,000 women.

No district specific demographic data for Mbeya Rural District is available. As such, national estimates applicable to rural areas have been used as follows: Mbeya Rural's total fertility rate was 5.4 while life expectancy was estimated to be 56.5 for male and 58.3 for female as at 2010.

There is a general increase in life expectancy of the people of Ileje District. According to the 2008 estimates, the district's life expectancy at birth was 48.36 and 58.24 years for males and females respectively. The maternal mortality rate in 2010 was 295 per 100,000 live births, which is better as compared to the national average of 675. Similarly, under-five mortality rate during the same year was 75 per 1000 live births while the national rate was 128.

Life expectancy in Momba District is estimated to be 50 years while total fertility rates for 2013 is 7, a figure which is quite high compared to the national average. Other health indicators worth highlighting includes severe malnutrition at 1.2% and underweight births at 2.9%. Table 3-2 is a summary of fertility rates and life expectancy in the basin.

Table 3-2: Fertility Rates and Life Expectancy in the Basin

District	Year	Fertility Rates	Life Expectancy	
			Female	Male
Momba	2013	7.0	50	
Mbozi	2013	7.0	58.0	57.0
Mbeya Rural	2010	5.4	58.3	56.5
Ileje	2008	6.1	58.2	48.4
Kyela	2013	5.1	45	
Karonga	2012	5.7	60.8	58.1
Chitipa	2010	6.5	60.95	55.87

Sources: District Data, Population Census Reports and the Tanzania Demographic and Health Survey. Fertility rate for Ileje District, which is predominantly rural, is derived from national rural fertility rates for Tanzania (Tanzania Demographic and Health Survey, 2010)

Fertility rate is one of the significant demographic indicators worth considering in order to move towards sustainable socio-economic development in the basin. Without considering other variables, the increasing number of children born per woman on its own leads to a steady increase in population. The SRB natural resources will continue to be used at unsustainable rates if the rate of population increase is also high. Secondly, it is also necessary to increase life expectancy of the basin population and this should be done through integrated and multi-sector strategies.

3.4 ANALYSIS OF NATIONAL POVERTY

This section seeks to determine the proportion of people that are deemed poor through the use of the agreed national aggregate threshold of basic food consumption and availability of other basic non-food items. The poverty line, defined as the threshold level of welfare, distinguishes poor households from non-poor households. The average annual consumption per capita in Malawi was MK54, 568 ($348) in 2011 implying that on average, a Malawian consumed about MK150 ($0.96) per day. The international poverty line is based on the minimum expenditure of one dollar per day, literally meaning that all individuals who spend less than a dollar a day on basic food consumption are considered to be poor.

Poverty is widespread in rural areas compared to urban areas of Malawi. Regional statistics show that the rural part of the northern region has the second higher rates of poor people at 60% after the rural southern Malawi. Incidence of rural poverty in Malawi shows that there is an increasing trend based on results of the 2005 and 2011Integrated

Household Surveys. Poverty rates for Chitipa and Karonga Districts were 75.6% and 61.7% respectively in 2011, while in 2005, the rates were 67.2% and 54.9% respectively. However, estimated poverty rate for Chitipa District for 2012 was 67% and this is shall be adopted as an estimated level of poverty in the Songwe River Basin on the Malawian side. On the basis of the basin population, this translates into an estimated population of 74,944 being categorized as poor.

In 2007, the Household Budget Survey revealed that the percentage of poor people was estimated to be 33.6% in Tanzania. There was a modest decrease in percentage of poor people between 2011 and 2012, as the figure went down to 28.2%. In the absence of any latest surveys, it is therefore assumed that about 28.2% of the basin population in Tanzania is poor. This translates into an estimated 57,811 people in the basin being poor. Therefore an estimated total of 132,755 people, representing about 42% in the Songwe River Basin were classified to be poor and ultimately living on less than a dollar per day.

3.5 POVERTY LINES

3.5.1 Poverty Line on the Malawi Side of the Basin

The consumption per capita for rural areas in Malawi was MWK 118.00 (US$ 0.75) per day while that for urban areas was MWK326.00 (US$ 2.0) per day in 2011. However the mean annual consumption per capita for Chitipa and Karonga were MWK 32,336.00 (US$ 206) and MWK 41,043 (US$ 261) respectively for the same year (IHS3, 2011).

In the same year, the minimum annual per capita income considered acceptable for Malawi was MWK 37,002 (about US$236). This literally meant that any person spending less than US$ 236 annually on consumption was deemed poor. Additionally, the population with per capita expenditure of less than MWK 22,956 (US$ 146) was considered ultra-poor.

The minimum annual per capita income for Malawi therefore translated into an expenditure of about US$ 0.65 per day which is well below an internationally accepted standard expenditure of US$ 1.0 per day. Therefore, the poverty line for the Songwe River Basin on the Malawi side as of 2011 was US$ 236.00. Based on this poverty line, Chitipa had about 75.6% of its population classified as poor while for Karonga's population, 61.7% consisted of poor people in the year under consideration. Looking at poverty trends in the two districts, incidences of poverty are generally increasing as shown above.

The average annual income per household as reported in the baseline data collection of 2013 for Chitipa District is MWK 36,280.80 (US$ 99)and, according to the District Council's Monitoring and Evaluation Assessment, currently an estimated 67% of the population is poor and out of this, 30% falls in the category of ultra-poor. These figures therefore, indicate that the majority of rural people in Chitipa including the majority of the population in the Songwe River Basin in Chitipa are poor.

3.5.2 Poverty Line on the Tanzania Side of the Basin

The Household Budget Survey of 2007 showed that poverty levels were quite high among the rural people. Based on the minimum threshold expenditures on food (TZS 10,219) and non-food basic needs (TZS 13,998), two poverty lines were drawn. The results showed that nationally, 37.6% of rural people were living below the basic needs poverty line while 18.4% were below food poverty line. Among the female headed households, a total of 23% of the households were below poverty line. Based on a combined minimum expenditure on food and non-food basic needs, a poverty line for rural parts of Songwe River Basin on the Tanzanian side was TZS 290,604 (US$ 234) per annum in 2007.

The Household Budget Survey of 2011/12 for Tanzania revealed that the basic needs poverty line for rural areas was TZS 437,784 (US$ 278). Using this poverty line, about 28.2% of people were poor. Since the survey was spread between the two years, the poverty line calculated below after factoring inflation will apply for 2012. The Poverty Line applicable to the Songwe River Basin in Tanzania based on calculations after computing official inflation rates and currency exchange rates in 2012 is estimated to be US$ 307.66 (TZS 487,046.97).

3.5.3 Poverty Line of the Songwe River Basin

Although the people on both sides of the Songwe River have a lot in common, the two countries' economic data vary significantly such that it is very difficult to come up with a realistic basin poverty line. As seen from Table 3-3 below, factors such as inflation and official exchange rates have a greater impact on the overall acceptable annual per capita expenditure on basic items.

Table 3-3: Rural Per Capita Consumption for Tanzania and Malawi

Annual Per Capita Consumption For Tanzania Rural			Annual Per Capita Consumption For Malawi		
Year	**TZS**	**US$**	**Year**	**MWK**	**US$**
2011	419,868	267	2011	37,002	236
2012	487,047	308	2012	44,920	177
2013	525,524	333	2013	57,453	157

Sources: Tanzania Household Budget Surveys for 2007 and 2011/12, NBS and Malawi Integrated Household Surveys for 2005 and 2011, NSO

In Malawi, the value of the currency is greatly eroded because of high inflation and eventual devaluation that occurred in 2012. The result is that although there is an increase

in disposable incomes from 2011 to 2012, in dollar terms, there is a big decrease in purchasing power of the population. For purposes of this study, the Poverty Line for Malawi for 2012 is maintained at US$ 236.

A reduced rate of currency devaluation coupled with a manageable inflation rate has helped to keep the local currency (TZS) in Tanzania quite strong. As the table shows, this has pushed up the amount of disposable incomes both in dollar and local currency terms. The poverty line on the Tanzanian side of the basin in 2012 has therefore been estimated to be around US$ 307.66.

For the purpose of this study, the Songwe River Basin poverty line has been derived by considering and averaging the poverty lines of the two sides of the basin and is estimated to be US$ 272 as at 2012. Although this is still not equal to the international standard expenditure of one dollar per day on basic needs, it has been adopted as a reasonable reference point for this study.

3.6 EXTENSION AND CREDIT SERVICES IN THE SRB

As the majority of the population in the Songwe River Basin consists of farmers, it is also necessary to assess the level of extension services that they receive from agricultural experts. The results of the survey show that there is a low level of extension services provided to farmers in the basin. Only about 33% in Tanzania and 54% in Malawi indicated that they have had access to extension services largely provided by government agricultural experts (75% in Tanzania and 94% in Malawi).

Access to credit facilities in Malawi is generally low. At national level, percentage of rural households that accessed credit in 2011 was 7.9. Chitipa and Karonga's access rates to credit were 5.0% and 5.9% respectively in the same year (Source: IHS2011).

The basin population, just like the majority of the rural inhabitants in both countries also has limited access to credit facilities. Only 15 households from total sample reported that a family member accessed credit, representing 7.6% access. The credit had interest ranging from 10% to 40% in Malawi and 1% to 3% in Tanzania with Malawian loan recipients offering cash deposits as collateral since most of the credit was accessed from village banks.

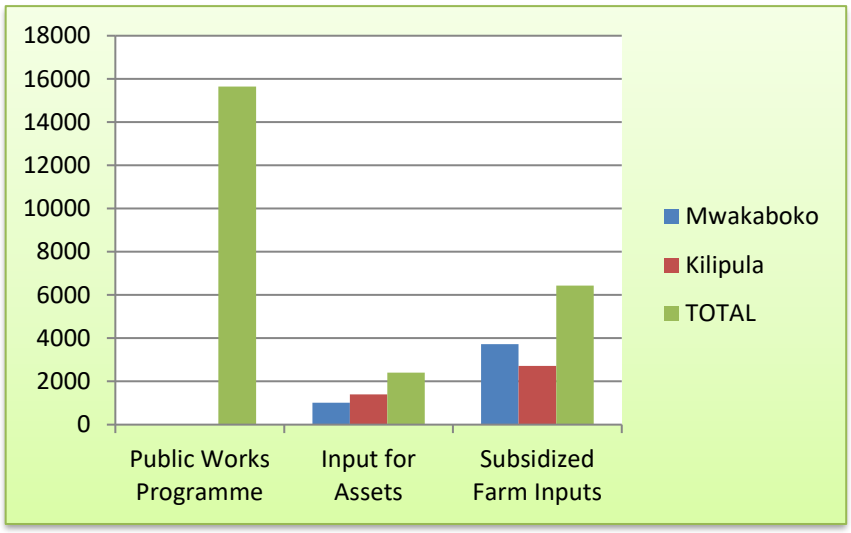
3.7 POVERTY MAPPING ACTIVITIES

3.7.1 Vulnerability Assessment in Malawi

The Malawi Vulnerability Assessment of 2013 shows that 393 households from T. A. Kilipula under Mpata Extension Planning Area needed food assistance during 2014's lean period of about two months. Provision of food assistance and other interventions show that the poverty situation in the Songwe River Basin in Karonga is worrisome. Therefore, there is a need to devise sustainable livelihoods strategies to counter dependence on

subsidized farm inputs and other interventions in order to increase incomes of people in the Songwe River Basin. Figure 3-1 and Figure 3-2 shows the government's interventions which target poor households after carrying out thorough poverty mapping and vulnerability assessment.

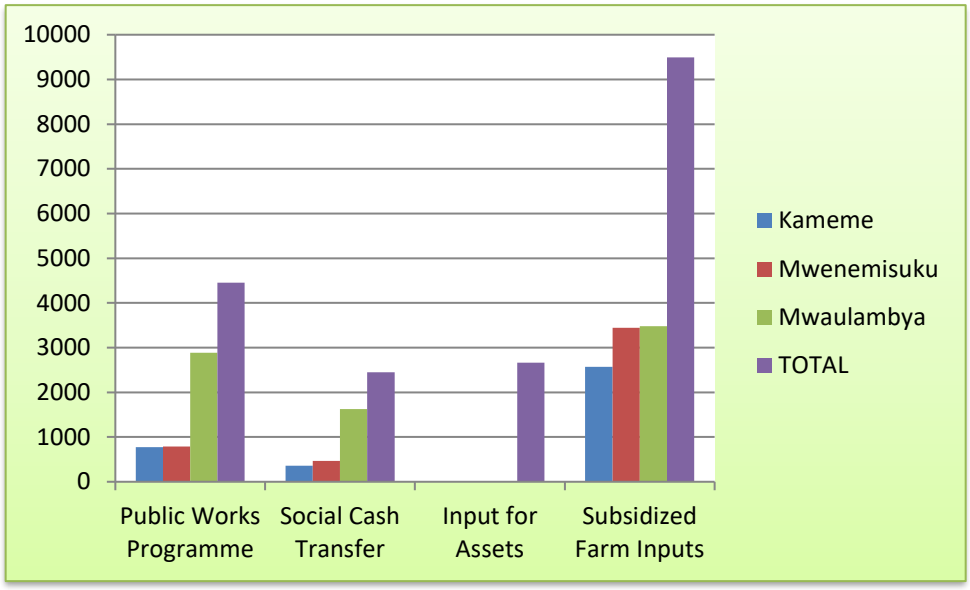
Figure 3-1: Government Interventions on Poor Households in Karonga



Source: District Data Collection, Karonga2013

In the above cited report, no household in Chitipa District was identified as requiring particular interventions towards food security. The main consideration was that Chitipa District as a whole recorded maize surplus, although its availability at household level could not be guaranteed.

Figure 3-2: Government Interventions on Poor Households in Chitipa



Source: District Data Collection, Chitipa 2013

3.7.2 Vulnerability Assessment in Tanzania

The National Strategy for Growth and Reduction of Poverty (NSGRP), popularly known as the MKUKUTA is Tanzania's overarching development strategy whose main objective is to achieve economic growth and reduce poverty. The strategy recognized that implementation of previous poverty reduction strategies produced mixed results. Based on a number of indicators that were monitored, it was observed that high levels of poverty among different groups of people still exists and that different groups of people have their own poverty problems that are felt in different ways.

The Household Budget Survey of 2007 showed that poverty levels were quite high among the rural people. Based on the minimum threshold expenditures on food (TZS10,219) and non-food basic needs (TZS 13,998), two poverty lines were drawn. The results showed that nationally, 37.6% of rural people were living below the basic needs poverty line while 18.4% were below food poverty line. Among the female headed households, a total of 23% of the households were below poverty line.

3.7.3 Mbeya Region

Mbeya Region in which the five districts under the Songwe River Basin fall has no district specific data on poverty levels. The majority of people in this region excluding Mbeya City Council are farmers and agriculture contributes a significant share of the local economies of the five districts of Ileje, Kyela, Mbozi, Momba and Mbeya Rural. According to the 2004 Regional Poverty Comparisons, Mbeya had a modest poverty severity index of 3.8

compared to the highest of 8.3 for Arusha Region and the lowest of 2.5 in Tabora Region based on per capita expenditure. This may however not be an exact reflection of the extent of poverty among the basin population because of glaring disparities between urban and rural expenditure patterns. The general picture remains that the reintroduction of subsidized farm inputs has helped to improve agricultural productivity over the years for such crops as maize and paddy. Contract farming has also assisted farmers to access increased extension services and link them to reliable markets for their produce.

Poverty however, is multi-dimensional and as it is shown below, a consideration of other parameters point to the fact that there is still a significant proportion of people in the five districts within the river basin who are living in poverty. According to the Tanzania Demographic and Health Survey 2010, three nutritional status indicators for the under five children were measured. These are Height for Age, Weight for Height and Weight for Age. Without going into the technical specifics, the results showed that at national level 42 % of children under five years of age were stunted, 5 % were wasted, and 16 % showed both chronic and acute under-nutrition. These results implied that no significant improvements were made on nutritional status indicators as prescribed in the national development strategy (MKUKUTA targets).

3.8 SUMMARY OF THE POVERTY PROFILE

Poverty is widespread in the Songwe River Basin and the purpose of this programme is to improve the welfare of the communities so that they are able to access basic food and non-food needs. As shown in Section 3.5.3, about 42% of the population in the Songwe River Basin lives below the poverty line estimated to be US$ 272. The ultimate goal therefore is to have zero population living in extreme poverty by 2025. Various initiatives and interventions need to be directed into the basin to achieve this target.

The Songwe River Basin Development Programme is a multi-faceted and highly integrated programme involving a number of sectors. High impact projects such as the planned large scale irrigation farming will have significant contribution towards raising the incomes among the basin population.

Governments of the two countries are implementing interventions targeting the very poor segments of the population within the basin such as provision of farm inputs subsidies (in Malawi and Tanzania), direct social cash transfers (in Malawi) and cash/farm inputs in lieu for labour towards public works activities (in Malawi). There is no indication that such initiatives/interventions are ending soon although changes may be made on the approach and the criteria of selecting beneficiaries. Therefore, these interventions are expected to continue because they serve political interests of the ruling elite and also act as a platform to demonstrate the governments' social responsibility to their citizens. As poverty manifests itself in various forms, Table 3-4 overleaf highlights some strategies of overcoming various forms of poverty and sets out targets that need to be met within a 10 year period.

3.9 PROPOSED STRATEGIES TO REDUCE POVERTY

There are many ways of assessing prevalence of poverty in local communities and interventions aimed at reducing or eradicating poverty are also diverse. Efforts therefore should be directed at improving existing sector interventions and where plans are already in place, the Songwe River Basin Development Programme should facilitate and support implementation of the same. Table 3-4 has highlighted strategies of reducing poverty but these can only be implemented successfully if they are considered in the context of the overall development strategy of the basin. Precisely, all interventions aimed at uplifting the lives of people within the Songwe River Basin should be integrated within the overall development concept of the river basin. Specific interventions in all sectors such as agriculture, education, health, women empowerment, trade and industries, energy, water supply and road infrastructure shall contribute to change the lives of the people for the better in the next 10 years. General poverty reduction strategies are shown in Table 3-4 below.

Table 3-4: Strategies for Poverty Reduction

Specific Issues	Objective	Strategies/Measures	Indicators
Low household incomes	Increase household incomes	Diversify income generating activities Encourage farmers to grow high value crops Encourage the population to engage in non-farm activities Promote farmers' access to credit and extension services	Expenditure of not less than $1 per day 50% of farmers selling high value crops Zero cases of ultra-poor households 75% of the population accessing credit and extension services
Malnutrition	Reduce incidences of malnutrition	Encourage farmers to diversify food crops production Support the consumption of high nutrient foods	Zero cases of stunting Zero cases of malnutrition
Low access to potable water	Increase access to safe and potable water	Support the provision of potable water within the basin Encourage the promotion of awareness campaigns on dangers of unsafe water Promote hygienic practices in the communities of the basin	100% access to potable water Communities walking less than 0.5km to access water 100% access to improved pit latrines
Low ownership of productive assets	Increase ownership of productive assets	Encourage and sensitize communities on the benefits of productive assets Support the provision of productive assets through credit	Number of groups and households owning productive assets Number of groups accessing credit for assets

4 PARTICIPATORY COMMUNITY NEEDS ASSESSMENT

4.1 ANALYSIS OF SRB COMMUNITY PRIORITIES

The SRBDP undertook consultations with various groups of people at all levels as the 2050 Shared Vision was being formulated. Consultations were done at community, district and national levels where issues/challenges that have a negative impact on the lives of people in the Songwe River Basin were identified. Further to that, the Shared Vision has clearly articulated the aspirations of the people in the river basin and spelt out where they want to be by 2050. The Community Development Sub-Programme seeks to build on this vision and attempts to address the challenges facing the Songwe River Basin population. In this regard, the Community Development Sub-Programme, which is a framework aimed at contributing towards the improvement of the social and economic status of the people in the basin has suggested short and medium term proposals and strategies based on sector plans.

The two countries' existing structures through which local development is achieved use participatory methods in identifying, prioritizing, approving, implementing and evaluating community development interventions. These structures should be maintained.

4.1.1 Priorities of Communities in the Basin

This section contains a summary of key community priorities that were identified during the preparation of the Songwe River Basin Shared Vision and also the sector priorities/plans as proposed during consultations with district council officials at the time of district data collection exercise. Other priorities are contained in other programmes.

Water, Sanitation, Pollution Control and Waste Management

- All villages have properly developed pollution control and waste management systems
- Better management of pollution and waste at community level
- All households access clean and potable water throughout the year

Agriculture and Marketing Infrastructures

- Increased extension services
- Reduced hunger and poverty at household level
- Reduced shifting cultivation
- Properly developed and managed market infrastructure
- Reduced losses during marketing processes

Community Participation

- Increased participation of communities in development projects
- Better and continuous communication between government and community level development structures
- Properly developed capacity in all community level development structures within the basin
- Proper engagement of community members in development activities
- Increased security at all levels
- More sustainable policies on poverty eradication

Population, Demography and Gender

- Reduced family sizes
- Reduced migration
- Reduced HIV prevalence rate
- Harmful cultural practices that increase the spread of HIV abandoned
- Reduced death rate from AIDS
- Reduction in gender insensitive cultures
- Equal control and management of resources
- Reduction in early marriages

Health

- Reduced distances to access health facilities across the basin
- Availability of quality health services to all communities in the basin
- Reduced occurrence of water-borne disease

Education

- Equality between boys and girls in accessing education
- Full commitment to “education for all”
- Quality and adequate educational infrastructure (offices, staff houses, classrooms and toilets)

Discussions with officials from various sectors in Songwe River Basin revealed that improvements in the condition of roads will greatly contribute towards realizing corresponding improvements in the delivery of services such as access to schools, health centres and mobility of goods. The key priority in the road sector is to have all weather roads throughout the year.

4.2 TRADITIONAL AND FORMAL INSTITUTIONAL ARRANGEMENTS

Local development within the Songwe River Basin is carried out through a decentralized and participatory approach. As earlier observed, the communities themselves identify development projects, prioritize and forward them to a higher level decision making body which in turn scrutinizes, prioritizes and submits to the highest level authority at district headquarters. For large scale development projects whose impact are national or regional in nature and are funded by central governments and donors, consultations are still done, though much of it is done at district level.

During the period when full councils were non-existent in Malawi, some districts had been using committees known by different names such as district consultative committee or district consultative forum to build consensus and decide on very pertinent matters.

The VDCs which cater for a group of villages within a Traditional Authority has the following major functions:

- Coordinating community-based issues with the ADC and DEC and communicate messages from the ADC and DEC to the communities
- Encouraging and mobilizing community resources for popular participation in self-help activities and initiating locally funded development activities
- Assist in identifying, prioritizing and preparing community needs and submit the same to the ADC
- Supervise, monitor and evaluate the implementation of development activities in the villages
- Secure external funding for prioritized community-based projects

The ADC, which is a representative body of VDCs under the jurisdiction of a Traditional Authority (T/A), has the following functions:

- Organizing monthly meetings of the ADC in liaison with the relevant VDCs
- Assisting in the identification, prioritization and preparation of community needs which encompass more than one VDC and submitting them to the DEC
- Supervising, monitoring and evaluating the implementation of projects at TA level
- Mobilizing community resources and soliciting funds
- Receiving, prioritizing, and preparing project proposals from VDCs for submission to the DEC.

The functions of DEC include assisting in the identification, prioritization and preliminary feasibility studies of the community needs; undertaking technical appraisal of project proposals; training VDC and ADC in technical, leadership and management skills; acting as a technical advisory body on local development; advising the District Council on

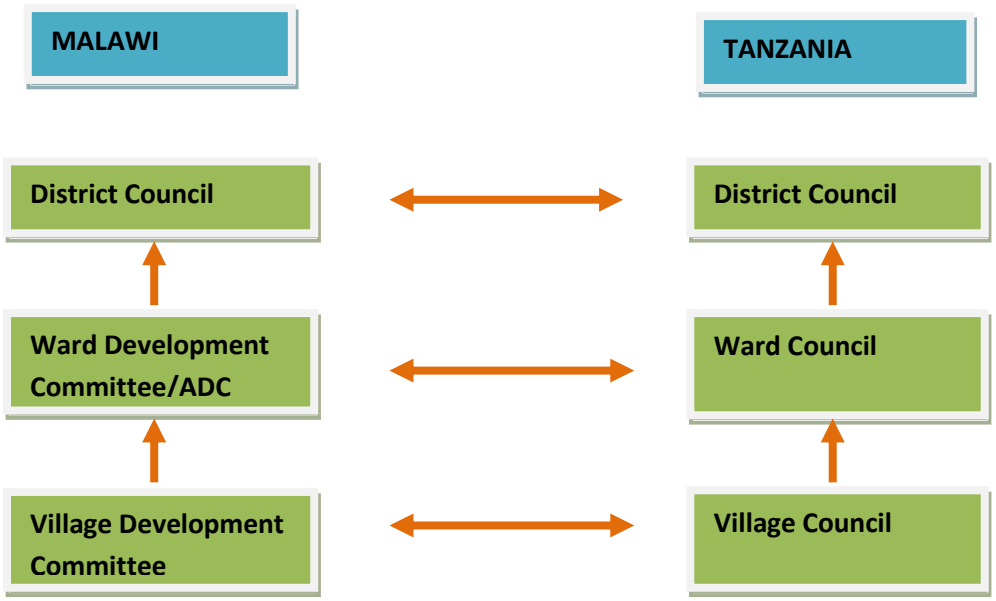
sectoral policies and programmes and assisting in securing funds from local and external sources.

The scenario in Tanzania is slightly different in that decentralization is entrenched in the entire society. However, the decision making structures are almost the same as those in Malawi. At village level, there is a village council, then a ward council at ward level and a district council at district level. The functions of these councils on community development are almost similar to those of Malawian side.

Community development in both countries relies heavily on grassroots participation and contributions. Communities contribute materials such as bricks, sand and quarry stone and labour in some cases for construction of schools, dispensaries and other physical structures. Critically, communities through existing village headpersons in Malawi and village councils in Tanzania usually donate land on which physical structures such as schools and dispensaries are to be built. Communities who show greater commitment to contribute these materials easily get financial support from district councils towards implementation of development projects. All community development projects that are recommended to be implemented in the Songwe River Basin will adopt the same approach. This will ensure that communities own the projects.

Figure 4-1 below is an overview of decision making processes of community development projects in both Tanzania and Malawi. Basically, the process follows a bottom up approach. However, decisions on major infrastructure projects in the basin will still have elements of top down approach as they are likely to have regional or national impacts. Community development decisions in the Songwe River Basin will however, follow the approach outlined in Figure 4-1.

Figure 4-1: Development Decision Making Structures in the SRB



4.3 SUSTAINABILITY AND VIABILITY OF VILLAGE LEVEL INSTITUTIONS

Village level institutions in both Malawi and Tanzania are strong and sustainable to effectively assist in implementing development. As seen from the above structure, development decisions are coordinated at all levels through formal institutions.

Malawi's hierarchy of decision making for local development as outlined in the District Development Handbook comprises the Village Development Committee (VDC) at village level, Area Development Committee (ADC) at traditional authority level and District Executive Committee (DEC) at district level. The Local Government Act in Malawi provides that there shall be a full council at district level which shall be a policy making body. Although Malawi's local authorities operated without councillors since 2004, local development continued to be carried out but legitimate representation at local level had been lacking. After the May 2014 general elections, councillors are now in place and it is expected that they will play their rightful roles of spearheading development at all levels in the districts.

Two main factors are therefore expected to contribute to the strengthening and sustenance of local level development and these are the presence of newly elected councillors and the existence of non-state actors (NGOs, CBOs, FBOs) and other oversight committees in various spheres of development. Councillors are expected to contribute to the balancing and harmonization of institutional arrangements for both sides of the basin.

4.4 PEOPLE'S PERCEPTION OF FLOODS

Although floods especially in the lower basin affect a significant percentage of the population, perception to floods is always diverse. Some people see floods as a serious challenge on their livelihoods, while others regard floods as an opportunity. During the consultation process when the Shared Vision 2050 was being formulated, there was very little mention of floods as being an issue. Karonga District (Malawi) and Kyela District (Tanzania) where most flooding takes place only contribute about 18.7% (59,518) of the basin population and 11% (453 km^2) of the basin area. This may explain why the issue of flooding does not feature highly in the consultative forums for the districts at all levels. This however, should not lead authorities to ignore flooding issues, as floods are known to have adverse impacts on the lives of people. Floods can lead to damage to agricultural land, human and animal life and buildings. Floods also damage infrastructure and the natural environment. The floods experienced at Iponga in Karonga in 2014 are testimony to the negative effects of floods as the road, crops and farm land were washed away and some houses also got damaged.

The Songwe River meanders especially in the lower reach stretching for a distance of about 23 km up to Lake Malawi/Nyasa. As the river goes through this natural occurrence, the Tanzania/Malawi boundary becomes unstable and some families on both sides either lose or gain land in the process. The concerned families however, have developed their own mechanisms of compensating for any loss of land. It is also important to note that families that cultivate within a 60 m stretch along the river do so illegally because by law, this is supposed to be a protected buffer area where no farming is permitted.

Figure 4-2 shows typical meandering in the lower section of Songwe River with sections where sedimentation and erosion take place. More details are contained in the Detailed Design Report on the Stabilisation of the Lower Songwe River, which emphasises community led non-structural means of bank stabilisation.

Figure 4-2: Lower Songwe River Meanders

Source: Update of the 2003 Feasibility Study Final Report, 2014

For the flooding problems, a Flood Early Warning and Response System has been recommended and developed in outline for the SRBC. It is described in the Business Plan for the SRBC. Flooding will be a rare event after the Lower Songwe Dam is in place, but measures need to be taken to reduce risk of flood damage when they do happen.

5 HEALTH AND EDUCATION PROFILE

5.1 HEALTH PROFILE

People's knowledge of and willingness to use medical facilities is generally high in the two Malawian districts of Chitipa and Karonga, as more than 70% of people seek medical attention when they fall sick. The common diseases in these two districts on the Malawian side are fever and malaria, sore throat and flu, headache, diarrhoea, pneumonia and respiratory infections. On average, life expectancy in the two districts ranges from 55.8 for males to 60.9 for females.

Major reported diseases on the Tanzanian side of the Songwe River Basin are hepatitis A, malaria, typhoid fever, diarrhoea and aids related infections (ARIs). Life expectancy for the districts in the basin on the Tanzanian side ranges from 45 to 58 years. However, national data for Tanzania shows that life expectancy for females and males is 58.3 and 56.5 respectively. The population in the river basin on the Tanzanian side has also benefited from the government's directive and subsequent efforts to provide a dispensary in each village and a health centre in each ward. Fertility rates in the Songwe River Basin range from 5.1 to 6.2 and these are quite high. The implication of such rates is that population in the area will continue to increase at an increasing rate thereby putting more pressure on the available resources.

The sample survey conducted under the SRBDP in 2013 revealed that the basin population had access to health facilities within the average distance of 3.3km for Tanzania and 4.5 km for Malawi. The existing health facilities in the SRB are shown in Table 5-1 below.

Despite this apparently improved status, other areas still remain unserved because of accessibility problems due to generally poor road transport infrastructure. A consideration of travel time was also used as a measure of access to medical services especially for Chitipa District. The data collection exercise revealed that travel time to health facilities is quite high in Chitipa at a minimum of 77 minutes during dry season and a maximum of 161 minutes for Mwenemisuku during rainy season. Low health staffing levels on both sides as shown by high medical staff/patient ratios and general inadequacy of medical drugs are other challenges facing health delivery services within the basin. Acute shortage of health personnel in various facilities in Ileje District is undermining efforts to improve delivery of service and people still travel long distances to access appropriate and critical health services such as maternal care. This therefore calls for proposals for additional health facilities and respective district councils made recommendations for construction of new facilities in their sector plans as contained in Table 9-1. In addition, specific strategies need to be devised to reduce or eliminate completely the challenges in the health service delivery in the basin area and these are contained in Table 5-2.

Table 5-1: Summary of Health Facilities in the SRB

District	Health Facility			Total
	Hospital	Health Centre	Dispensary/Health Post	
Chitipa	2	4	63	69
Karonga	2	4	44	50
Ileje	2	-	9	11
Kyela	2	-	35	37
Mbozi	2	3	39	44
Mbeya	2	3	51	56

Source: District Councils Data Collection, 2013

5.2 STRATEGIES OF MITIGATING CHALLENGES IN THE HEALTH SECTOR

Overall, the plan is to construct 8 new health centres and 55 dispensaries across the Songwe River Basin. In addition, some dispensaries are recommended to be upgraded to health centres to enable them offer more services and serve a bigger catchment areas. Some district specific plans already have funding commitments from governments and other funding sources but it is worth mentioning that communities play a big role in Tanzania in mobilizing materials for construction of health facilities. Tanzania is also obliged to provide dispensaries in each ward and this is reflected by a large number of new dispensaries being proposed in the basin. See Table 9-1 Summary of Proposed Structural Projects in Section 9 below.

Access to health services as earlier stated is hampered by poor road condition on both sides of the Songwe River Basin. Improvements in the condition of existing roads in the basin will greatly improve mobility of people thereby assist to reduce travel time to access services at the health facilities. The Songwe River Basin Commission is expected to complement existing efforts of the respective district councils in improving the health of people in the basin. In addition, as various projects and programmes will be implemented in the basin, it is imperative to address specific health challenges that the communities in the high impact areas will face. Some of these measures are shown in Table 5-2. As some people are likely to be resettled, deliberate strategies will be formulated to provide social services to such communities. It is therefore recommended that a specific review concerning the resettled communities should be done at the appropriate time.

Table 5-2: Summary of Issues and Strategies in the Health Sector

Specific Issues	Objective	Strategies /Measures	Indicators
High cases of malaria and diarrhoea infections	Reduce the prevalence of diseases	Support measures of preventing diseases Assist the communities to practice hygiene	Zero incidents of malaria infections Zero cases of water borne diseases
High mortality rates	Reduce mortality rates	Support the increase of and access to health facilities Facilitate the deployment of medical staff Improve mobility to health facilities	Health facilities in each village Standard patient/medical staff ratio Average 3km walking distance to health facility

5.3 EDUCATION PROFILE

At the country level, education is one of the priority areas and it is recognized as a major catalyst to socio-economic wellbeing of the people. Primary education is compulsory in Tanzania while in Malawi, government has also demonstrated its commitment to achieving the Millennium Development Goal by enacting new legislation making primary education compulsory. In both countries, specific efforts have been directed at reducing walking distance to schools, increasing teachers and also introducing school feeding programmes to encourage young children to remain in school. The last measure has been attributed to the retention of pupils in primary schools in both countries.

5.3.1 Literacy Rates

Data at regional level in Tanzania shows that as of 2012, literacy rate for Mbeya Region stood at 80.8%. However, there was a significant difference between males and females with the rate for females being 75.7% while that of males standing at 86.6%.

Specific results of the 2008 Population and Housing Census for Malawi are worth highlighting for the purpose of this study. The Northern Region where the two districts of Chitipa and Karonga are located had an overall literacy rate of 77%. The population of the literate was dominated by males at 79% while that of females was 74%. Overall literacy rate for Karonga District was reported to be 74.9% while that for Chitipa was 77.9% in 2011. These are quite high figures compared to the national average rate of 65.4% in 2011. However, these results show that there were no significant changes in the literacy of the population over a three year period.

The two districts of Ileje in Tanzania and Chitipa in Malawi have a combined share of 72.8% of total land area of the Songwe River Basin. Ironically, these are also the districts with large parts that are difficult to access because of the rough terrain.

Generally, however, educational facilities are well provided in all the districts within the basin. On the Tanzanian side, primary school learners cover acceptable walking distances to schools of not more than 5km and the pupil teacher ratio is acceptable and in some schools, it is as low as 23:1. Major challenges in the education sector include the rough terrain in Ileje and Chitipa where roads are in poor state especially during the rainy season. In the lower basin, access to schools becomes a challenge because of flooding. This therefore increases learners' travel time to schools.

Specifically on the Malawian side, the situation is even worse as the pupil teacher ratio is high and accessibility to education facilities is hampered by poor road infrastructures as seen by learners' long travel time to schools. Major areas that will require immediate attention are improvements in the condition of roads, expansion of the existing road network and construction of additional schools and deployment of additional teaching staff. On the Tanzanian side, specific measures that require undertaking include improving the condition of roads and provision of other social supporting infrastructures to attract qualified teachers. In Ileje in particular, it was reported that most qualified labour shun the district because of poor working environment and general lack of basic services. Unlike other districts, Ileje is linked by a gravel road which is difficult to use especially during rainy season.

5.4 PROPOSED SECTOR STRATEGIES IN THE EDUCATION SECTOR

As earlier observed, education facilities in the Songwe River Basin are fairly well provided and they match with the current school going population. The challenges in the education sector are a result of lack of supporting secondary social services such as water, communication and poor transport infrastructure. Interventions targeting these services will reduce travel time to schools for pupils and encourage teachers and learners to spend adequate time focusing on education instead of worrying about how and where to get potable water. Improvements in these social services will also encourage teachers to relocate to these schools. Most public sector employees such as teachers, medical personnel and other technical staff shun Chitipa and Ileje Districts because of poor social services.

A multi-sectoral and integrated community development in the Songwe River Basin will assist to improve education standards and overall literacy rates in the medium to long term period. Therefore, it is recommended that the Songwe River Basin Development Programme should complement provision of basic education infrastructures where communities and district councils do not have the capacity to do so. Specific actions will be developed after thorough consultation with the concerned district councils is done and prioritization of projects at ward and district levels is completed. Table 5-3 is a summary of strategies in the education sector.

Table 5-3: Summary of Issues and Strategies on Education and Literacy

Specific issues	Objective	Strategies/Measures	Indicators
Poor access to education facilities	Increase accessibility to schools	Improve road infrastructure Provide additional education facilities and other infrastructure	All weather roads Maximum 30 mins travel time to schools New schools and additional classroom blocks
Low literacy levels among women	Reduce illiteracy among women	Promote adult literacy Support girls to remain in schools through incentives	Number of new adult literacy education centres Low rates of girl dropouts
High pupil/teacher ratio	Reduce the pupil/teacher ratio	Deploy more teachers to schools Provide conducive environment for teachers to work in the basin	Standard pupil/teacher ratio Low teacher turnover

6 GENDER ISSUES AND ANALYSIS

6.1 ANALYSIS OF GENDER ROLES

An overview of population of the two countries shows that females are more than males. Even at district level, all the five districts in Tanzania which form part of the basin have more women than men. This brings the question of how roles and responsibilities are shared between females and males in the region. Although the sample survey revealed that sharing of roles and responsibilities between women and men is moderately done, the reality as seen in the subsequent paragraphs is that men still dominate on many social and economic issues in the basin.

Of the sampled households, only about 19% and 12% in Tanzania and Malawi respectively were headed by women. Traditionally, in a household where a husband is alive, he automatically heads it and with it also goes the ownership of assets. The survey reported that land is mostly owned by men (80% for Malawi and 50% for Tanzania). There was however a large percentage of missing responses on the Tanzanian side, hence the relatively low figures.

6.2 CURRENT SITUATION

A brief assessment of the current situation of gender was made focusing on composition of councils or development committees in districts within the Songwe River Basin. The assessment showed that women representation is quite low in decision making structures. Only Mbozi District has higher women representation of up to 40% and 50% for village councils and district council structures respectively. In the case of Tanzania, women prefer to become councillors through special seats. Mbeya District Council has 8 women against a total of 25 representatives while Ileje has 6 women councillors only. All three wards of Isuto and Iwiji that are within the basin in Mbeya are headed by men. On the technical section of Ileje District Council, 4 departments out 14 are headed by women. At only 4%, Karonga District in Malawi has a lowest percentage of women at level three of decision making. The sample survey conducted in the 5 districts in the basin showed that out of the 45 villages sampled, only 10 had attained an equal representation of females and males in village committees. Problems and challenges associated with women participation in decision making as shown in Table 6-1, are caused by many factors such as heavy family obligations, low literacy rates and deliberate discrimination against them. In addition, cultural beliefs affect women's confidence and are therefore not ready to take challenging responsibilities.

Table 6-1: Women Participation in Development and Decision Making

Decision Making Level	Average Percent Of Women	Observations/Challenges
Village Councils/Village Development Committees	Almost 30% are women in Village Councils/Village Development Committees	• Low women participation • Women have heavy work burden • High illiteracy among women • Women's voices and issues are rarely taken on board because they are few in the councils
Ward Councils/Area Development Committees	20 to 30% are women in the Ward Councils or Area Development Committees	• Low percentage of women in councils/committees • Less contributions by women • Low education and less exposure by women • Women needs are rarely accommodated in meetings
District Councils/District Executive Committees	20 to 40% of district councils (Tanzania) and District Executive Committees (Malawi) are women	• Low women representation in committees/councils • Shortage of career women • Family obligations negatively affect women attendance and contributions in meetings • Most women are not ready to compete for council seats • No deliberate gender sensitive policies

6.3 ASSESSMENT OF INSTITUTIONS PROMOTING GENDER

Meaningful and equitable development cannot be achieved if a certain section of the population is left behind. Women constitute more than 50% of the Songwe River Basin population and yet they are marginally represented in decision making organs at all levels in the basin.

Deliberate strategies aimed at empowering women need to be formulated within the context of the existing policies and legislations for both countries. District councils in the basin have planned initiatives aimed at supporting women participation in decision making which the Community Development Sub-Programme needs to promote. It is

therefore recommended that women should be encouraged and supported to hold positions of leadership in various development interventions.

The ultimate goal is to reduce gender imbalance so as to ensure that 50% women own productive assets and ensuring that at least 50% women hold leadership roles. This will be achieved through sensitizing communities on gender equity and encouraging deliberate inclusion of women in leadership roles.

There are a number of existing and proposed initiatives that district councils in the Songwe River Basin are implementing and wish to undertake aimed at encouraging women to take active roles in community development. This is in recognition of the fact that women constitute a bigger share of the population. A summary of these initiatives is given in Table 6-2 below.

Table 6-2: Current and Proposed Initiatives Supporting Women Participation

District	Programmes/ Projects	Objectives	Target Areas	Current /Future	Sources Of Funding
Mbeya Rural	Providing education to women who want to contest in political position	Increase number of women in decision making positions	Iwiji, Isuto and Ilembo	Current	District Council
	Sensitization of women on group formation, entrepreneurial skills and income savings	Increase income generating groups and improve their businesses	Iwiji, Isuto and Ilembo	Current	Donors
	Loans for income generating activities to women and youth groups	Increase women's economic empowerment	Iwiji, Isuto and Ilembo	Current	Ministries of Gender and Children, and Youth
	Promote girls' education	Increase number of educated girls	Iwiji, Isuto and Ilembo	Future	District Council and donors
Ileje	Monitoring and evaluation of accountability in community developments	Help projects to achieve intended goal of benefiting the communities	Itale and Malangali	Current	Ministry of Women and Community Development

District	Programmes/ Projects	Objectives	Target Areas	Current /Future	Sources Of Funding
	Prevention of gender based violence	To provide equality on gender issues	Ibaba, Mbebe and Malangali	Current	Ministry of Women and Comm. Dev.
Mbozi	Gender mainstreaming	Provide equal opportunities to all	Communities and households in all wards	Future	Office of the District Executive Director (DED) and donors
	Promotion of gender equality	Inhibiting traditional practices that discriminate against women	Communities and households in all wards	Future	Office of the District Executive Director (DED) and donors
Kyela	Promotion of Community participation in projects	Promote women and men's participation at all stages of project implementation	Rural and sub-urban areas	Current	Tanzania Gov. and World Bank (TASAF)
	Women Development Programme	Assist economic empowerment of women through soft loans	Women groups	Current	Ministry of Comm. Dev., Gender and Children
Chitipa	Economic Empowerment	Improve literacy among women	Women groups	Current	Local funding through COMSIP
	Leadership and Community Mobilization	Improve and promote leadership skills	Women and youth groups	Current	Local funding through COMSIP

Note: Information from Momba and Karonga Districts on initiatives for women was not available

6.4 STRATEGIES TO IMPROVE WOMEN THROUGH THE SRBDP

The Songwe River Basin Commission shall promote the inclusion of women in decision making activities through the existing district councils' structures. This is mainly because any entry into community development shall remain through district councils. As already noted in section 4.2.13.1, women encounter several challenges that prevent them from contributing effectively in decision making committees. The SRBC should facilitate training to development committees at all levels in order to build their capacity. In this way, women members of these committees will have their confidence built in order to contribute effectively.

The SRBC shall also help to identify resources for the implementation of existing and proposed gender mainstreaming activities in various sectors at district levels with the overall aim of ensuring that women issues are accommodated and addressed in various development interventions. Looking at gender issues in broad terms, other sector strategies such as promotion of girl education, elimination of gender insensitive cultures and reserving elected positions in ward and constituency assemblies will directly contribute to empowering women to be actively involved in development matters within and beyond the basin.

6.5 LEGISLATION RELEVANT TO GENDER EQUITY

6.5.1 Gender Issues in Malawi

The Malawi Constitution, which is the supreme law has a section that entrenches gender issues in the country and it clearly invalidates all laws, regulations and policies that are not in tandem with these provisions. Specifically, Section 24, sub-section 1 states that women have the right to full and equal protection by the law, and have the right not to be discriminated against on the basis of their gender or marital status

In addition, Section 24, sub-section 2 invalidates any law that discriminates against women on the basis of gender or marital status and legislation shall be passed to eliminate customs and practices that discriminate against women particularly practices such as:

a) sexual abuse, harassment and violence
b) discrimination in work, business and public affairs
c) deprivation of property, including property obtained by inheritance

The Malawi's Gender Policy seeks to achieve the following broad objectives:

- To increase access, retention and completion to quality education for girls and boys
- To ensure gender issues and concerns are addressed throughout the health sector

- To ensure gender concerns and issues are mainstreamed throughout all activities relating to HIV and AIDS
- To strengthen gender mainstreaming in the agriculture, food and nutrition security sector
- To strengthen gender mainstreaming in the natural resources and environmental sector in order to achieve equality and sustainable environmental development
- To reduce poverty among women and other vulnerable groups through economic empowerment
- To promote women's participation in politics and decision making
- To eliminate gender based violence from the Malawian society
- To strengthen the capacity of the National Gender Machinery
- To reduce child abuse and trafficking

Through the National Land Policy, the Malawi Government strongly supports gender sensitive access to land and calls for changes in inheritance laws to allow the remaining spouse, children and especially orphans to inherit the property of their parents even when the deceased parent or parents die without a will. Further to this, one of the objectives of the policy is to ensure that all land reforms guarantee tenure security with emphasis on equitable access to land without any gender bias and/or discrimination to all citizens of Malawi.

In recognizing that large proportion of land in Malawi is under customary status, the land policy further supports protection of rights of women and/or any surviving spouse to inherit deceased land by introducing simple measures to facilitate legal recognition of such owners without any discrimination on the basis of gender. The policy supports the registration of individual or family title to land arising from inheritance without any discrimination.

6.5.2 Gender Development in Tanzania

The Constitution of the United Republic of Tanzania endorses gender equality and equity and guarantees full participation of women and men in social, economic and political life. The Government is also implementing international commitments as enshrined in the United Nations Charter and on the Human Rights Declaration (1948), the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (1979).

The Government has also established mechanisms for gender policy formulation, coordination, monitoring and evaluation of implementation of gender development policy, gender mainstreaming programmes and plans. The mechanisms include establishment of a Ministry responsible for gender development, setting up gender desks in ministries, independent departments, regional and district authorities.

The revised 2006 National Population Policy of Tanzania has the attainment of gender equity, equality, women's empowerment, social justice and development for all individuals as one of its goals.

The Tanzanian Government has undertaken to entrench gender inclusion in its activities through the formulation of the National Strategy for Gender Development whose goal is to achieve gender equality and equity in Tanzania as stipulated in the National Constitution and the Women and Gender Development Policy of 2000.

Women's rights and recognition of gender are central to the Village Land Act in Tanzania with specific provision that spouses should co-register land and that ownership rights should be at 50% each.

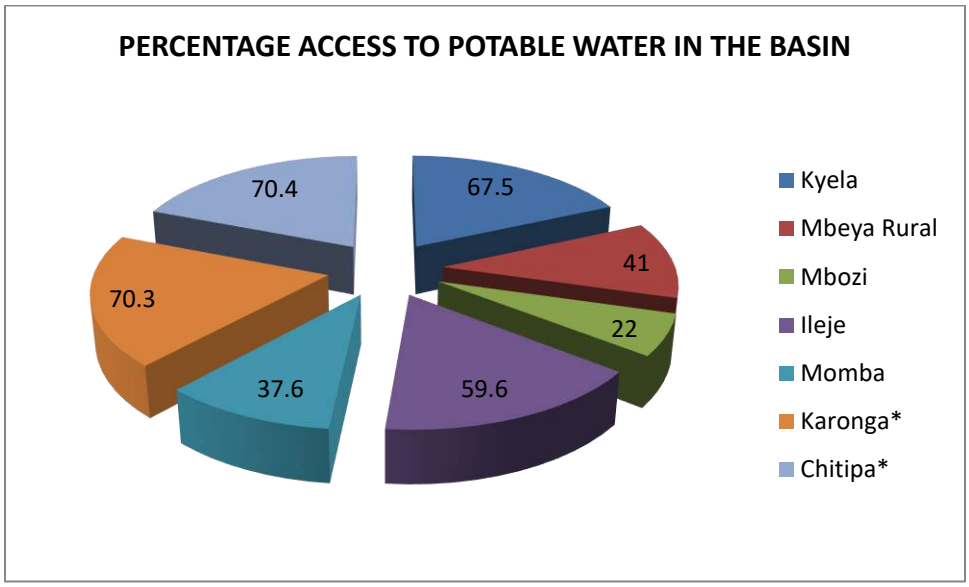
The two countries' laws and policies support treatment of all groups of people equally and outlaws all forms of discrimination based on gender, race/colour or marital status. Therefore it is expected that various interventions proposed in this programme together with major investments already earmarked for the basin will be implemented with full recognition of various legislations that promote equality, justice and fairness to all people in the two countries.

7 STATUS OF WATER SUPPLY

7.1 OVERVIEW

Figure 7-1 is a summary of percentage access to safe water in the basin. Significant and collaborative measures need to be undertaken to ensure that the basin population attains the minimum acceptable level of access to potable water: access to safe water within 400 metres (in Tanzania) and 500 metres (in Malawi) of the dwelling place based on National Policy. Consideration has been given to harmonising these distances in the SRB, but it is impractical because doing so simply moves the lack of harmony to *within* the country which would create larger problems. Further discussion is provided by District in the following sections.

Figure 7-1: Summary of Access to Safe and Potable Water in the Basin 2013



Sources: District Baseline Data Collection (2013), Socio-Economic Profiles for Mbozi, Momba and Karonga Districts, NSO (2012)
*NOTE: * The access rates for Chitipa and Karonga are irrespective of whether the water point is functional or not.*

7.2 WATER SUPPLY IN THE SRB TANZANIA

7.2.1 Water Supply in Ileje District

The current status of water supply in Ileje and plans for improvement are given in Table 7-1. In an effort to ensure that safe and potable water is available to all communities in

the Songwe River Basin, Ileje District Council has plans to construct new water supply schemes between now and 2020. The proposed schemes and the schedule of implementation are given in Table 9-2 in Chapter 9 below. Although the District Council has such ambitious plans to supply water to its citizens, there are no readily available funds to realize this. The main source of funds is the Ministry of Water and therefore the council is appealing for financial and technical support from cooperating partners towards some of these schemes.

Table 7-1: Current Water Supply Situation in Ileje

No.	Name Of Water Supply Source	Type	State/Condition	Rehabilitation Plans
1	Mtima Water Supply	Gravity	Partially working	Plans to rehabilitate the scheme
2	Chabu Water Supply	Gravity	Non-functional	Plans to rehabilitate the scheme
3	Bupighu Water Supply	Gravity	Working below capacity	Rehabilitation is planned in future
4	Ibungu Water Supply	Gravity	Working below capacity	Rehabilitation is planned in future
5	Msia Water Supply	Gravity	Partially working	Rehabilitation is planned in future
6	Ndola Water Supply	Gravity	Working partially	Plans to rehabilitate the scheme
7	Kapelekesi Water Supply	Gravity	Working partially	Plans to rehabilitate the scheme
8	Msia/Chitete	Boreholes	Hand-pump worn out	Plans are underway to repair the pumps
9	Ibeya/Ndola	Boreholes	Hand-pump worn out	Plans are underway to repair the pumps
10	Yenzebwe/Itumba	Boreholes	Hand-pump worn out	Plans are underway to repair the pumps
11	Mapozoro/Mbebe	Boreholes	Hand-pumps worn out	Plans are underway to repair the pumps
12	Ntembo/Chitete	Boreholes	Hand-pumps worn out	Plans are underway to repair the pumps

7.2.2 Water Supply in Kyela District

Water supply in wards within the Songwe River Basin in Kyela District is generally erratic. The main source of water is drawn from underground. Ngana Gravity fed water scheme supplies water to the following wards/areas: Ngana, Ikimba, Katumba Songwe, Ikolo, Ngonga and Bujonde. Kyela Town, which is just outside the basin, has its own water supply scheme. The Ngana water supply scheme is partially functional as only 5 villages out of 25 are currently served. According to the overall district, access to potable water is estimated to be 67.5%, but the objective is to ensure that every citizen accesses potable water within the walking distance of about 400m.

Water is also supplied through boreholes and the council intends to rehabilitate all non-functional boreholes in future depending on availability of funds. New boreholes are proposed to be constructed at Kabanga and Lubele using the Local Government Capital Development Grants.

7.2.3 Water Supply in Momba District

There is only one water supply scheme within the two wards in Momba District, namely Mpemba but it is in a non-functional state. The council has no immediate plans to rehabilitate it because of lack of funds. In addition to the scheme, potable water is sourced from boreholes and shallow wells although a good number of them are also not functioning. Realistically, rehabilitation of these boreholes and shallow wells is not expected soon because of budgetary constraints. Access to clean and potable water in Momba District as a whole is estimated to be 37.6%. The district council has plans to construct a new water scheme in Nandanga Village in the 2014/2015 financial year with funding from the Ministry of Water.

7.2.4 Water Supply in Mbozi District

The existing gravity fed water supply schemes in Mbozi area of the river basin are Hezya/Haraka and Isandula. There are also non-functional hand pump shallow wells in Ihanda and Iyula and there are no immediate plans to rehabilitate them. In addition, there are 231 existing shallow wells in the project area of Songwe River Basin in Mbozi District. The district plan to supply potable water at Namwangwa has already been achieved. Therefore their focus is planned to be on rehabilitating hand pump shallow wells in Ihanda and Iyula Wards and also constructing a new water supply scheme at Haraka Village.

7.3 WATER SUPPLY IN SRB MALAWI

The Songwe River Basin Shared Vision 2050 has water resources and management as one of its priorities. Access to potable water within the Songwe River Basin is generally low. The major sources for water supply are surface water (streams) and ground water (boreholes and springs). Only urban areas have greater access to improved water supply and sanitation services. The existence of two large water bodies, Lake Malawi/Nyasa and

Songwe River has contributed to making available two reliable water sources and this partly explains the higher access rates to potable and clean water in Karonga District. Access to safe and potable water is based on the average population recommended to be served by a water supply facility. A communal water tap is ideal for 120 people; a borehole serves a population of 250 while a shallow well is recommended to cater for 100 people.

A household is considered to have access to safe and potable water if the source of water is piped into a dwelling house, piped into yard or plot, communal standpipe, protected well in yard or plot, protected public well, borehole only in rural areas, a water bowser and bottled water.

7.3.1 Karonga and Chitipa Districts

The Malawi Government through the Northern Region Water Board is constructing a new water supply scheme at Songwe Border with funding from the World Bank. The project is expected to increase access to potable and safe water to the residents of this border town.

Major sources of drinking water in Karonga and Chitipa Districts as revealed by the 2008 Population and Housing Census for both dry and wet seasons, in order of importance are boreholes, rivers/streams and communal water taps. This trend has not changed much as the current status also shows that boreholes are the main sources of water supply in the basin. Table 7-2 below shows existing water supply schemes and boreholes in the Songwe River Basin in Karonga and Chitipa Districts, their condition and plans for rehabilitation.

Table 7-2: Existing Water Supply Sources and Future Plans

Item No.	Water Supply Source	Type	Condition	Future Plans	
Karonga District – TA Mwakaboko And Kilipula					
1	Iponga Gravity-fed Scheme	Rural taps	Non-functional	None	None
2	Ighembe Gravity-fed Scheme	Rural taps	Non-functional	None	None
3	Lufilya Gravity-fed Scheme	Rural taps	Partly functional	To be rehabilitated with funding from DFID and WVI	

4	10 Boreholes		Partially functional	To be rehabilitated in the short to medium term by CADECOM
5	10 Boreholes		Non-functional	To be rehabilitated in the short to medium term by UNICEF and WVI
6	92 Shallow wells		Non-functional	To be rehabilitated in the short to medium term by CADECOM
Chitipa District –TA Kameme, Mwaulambya And Mwenemisuku				
1	Chinthekwe Gravity-fed Scheme	Rural taps	Partially functional	Need to change intake point and extend it
2	Ifumbo Gravity-fed Scheme	Rural taps	Non-functional	Need for total rehabilitation and extension
3	Chinunkha Gravity-fed Scheme	Rural taps	Partially functional	Need for total rehabilitation and extension
4	Misuku Gravity-fed Scheme	Rural taps	Non- functional	Under rehabilitation
5	447 Boreholes		37 not functional	Need for rehabilitation
6	436 Shallow wells		235 not functional	Need for rehabilitation
7	30 Protected wells (Misuku only)	Natural springs	8 non-functional	Need for rehabilitation

Sources: District Councils in the Songwe River Basin (2013/14)

There were a total of 423 taps in the Songwe River Basin in Chitipa District. Out of these, 318 representing 75% were functional while the rest were not functional. Some of the factors contributing to non-functionality of water supply facilities in Chitipa include lack of shops for spare parts, lack of trained community members in operations and maintenance and shortage of water monitoring assistants in the water sector in the whole district. The rehabilitation of the water supply schemes proposed above includes fixing the non-functional taps. Chitipa District Council has plans to construct new boreholes along Songwe River in Traditional Authorities Kameme and Mwabulambya. In addition, there are also plans to construct new water supply schemes as shown in Table 7-3.

Table 7-3: Plans for New Water Supply Schemes in Chitipa

No.	TA	Location	Proposal
1	Kameme	Songwe	Gravity-fed water scheme
2	Mwabulambya	Witimba	Gravity-fed water scheme
3	Mwenemisuku	Matipa and Chilughi	Gravity-fed water scheme

Source: Chitipa District Water Supply, 2014

Although Chitipa District Council has plans to construct these water supply schemes and boreholes, it has no ready sources of funding.

In Karonga District, DFID and World Vision International, which are international organizations involved in various developmental work, have committed to rehabilitate the Lufilya Gravity-fed Water Scheme although the time frame is not known. Currently, there are no plans to construct new boreholes or shallow wells in the river basin of Karonga District.

7.4 OVERVIEW OF SRB POTABLE WATER INVESTMENT REQUIREMENTS

The previous sections describe requirements for investment in new schemes and rehabilitation of existing schemes from the District administration perspective. In order to develop requirements from a basin perspective, a database of individual schemes was prepared and classified as follows:

- Location by District, ward/T/A and village
- Water source: ground or surface water
- Type of scheme: borehole, small gravity system etc.
- New scheme or existing scheme requiring rehabilitation
- Estimated cost
- Availability of funding.

The data show that the Districts consider that investment totalling about US$ 13.14 million is required to meet immediate needs, of which at least 25% would be in schemes using groundwater as a source and over 45% in surface water schemes, see Table 7-4.

Table 7-4: Estimate of Investment Requirements in Water Supply by District

District	Investment Requirement (US$)

	Groundwater	Surface Water	Unknown	Total
Mbeya Rural	-			-
Kyela	57,414	844,800	-	902,214
Ileje	-	1,267,200	985,600	2,252,800
Mbozi	4,000	422,400	-	426,400
Momba	238,000	-	281,600	519,600
Tunduma				-
Chitipa	2,396,866	3,143,600	2,400,000	7,940,466
Karonga	533,600	563,200	-	1,096,800
Totals	3,229,880	6,241,200	3,667,200	13,138,280

Overall, this investment would improve the supply of potable water to about 178,700 people, or 42% of the basin population. This estimate appears to be reasonable, as shown in Table 7-5. Taking present access from Figure 7-1, overall basin access is adequate for about 56% of the population, leaving about 170,000 without adequate access. The Districts have identified schemes that would improve supply to about 178,700 people. This stacks up well overall, but note the Malawi Districts appear to be planning to improve to supply to a population that is already considered to have reasonable access, while the Districts in the Tanzania sector appear to be under-planning their requirements. As a result, the planned investment (according to the District estimates) targets 70% of the basin requirements to the Malawi sector, whereas 71% of people in SRB lacking adequate access are in the Tanzanian sector.

This situation is partly explainable bearing in mind very few SRB inhabitants have adequate water supply and it is very hard for District authorities to be objective in a basin context. Further, identified funding for water supply in SRB Tanzania is much lower than that in SRB Malawi. Although only a very inadequate 5% of basin water supply schemes have ear-marked funding, nearly all of this is in Malawi. The planning initiative as defined by the Districts clearly requires a broader, basin-level view.

Table 7-5 Present and Planned Access to Improved Water Supply

District	% with access	Estimated Population 2013	Population With access	Access to be Improved	Planned for access to be improved
Mbeya Rural	67.5	15,512	10,470	5,041	-
Kyela	41.0	60,675	24,877	35,798	15,250
Ileje	59.6	94,906	56,564	38,342	27,222
Mbozi	22.0	50,137	11,030	39,107	6,200
Momba	37.6	5,022	1,888	3,134	6,742
Chitipa	70.4	124,681	87,776	36,906	81,688
Karonga	70.3	40,502	28,473	12,029	41,600
Overall	56%	391,436	221,078	170,357	178,702

Another issue of note is the proposed source of water for new schemes and renovation of existing schemes by the Districts. **Error! Reference source not found.** shows that only 25% of proposed investment would be in groundwater schemes; the proposal is identified more specifically in Table 7-6 which shows that 90% is proposed for small, gravity fed water supply schemes.

Table 7-6 Proposed Investment in New and Renovated Schemes by Type, US$

District	Boreholes	Natural springs	Shallow wells	Small water supply	Grand Total
Mbeya Rural					
Kyela	57,414	-	-	844,800	902,214
Ileje	-	-	-	2,252,800	2,252,800
Mbozi	-	-	4,000	422,400	426,400
Momba	-	-	-	519,600	519,600
Chitipa	406,866	18,000	472,000	7,043,600	7,940,466
Karonga	80,000	-	172,000	844,800	1,096,800
Totals	544,280	18,000	648,000	11,928,000	13,138,280

Schemes of this type were historically logical when the population was concentrated adjacent to rivers: compared to a borehole a gravity scheme is relatively easy to construct and maintain and can deliver water to a wider area. Nearly all of the small water supply schemes in Table 7-6 are for renovation or extension. While it is reasonable of the Districts to seek to maintain what already exists, the needs of the wider basin population also need to be taken into account with more emphasis on groundwater development to serve the rapidly expanding population who do not have access to run-of river water supply – and therefore must walk much further to access water. Further, groundwater is normally a safer source of supply than surface water. In short, investment in groundwater

development will yield a greater return to achieving water supply targets than a similar investment in developing surface water supply.

7.5 SRBDP RECOMMENDATIONS FOR POTABLE WATER SUPPLY

The SRBDP Report Water Related Social Infrastructure: Water Supply provides a complete review of village water supply requirements in SRB. Its proposals are summarised in

Table 7-7. The proposed schemes for the SRBDP Water Supply Programme are shown on Figure 7-2. Some similarities to the District estimates can be immediately noted: the total cost estimate is US$ 12.34 million compared to about US$ 13.1 million estimated by the District administrations and the number of people expected to be benefit from improved water supply is about 267,000, or nearly 68% of the basin population and in excess of beneficiaries identified by the Districts.

The main difference is that the SRBDP recommendations are entirely oriented to the development of groundwater. Therefore Districts with generally good access to run-of river surface supply – Kyela and Karonga – are not included. A large proportion of the population of these areas will benefit from the planned SRBDP water supply to Kasumulu and Songwe towns (each scheme will benefit about 20 villages as well as the urban population), which will also serve villages both upstream and downstream of the urban areas.

Table 7-7: Proposed SRBDP Village Water Supply Programme

District	Ward/TA	Boreholes, no.	Pumps, no.	Storage volume, m3	Pipework, m	Cost estimate, US$		POPULATION
						Investment cost US$	Recurrent US$ pa	
Mbeya Rural	Iwiji	6	6	6	200	626,680	41,759	17,696
Mbeya Rural	Masoko	1	1	1	35	76,240	4,327	2,393
Kyela	Ikolo	-	-	-	-	-	-	-
Kyela	Katumba Songwe	-	-	-	-	-	-	-
Kyela	Ngana	-	-	-	-	-	-	-
Kyela	Ngonga	-	-	-	-	-	-	-
Kyela	Ikimba	-	-	-	-	-	-	-
Kyela	Itope	-	-	-	-	-	-	-
Ileje	Itumba	3	3	1	400	484,251	47,910	11,778
Ileje	Mlale	1	1	1	60	254,612	9,728	5,381
Ileje	Itale	3	3	3	150	330,576	11,824	6,541
Ileje	Ibaba	2	2	2	120	296,464	11,346	6,275
Ileje	Ndola	4	5	4	100	470,920	16,341	9,039
Ileje	Ikinga	3	3	3	110	237,212	11,966	6,619
Ileje	Kafule	3	3	3	125	286,700	15,613	8,636
Ileje	Malangali	-	-	-	-	-	-	-
Ileje	Kalembo	-	-	-	-	-	-	-
Ileje	Bupigu	4	4	4	50	234,760	10,607	5,867
Ileje	Isongole	2	2	2	125	221,784	17,371	9,609
Ileje	Chibete	2	2	2	70	208,506	8,847	4,893
Ileje	Mbebe	2	2	2	90	288,496	12,740	7,047
Mbozi	Iyula	3	3	3	110	435,660	29,035	16,060
Mbozi	Nyimbili	9	9	9	260	1,130,408	50,043	27,680
Mbozi	Vwawa	-	-	-	-	-	-	-
Mbozi	Isandula	3	3	3	105	326,928	13,974	7,729
Momba	Chiwezi	1	1	1	50	164,968	6,570	3,634
Tunduma	Tunduma	-	-	-	-	-	-	-
Chitipa	Mwabulambya	26	26	840	210,903	3,402,836	74,455	61,829
Chitipa	Mwanamisuku	8	8	210	36,142	677,704	17,934	14,893
Chitipa	Kameme	10	10	320	98,295	1,507,540	26,152	21,716
Chitipa	Chitipa Boma	3	3	400	25,300	679,790	31,459	11,617
Karonga	Kilupula	-	-	-	-	-	-	-
Karonga	Mwakaboko	-	-	-	-	-	-	-
	Tanzania	52	53	50	2,160	6,075,167	320,000	110,055
	Malawi	47	47	1,770	370,640	6,267,870	150,000	156,877
	Total	99	100	1,820	372,800	12,343,037	470,000	266,932

TANZANIA / MALAWI - SONGWE RIVER BASIN

Water Supply Service Areas

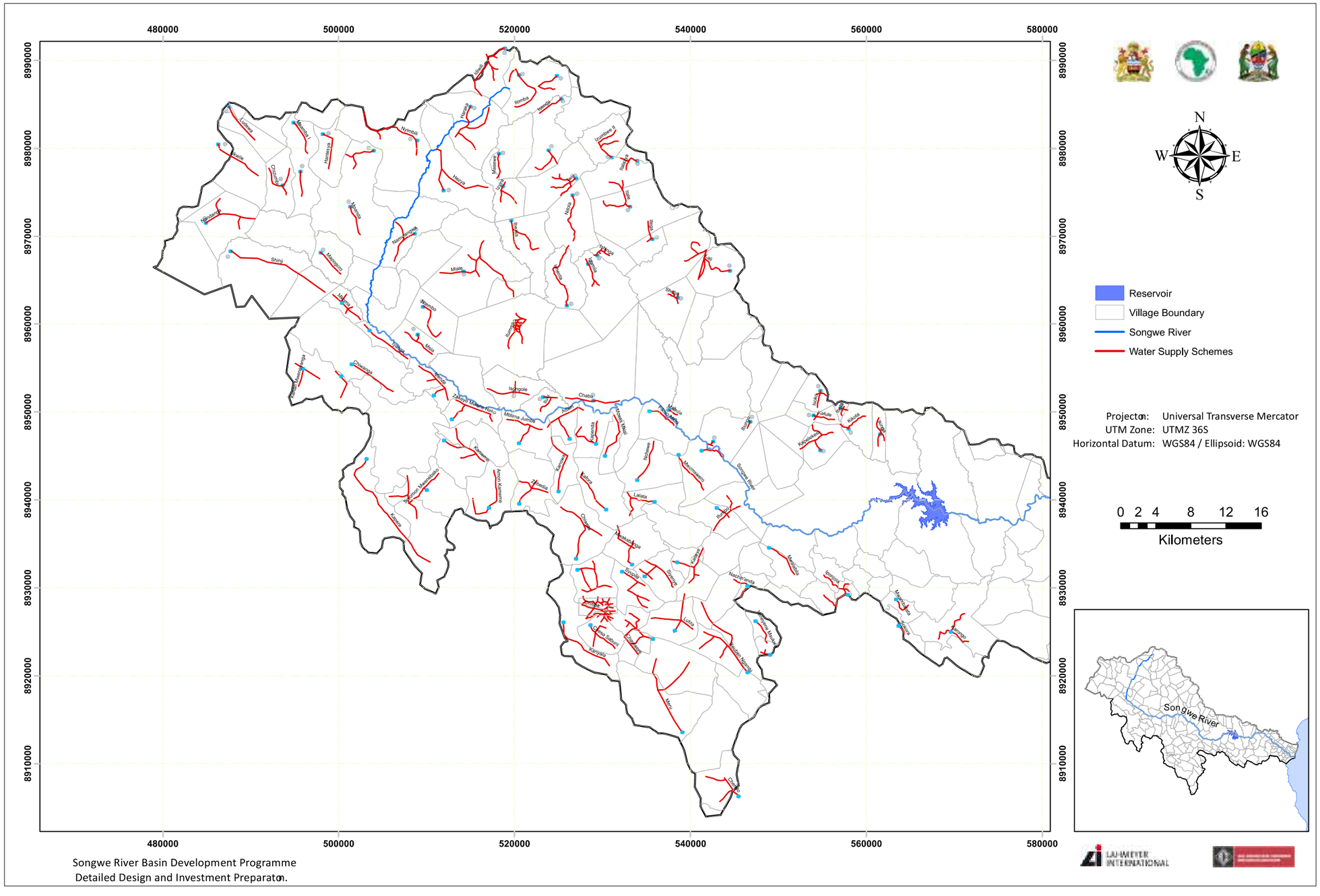


Figure 7-2: Proposed SRBDP Water Supply Schemes

Given this change in geographical focus it is unsurprising that the distribution of planned investment by District changes: Mbeya Rural and Mbozi (with only 22% access to improved water supply) for example, will now benefit more from water supply investment. Ileje District remains with a large proposed budget (US$ 3.3 million compared with the District estimate of US$ 2.3 million) but this will be targeted to borehole development rather than the implementation of small gravity water supply that will benefit fewer people. Chitipa also remains with a large budget ((US$ 6.3 million compared with the District estimate of US$ 7.9 million): again this will be directed to borehole development.

7.6 SANITATION AND WASTE DISPOSAL IN SRB

Songwe River Basin is predominantly rural in nature and communities do not have organized system of collecting and treating waste. Access to improved sanitation facilities such as water borne toilets or improved toilets is very low. Even for those households that are using water borne toilets do empty liquid waste in septic tanks which is never treated after emptying.

Assessment of the two districts of Chitipa and Karonga in Malawi shows that in 2008, the population was mostly using traditional pit latrines, followed by ventilated improved pit latrines and a few who had flush toilets. Of serious concern is the situation in Karonga where a large population had no toilet facility, an indication of high rates of open defecation in the district.

Notable use of septic tanks is common in major urban areas of Chitipa in Malawi and Itumba and Isongole (Ileje) in Tanzania. The other small urban areas and rural settlements use improved and ordinary pit latrines for discharge of effluents. The sample survey results showed about 80% of the households use pit latrines in Tanzania while in Malawi, households using pit latrines was about 56%. There were some missing responses, an indication that some households were not willing to talk about the subject. No household reported use of water closet in Tanzania while in Malawi, only 1% indicated that they use water closet.

At regional level, statistics show that discharge of effluents in Mbeya Region is mostly through composting (37.2%), buckets (30.1%), pit latrines (19.2%), ventilated improved pit latrines (7.3%) and flush toilets (3%). It should be stated however that the majority of the rural communities use pit latrines as a means of disposing effluents.

Sanitation of this type is generally used in urban areas, which the SRB does not have. However, as the population grows and the rural towns become urban areas, attention should start being given to providing proper sanitation.

There is no formal collection and disposal of solid waste in the Songwe River Basin. Kasumulu and Songwe, small border towns in Tanzania and Malawi respectively have just started the process of collecting solid waste. It is worth noting however, that collection, treatment and disposal of solid waste in the basin is primarily being done at individual

household level because settlements are scattered and generally the amount of waste is quite small.

7.7 STRATEGIES IN THE WATER SUPPLY SECTOR

The proposed dams will provide adequate and reliable source of water to the communities. However, it is the lower dam that has high potential to supply potable water through gravity to the two basin districts of Kyela and Karonga. The border town of Kasumulu will be the first beneficiary of reticulated water supply through the direct intervention of the programme while Songwe Town on the Malawian side is already benefiting from a government water supply initiative under Northern Region Water Board in the short term. In the long term, the dam will be the main source of water for Kyela and Karonga villages in SRB and it is therefore recommended that through this scheme, water supply should be extended to other surrounding communities.

In light of the above, the complementary development of ground water sources is required for the needs of the basin population that are less fortunate and cannot have economic access to water supply from the Lower Dam. As such, preservation of existing water supply sources should therefore form an integral part of the overall water resources management plan. Specific measures are outlined in the natural resources management sub-programme and the SRBDP Report Water Related Social Infrastructure: Water Supply. Essentially it is recommended that the SRBDP should directly and indirectly support the water sector players in their efforts to supply potable water to the Songwe River Basin communities. The underlying principle and overall objective is to make sure that every household has access to safe and potable water within a maximum distance of 400m based on the water policies of the two countries. Therefore, the SRBDP shall expend their energies in supporting the realization of this policy requirement and also the aspirations of the basin population as contained in the SRB Shared Vision 2050 which prioritizes supply of safe and potable water to all households throughout the year.

7.8 STRATEGIES IN THE SANITATION SECTOR

The two district councils of Karonga in Malawi and Kyela in Tanzania should develop measures for managing sanitation issues in the border urban centres of Songwe and Kasumulu respectively. This is particularly important because of the interventions in the water supply sector. Once completed, the water supply projects will result in many households opting to have flush toilets and a generally improved access to potable water will be attained. Discharge of foul water and effluents should be properly regulated and managed by the two councils in order to prevent pollution of the Songwe River ecosystem.

The Community Development Sub-Programme recommends that Kyela and Karonga District Councils should develop guidelines in consultation with communities in Kasumulu and Songwe Urban Centres respectively for the management of liquid waste. One of the options that should be promoted is the use of septic tanks or a simple sewer system that will connect the urban centres for the discharge of effluents. In addition, the two councils

should immediately embark on solid waste collection, transportation and disposal efforts in order to improve the environmental outlook and general hygiene of the two centres. Therefore, there is a need to identify waste disposal site in conjunction with relevant stakeholders namely, environmentalists, geologists, water engineers and land use planners.

8 STATUS OF ROAD INFRASTRUCTURE AND ENERGY

8.1 ROAD NETWORK IN SRB MALAWI

The Songwe River Basin has different types and classification of roads. The Malawi side of the river basin has all types of roads as per the national classification such as main, secondary, tertiary, district and several undesignated ones. Table 8-1 gives a summary of all roads in the basin and their condition on the Malawian side.

Table 8-1: Road Network on the Malawi Side

District	Name Of Road	Classification	Condition
Karonga	Karonga-Songwe border	Main (Bitumen)	Fairly good
	Songwe border-Ngana	Secondary (Earth)	Bad
	Dusi-Kasantha	District (Earth)	Bad
	Ighembe-Kitwika	District (Earth)	Bad
	Iponga-Ndemange	District (Earth)	Very bad
	Kiwe-KaundiAdmarc	District (Earth)	Poor
Chitipa	Karonga-Chitipa	Main (Bitumen)	Very Good
	Kasisi-Sokola	Tertiary (Earth)	Poor
	Namatandani-Songwe	Tertiary (Earth)	Poor
	Udonda-Mwamunkumbwa	District (Earth)	Poor
	Phalula-Nakatowo	District (Earth)	Poor
	Njerengwa Turn off-Upighu	District (Earth)	Poor
	Chitipa Boma-Nkhangwa	Main (Earth)	Poor
	Ngoya-Nakatowo	District (Earth)	Poor
	Mbirima-Songwe bridge	District (Earth)	Poor

Sources: Karonga and Chitipa Districts Road Offices, 2014

There is also a 60km road which branches off along Karonga-Songwe Road at Mwenitete to Ngerenge, and joins Karonga-Chitipa Road at Kapoka via Sokola which needs to be rehabilitated to facilitate accessibility of the basin. Generally, all roads on the Malawian side of the Songwe River Basin except those bituminized are in poor condition and this

situation negatively affects accessibility to various services and facilities and overall development in the basin.

8.2 ROAD NETWORK IN SRB TANZANIA

Various classes of roads also exist in the basin on the Tanzanian side. Roads are classified as follows:

(a) Trunk Roads: Roads adjoining one region to the other. They are usually paved
(b) Regional Roads: Roads joining trunk/regional roads or productive areas from district headquarters
(c) District Roads: These roads are described as follows:
    I. Roads joining district headquarters to division headquarters and from division headquarters to wards
    II. Roads joining important centres to higher class roads
    III. Roads joining important centres with district roads
(d) Feeder Roads: These are roads joining district roads to village headquarters and those joining important centres to villages.

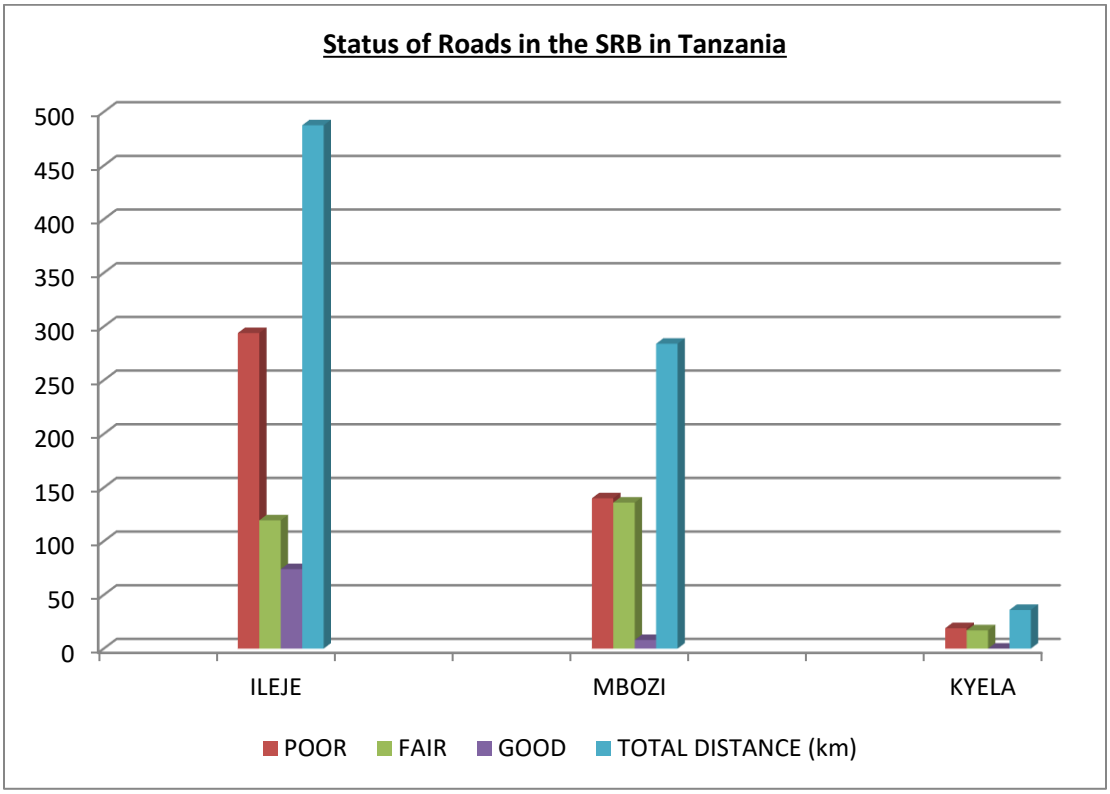
8.3 ROADS IN ILEJE DISTRICT

Ileje District has the longest road network in the Songwe River Basin that connects it to other districts and rural markets. Major roads in Ileje include the one that runs almost parallel to the Songwe River in some sections connecting the border town of Kasumulu in Kyela District and the other one connecting it with the highway from Mbozi to Tunduma. There is also a direct road linking it with Chitipa District on the Malawian side. The entire road network in the Ileje section of the basin is estimated to comprise 195.45km of gravel surfaced roads, 302km earth surfaced roads and about 6km or bitumen surfaced roads found at Itumba Township.

All roads in Ileje except at Itumba urban area are non-bituminized. The existing roads in the Songwe River Basin in Ileje District are in fair condition. They are passable during the rainy season except sometimes during heavy down pour. However, there are several areas of the basin that are still difficult to access because of rough terrain that makes road construction and maintenance extremely difficult.

Ileje District Council has plans to construct a new road from Isoko to Chikumbulu. Although there are no funding commitments to the proposed road construction, the council has targeted 2015/2016 as the fiscal year in which work should commence. In addition, construction of a bridge is also proposed on Mwati River during the same fiscal year despite the absence of funding commitments. Although the overall condition of all roads in the basin in Kyela is generally poor, the council has no immediate plans to rehabilitate or construct new roads due to lack of funds. Figure 8-1 is a summary of the condition of roads in the basin on the Tanzania side.

Figure 8-1: Status of Roads on Tanzania Side



Source: District Data Collection, 2013

8.4 STRATEGIES IN THE ROADS SECTOR

All developments in the Songwe River Basin will be integrated such that it is necessary to develop a network of roads that satisfies this approach. During discussions with District Commissioners for Chitipa and Ileje, it was revealed that there are large scale trading activities between the two districts although it was not formally documented. If the basin is to be developed as a single region, this cross border trade will need to be regulated and promoted. This therefore demands that districts within the basin should be inter-connected. Various stakeholders in the Songwe River Basin observed that the condition of most roads is so poor that it is affecting the social and economic development of the entire basin. Therefore improvements to the whole road network in the basin remains a critical precondition for investment and socio-economic development in general.

Connection between Karonga and Chitipa has been eased because of the newly constructed bituminized road. Similarly, Karonga and Kyela are connected by an existing bituminized highway which goes to Mbeya and later Mbozi and Momba districts. Although the district headquarters of Mbozi and Momba are outside the Songwe River Basin, it is critical that these two districts should be linked with Ileje by a bituminized road as the

current gravel road contributes to higher transport costs for business persons and ordinary citizens.

Ileje and Kyela are also districts that can complement one another because of the diverse agricultural products in these districts. Linkage between these two districts is however through a gravel/earth road, a situation that significantly increases travel time and costs between them. Based on the above scenario, development of a robust, effective and reliable transport system is a prerequisite to achieving the overall objective of Songwe River Basin Development Programme. Table 8-2 shows major roads projects that are proposed in this plan whose implementation will improve mobility within and outside the basin.

Table 8-2: Proposed Road Network in the SRB

No.	Name Of Road	Current Status	Proposed Status	Proposed Action
1	Chitipa-Kasisi-Songwe Bridge-Isongole (Ileje)	Earth	Primary Road, paved	Bituminized
2	Isongole-Kasumulu (Kyela)	Earth/gravel	Primary Road, paved	High class graveling Bituminized (Long term)
3	Itumba (Ileje) - Tunduma Highway	Gravel	Primary Road, paved	High class graveling Bituminized (Long term)
4	Mwenitete-Ngerenge (Karonga) to Kapoka via Sokola (Chitipa)	Earth	Secondary, graveled	High class graveling
5	Songwe Border-Ngana	Secondary, Earth Road	Secondary, paved	Bituminized
6	All roads to the Lower Dam Site	Earth Roads/tracks	Secondary, paved	Bituminized

NOTE: All dam access roads will be constructed as part of the investment package for the dam and hydro power scheme. They are not intended as public access roads.

8.5 ACCESS ROADS TO DAMS AND HPPS

Under the DDIP-SRBDP, only the Lower Songwe Dam and HPP is being taken as far as detailed design. However, in the Update of the 2003 Feasibility Study (2014) the Middle

Songwe Dam and HPP was also found to be feasible and is recommended to go forward to detailed design and implementation. The Upper Songwe Dam was not found to be feasible and was not recommended to go forward.

Access to the Lower Songwe Dam and HPP will be from two fronts. On the Tanzanian side, an access road is proposed from around Ikinga to the dam site, a distance of around 12.2 km, plus inner roads covering about 1.2 km. On the Malawian side, access is proposed from Mwandenga to Ngana through Nalupanda, a distance of about 12.9 km. Thereafter, a new road will proceed all the way to the dam for a distance of about 11.5 km. Provision of these access roads will involve upgrading existing roads and tracks and developing new ones, the design of which is being undertaken in the DDIP-SRBDP project. Altogether this will be undertaken as part of the whole project package under an initial phase comprising the dam, hydro power scheme and irrigation schemes. Cost estimates for access roads to the lower dam are derived from the Update of the 2003 Feasibility Study Final Report (2014).

For the Middle Songwe Dam and HPP, if it is to go ahead, access roads will also need to be developed. An upgrade of existing roads covering 48.82 km from Luvele (near the Kasumulu Border) to Malangali is expected, plus an existing track 7.94 km long to Chembe. From there, two access roads will be constructed; one leading to the dam covering about 5.69 km and the other one about 7.06 km leading to the Middle Songwe HPP power house.

All dam access roads will be of a high bitumen standard as heavy vehicles will use them. Dam access roads are not intended as public roads, but parts of them may be used as such. Implementation of first phase projects (2015 – 2025) under the Songwe River Basin Development Programme will determine the level of provision of ancillary services in and around the proposed project sites in future as these may also act as growth corridors.

8.6 ENERGY SUPPLY IN TANZANIA

Kyela District is served by the National Electricity Grid. Previously it had also had a power supply from the Kiwira Coal Mine and associated power station, but this has not been operating for some time. The whole district has about 2,816 customers (Source: Kyela District Profile) of which about 659 households are resident in SRB (Consultants' estimate based on TANESCO data, but using projected population estimates for 2022). In addition to electricity, other sources of energy used include charcoal, petroleum, kerosene, solar power and fuel wood.

Two urban centres of Vwawa and Mlowo in Mbozi are connected to the National Electricity Grid. In all there are an estimated 4,000 urban connections within SRB in this area. Within the basin, the village of Ukwile is also connected (about 614 rural households), Other sources of energy are wood, charcoal and petroleum. Some households use solar panels and biogas (Source: Mbozi District Environmental Scan).

The main sources of energy in Mbeya District are electricity, kerosene, charcoal and firewood. Electricity is supplied through the National Grid and is available in the small towns and some villages but none of these villages are within the basin. Nearly 96% of residents of Mbeya District live in rural areas without electricity connection; thus they depend mainly on forests for firewood and charcoal. Kerosene is used for lighting and cooking and is obtained from outside the district (Source: DDIP-SRBDP SESA Final Report, 2014).

The majority of households in Momba District are not supplied with electricity from the national grid. Apart from Tunduma Township (outside the basin) which is connected to the national grid, Chapwa "A" inside the basin is connected. 12 wards have no reliable electricity source. A very small population uses solar energy and biogas. The majority of the population uses firewood, charcoal and fuel lamps as their source of energy (Source: Momba Profile, 2014).

Ileje District is also connected through a power line running parallel to the Tunduma-Isongole road. Isongole (1,589 households) and Itumba (2,541 households) urban areas are served. Several rural centres along this route such as Mbebe (783 households served) , Ikumbilo (691 households served) and Msia (586 households served) have been connected. Mapogoro is scheduled or connection soon. It is the south-eastern part of the district that is completely not supplied with electricity.

Note that because of the very high cost of connection (estimated as US$ 1,217 per connection for SRB as a whole in the EDSP, Section 8.2.2, some of the households served may not actually be connected. See that report and the more detailed SRBDP Water Related Social Infrastructure Rural Electrification Report for tabulations of present connections and planned connections by TANESCO.

At regional level, the results of the 2012 census show that majority of the households in Mbeya Region use animal residuals (74.1%), wood/farm residuals (22.7%), charcoal (1.3%), electricity (0.2%) and firewood (0.1%). On sources of lighting, 45.2% of households use firewood, followed by candles at 17.8%, lamps at 16.6% and generators at 13.3%.

8.7 ENERGY SUPPLY IN MALAWI

According to the 2008 Population and Housing Census, very few households use electricity for lighting and cooking in the two districts of Chitipa and Karonga. The main sources of energy for lighting in order of usage at household level are paraffin, firewood and electricity while for cooking, firewood is also a dominant source followed by charcoal and paraffin. Very few households use electricity for cooking. This poses a challenge to natural resources conservation efforts in the two districts.

8.7.1 Chitipa District

There are no power generation plants and associated facilities operating in Chitipa District Area. Electricity is supplied through the national grid from Wovwe Hydropower Plant. Official records show that there are only 372 connections in the district. Information collected in mid 2014 shows that electricity is available within SRB at Kameme (394 households; Consultants' estimate based on ESCOM data, but using projected population estimates for 2022)), Lufita (646 households), Ifumbo (207 households), Kaseye (318 households) and TA Mwaulambya headquarters (656 households), so the connection rate is very low Table 8-3 shows households supplied with electricity in Chitipa District as of 2013.

The major problem of electricity supply in Chitipa is undersupply. There is a 33kv line supplying power from a sub-station in Karonga but intensive rationing resulting from inadequate power generation means that there is prolonged load shedding on daily basis and this is affecting people's lives.

Table 8-3: ESCOM Connections in Chitipa

Area	TA	H/Holds Applied	H/Holds Connected
Chitipa Town	Mwabulambya	700	305
Misuku	Mwenemisuku	80	25
Kapoka	Mwenemisuku	45	15
Lufita	Mwabulambya	75	21
Chisasu	Mwenemisuku	8	6
TOTAL		908	372

Source: ESCOM and Chitipa District Council, 2013

The majority of households in Chitipa rely on fuelwood, charcoal, paraffin and solar energy for cooking and lighting. However, fuelwood stands out as the major source for cooking in most households, a situation that is negatively affecting tree preservation efforts in the district.

8.7.2 Karonga District

Until recently, electricity supply in Karonga District was from Wovwe Hydropower Plant. The connection of the district to the national electric power grid has provided an alternative supply of electricity. ESCOM's main hydro power stations at Nkula / Tedzani / Kapichira situated along the Shire River in the southern region of Malawi provide backup supply to Karonga. Demand for electricity in the district shot up with the establishment of a uranium mining company at Kayerekera, although undersupply forced the company to continue to rely on electricity from diesel powered generators. Table 8-4 is a summary of feeder lines and electricity connections in Karonga District.

Table 8-4: ESCOM Connections in Karonga

Feeder Name	Customers	Area Supplied
1L5 (I.E. Feeder No)	3200	Airport, Old Town, Water Intake, to Kambwe Cotton- ginnery
2L5 (I.E. Feeder No)	1600	Hospital, Town Centre, Mwenilondo, to Lupembe health centre
OCB 280 (I.E. Feeder No)	2400	Masoko Telecentre up to Songwe border and Wiriro up to Chitipa District
UA 1L5 (I.E. Feeder No)	1200	Uliwa, Hara, Bundi, Tirola, Chilumba Jetty, Ngala, up to Mlale

According to ESCOM, only Kaporo, Kashata Ighamba and Iponga villages both in Karonga District and within the basin have access to electricity, about 493 households in total, most of which are not actually connected.

8.8 STRATEGIES IN THE ENERGY SECTOR

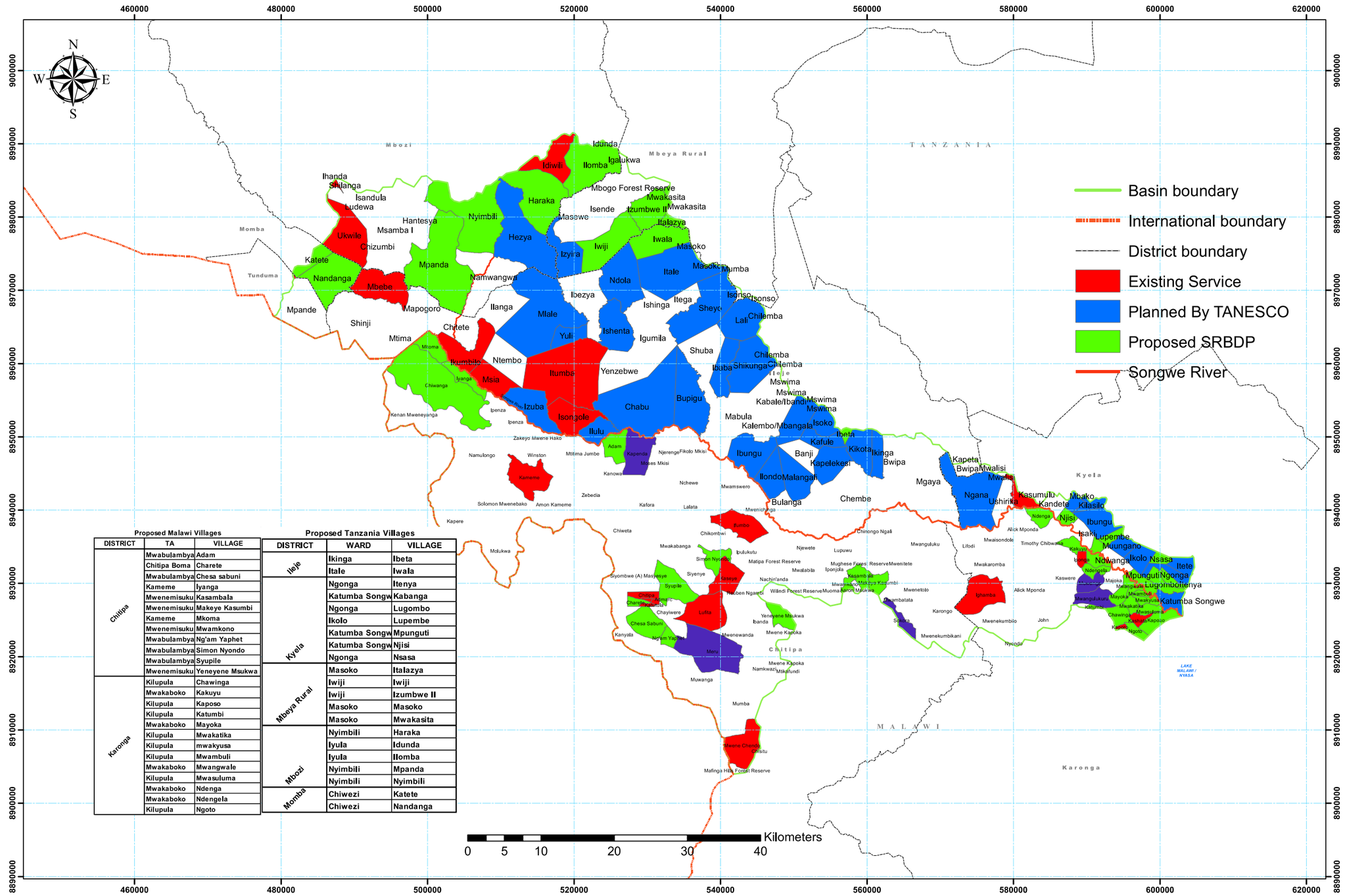
One of the major investments in the Songwe River Basin is the hydroelectric power scheme referred to as the Lower Songwe Dam and HPP. Electricity generated from this scheme will be fed into the national grids of the two countries. Without targeted intervention, there is a likelihood that all the energy produced in the basin may end up being consumed elsewhere just as with the case with other examples such as most forestry products. In order to establish these targets, TANESCO and ESCOM were consulted and their short term connection plans for SRB were established and reported in the SRBDP Water Related Social Infrastructure Rural Electrification Report.

Clearly SRBDP will not interfere with these plans, particularly as SRBC will have no electricity resources to offer to SRB until 2022 when electricity production comes on stream from the Lower Songwe Dam. However, from the data available it is possible to identify those areas which are not supplied now and are not included in ESCOM and TANESCO's connection plans. Electricity supply to these areas post 2022 has been planned and presented in the Water Related Social Infrastructure Final Report, Part 4, Rural Electrification. The plan prioritises distance from expected electricity supply sources and population density in 2022 to reduce supply costs. This procedure is reported in Chapter 8 of the EDSP, and summarised in Table 8-5 below. Figure 8-2 below the table shows the locations of rural electrification in terms of existing, planned by TANESCO and ESCOM, and the proposal for SRBDP.

Table 8-5: SRBC Electrification Plan by Administrative Area, Post 2022

DISTRICT	ADMINISTRATIVE AREA	RURAL HH 2022	URBAN HH 2022	2022 cover, rural households	2022 cover, urban households	Post 2022 cover, rural households	Post 2022 cover, urban households	Rural cover without SRBC Plan	Rural cover with SRBC Plan	Urban cover without SRBC Plan	Urban cover with SRBC Plan
Mbeya Rural	Ilolo	2,635	-	514	-	1,793	-	20%	88%		
Mbeya Rural	Mwaloo	1,136	-	-	-	1,136	-	0%	100%		
Kyela	Ikolo	1,014	-	870	-	1,014	-	86%	100%		
Kyela	Kalumbe Songwe	1,543	1,738	580	-	1,156	1,738	38%	75%	0%	100%
Kyela	Ngana	1,568	-	1,125	-	1,125	-	72%	72%		
Kyela	Ngonga	1,640	-	703	-	1,640	-	43%	100%		
Kyela	Ikimba	510	2,192	510	2,192	510	2,192	100%	100%	100%	100%
Kyela	Itope	222	-	-	-	-	-	0%	0%		
Ileje	Ilyinsa	296	2,641	-	2,641	-	2,641	0%	0%	100%	100%
Ileje	Mlale	988	-	801	-	801	-	83%	83%		
Ileje	Itale	1,502	-	668	-	1,196	-	44%	80%		
Ileje	Ibaba	1,590	-	1,400	-	1,400	-	88%	88%		
Ileje	Ndola	1,346	-	778	-	778	-	58%	58%		
Ileje	Ikinga	1,544	-	840	-	988	-	54%	64%		
Ileje	Kafule	1,470	-	1,286	-	1,286	-	87%	87%		
Ileje	Malangali	1,280	-	768	-	768	-	60%	60%		
Ileje	Kalembo	705	-	418	-	418	-	59%	59%		
Ileje	Ibaigu	1,213	-	942	-	942	-	78%	78%		
Ileje	Isongole	896	1,589	896	1,589	896	1,589	100%	100%	100%	100%
Ileje	Chitete	1,712	-	1,276	-	1,276	-	75%	75%		
Ileje	Mbebe	1,832	-	783	-	783	-	43%	43%		
Mbozi	Iyula	919	3,464	-	1,671	919	3,464	0%	100%	48%	100%
Mbozi	Nyimbili	4,122	-	572	-	3,110	-	14%	75%		
Mbozi	Vwawa	-	-	-	-	-	-				
Mbozi	Isanduia	1,461	-	614	-	614	-	42%	42%		
Momba	Chitete	541	1,614	-	-	541	1,614	0%	100%	0%	100%
Tunduma	Tunduma	423	-	355	-	355	-	84%	84%		
Chitipa	Mwalusembya	12,572	-	3,239	-	4,813	-	26%	38%		
Chitipa	Mwamemayiki	5,030	-	474	-	1,804	-	9%	32%		
Chitipa	Kamema	3,958	-	805	-	1,458	-	20%	37%		
Chitipa	Chitipa Boma	-	2,595	-	2,127	-	2,595			82%	100%
Karonga	Kilyputa	3,798	-	516	-	3,220	-	14%	85%		
Karonga	Mwakaboko	4,503	-	819	-	2,864	-	18%	64%		
Mbeya Rural		3,771	-	514	-	2,929	-	14%	78%		
Kyela		8,997	3,930	3,788	2,192	5,445	3,930	58%	84%	56%	100%
Ileje		16,272	4,129	10,815	4,129	11,488	4,129	66%	71%	100%	100%
Mbozi		6,502	3,464	1,186	1,671	4,643	3,464	18%	71%	48%	100%
Momba		541	1,614	-	-	541	1,614	0%	100%	0%	100%
Tunduma		423	-	355	-	355	-	84%	84%		
Chitipa		21,560	2,595	4,518	2,127	7,875	2,595	21%	37%	82%	100%
Karonga		8,301	-	1,335	-	6,083	-	16%	73%		
	Tanzania	34,007	13,138	18,659	7,993	25,402	13,138	49%	75%	61%	100%
	Malawi	29,861	2,595	5,853	2,127	13,959	2,595	20%	47%	82%	100%
	Overall	63,868	15,733	24,512	10,120	39,361	15,733	38%	62%	64%	100%

Figure 8-2: Rural Electrification in SRB – Existing, Planned and Proposed SRBDP



Proposed Malawi Villages

DISTRICT	TA	VILLAGE
Chitipa	Mwabulambya	Adam
	Chitipa Boma	Charete
	Mwabulambya	Chesa sabuni
	Kameme	Iyanga
	Mwenemisuku	Kasambala
	Mwenemisuku	Makeye Kasumbi
	Kameme	Mkoma
	Mwenemisuku	Mwamkono
	Mwabulambya	Ng'am Yaphet
	Mwabulambya	Simon Nyondo
	Mwabulambya	Syupile
	Mwenemisuku	Yeneyene Msukwa
Karonga	Kilupula	Chawinga
	Mwakaboko	Kakuyu
	Kilupula	Kaposo
	Kilupula	Katumbi
	Mwakaboko	Mayoka
	Kilupula	Mwakatika
	Kilupula	mwakyusa
	Kilupula	Mwambuli
	Mwakaboko	Mwangwale
	Kilupula	Mwasuluma
	Mwakaboko	Ndenga
	Mwakaboko	Ndengela
	Kilupula	Ngoto

Proposed Tanzania Villages

DISTRICT	WARD	VILLAGE
Ileje	Ikinga	Ibeta
	Itale	Iwala
Kyela	Ngonga	Itenya
	Katumba Songw	Kabanga
	Ngonga	Lugombo
	Ikolo	Lupembe
	Katumba Songw	Mpunguti
	Katumba Songw	Njisi
	Ngonga	Nsasa
Mbeya Rural	Masoko	Italazya
	Iwiji	Iwiji
	Iwiji	Izumbwe II
	Masoko	Masoko
	Masoko	Mwakasita
Mbozi	Nyimbili	Haraka
	Iyula	Idunda
	Iyula	Ilomba
	Nyimbili	Mpanda
	Nyimbili	Nyimbili
Momba	Chiwezi	Katete
	Chiwezi	Nandanga

Apart from erecting transmission lines to priority areas of the basin, it is proposed that the SRBC should subsidize electricity connections to consumers in the rural parts of the basin from revenues generated from the sale of electricity that will be supplied to the national grids. The total cost of supply (by 33kv line) to prioritised villages is estimated to be US$14.3 million. The total cost of connection within the villages (transformers, 400v line and metered connection to properties) is estimated as US$ 23 million.

The social impact of this initiative will be considerable. Without the current plans for expansion, only 11% of rural households (in 2022) will be in areas served by electricity now. With the planned extension of services by TANESCO and ESCOM the proportion will increase to 49%. The SRBDP planned initiative will serve areas in which an additional 15,000 households are located (in 2022) and will raise cover to rural households to 71%. About 50% of urban households will be (in 2022) in areas served by electricity now, but with the planned extension of services by TANESCO and ESCOM the proportion will increase to 64%. The SRBDP planned initiative will serve areas in which an additional 5,613 households are located (in 2022) and will raise cover to urban households to 100%. The impact of the SRBDP proposed Rural Electrification programme is significant and will have a very positive impact on the SRB economy and the livelihoods of the people.

The timescale for the proposed intervention is long (post 2022) and SRBDP does not dwell on implementation modalities. In practical terms SRBC will rely on the implementation and operational abilities of TANESCO and ESCOM to manage the proposed SRB expansion, rather than become involved as owner/operator. However, it is worth mentioning Malawi's Rural Electrification Project (MAREP). In this project, donors through central government provide resources for the procurement of materials for supplying power. ESCOM undertakes the projects on behalf of government and connects buildings. The project is now in the seventh phase and the SRBC should borrow some best practices from this intervention.

9 SUMMARY OF THE CDSP

9.1 FRAMEWORK AND LINKAGE TO OTHER SUB-PROGRAMMES

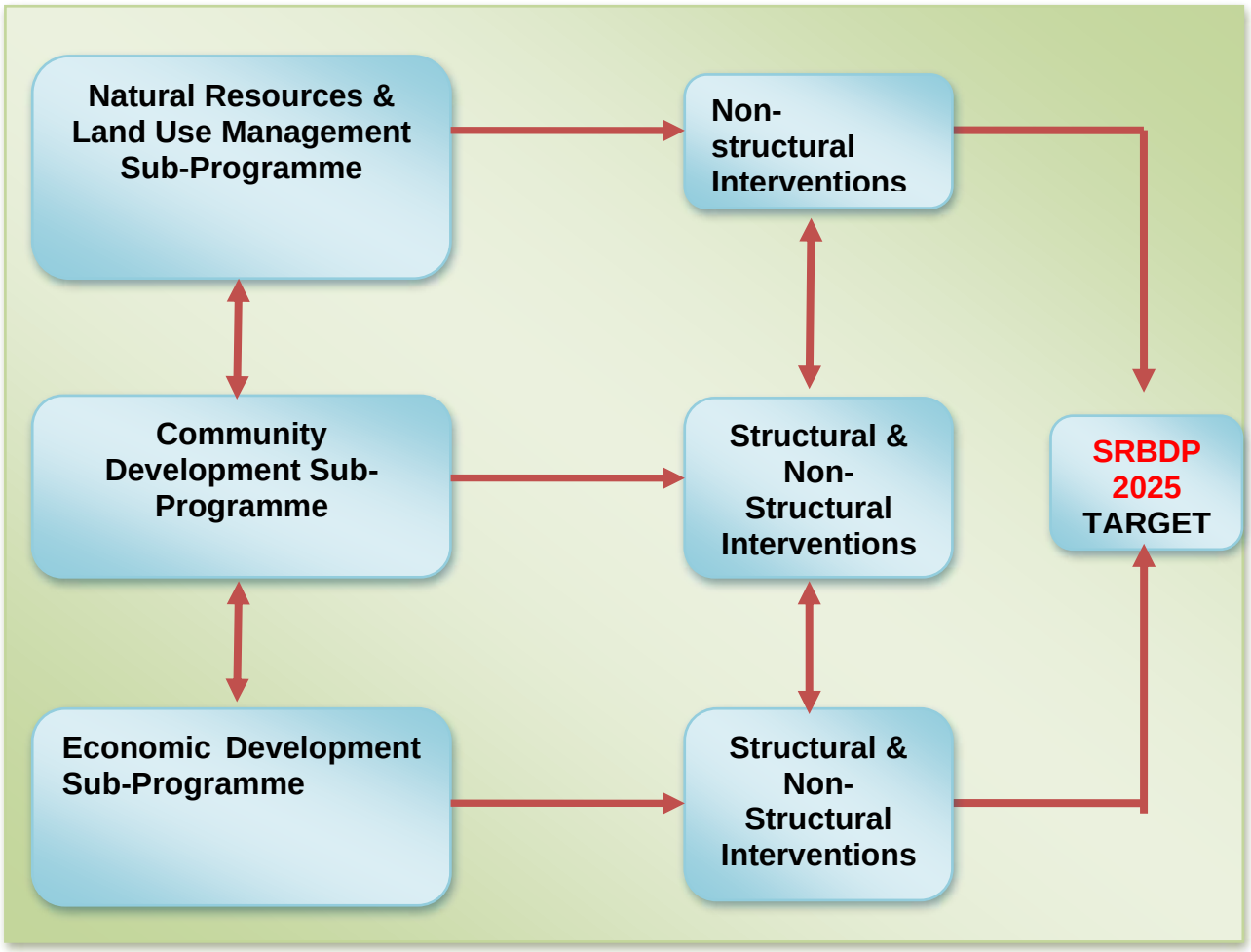
The Community Development Sub-Programme, together with the Economic Development and Natural Resource and Land Use Management Sub-Programmes, forms the Songwe River Basin Development Programme. These sub-programmes are meant to complement each other in achieving the overall goal of the SRBDP which is to contribute to the economic growth, improved health and living conditions and enhanced food security for the people of the Songwe River Basin in the context of the overall economic development of the two countries (Source: Inception Report, 2013).

Projects and programmes under all the sub-programmes are meant to benefit the communities in the basin directly or indirectly. Interventions that are targeted at specific beneficiaries will have long term impact and be sustainable if the communities themselves are involved. There is also a need to integrate interventions in all programmes in order to ensure that results are felt across various sectors of development. In this way, overall economic and social development will be visible.

Typically, measures aimed at water conservation under natural resource management will generate benefits that result in communities having reliable water sources. Similarly tree conservation interventions will require communities to be mobilized and sensitized on the value and importance of forests and be involved in any such efforts. Figure 9-1 below gives an overview of the linkages of the three programmes under SRBDP.

District Councils in the Songwe River Basin have proposed several infrastructure projects which they cannot immediately implement on their own but they are critical in ensuring that balanced and equitable development is achieved in the entire basin. Some of these social infrastructures such as new schools, health centres, water supply schemes and roads need to benefit from direct financing from the SRBDP Commission. Without specifying a strict implementation schedule, projects outlined in the table below are recommended to be implemented within the Songwe River Basin and financing from the SRBDP Commission and other donors will be very critical. Prior to the SRBC having access to its own generated revenue, it is recommended that it should vigorously be involved in identifying funding sources for some of the proposed projects.

Figure 9-1: Linkage with other Sub-Programmes



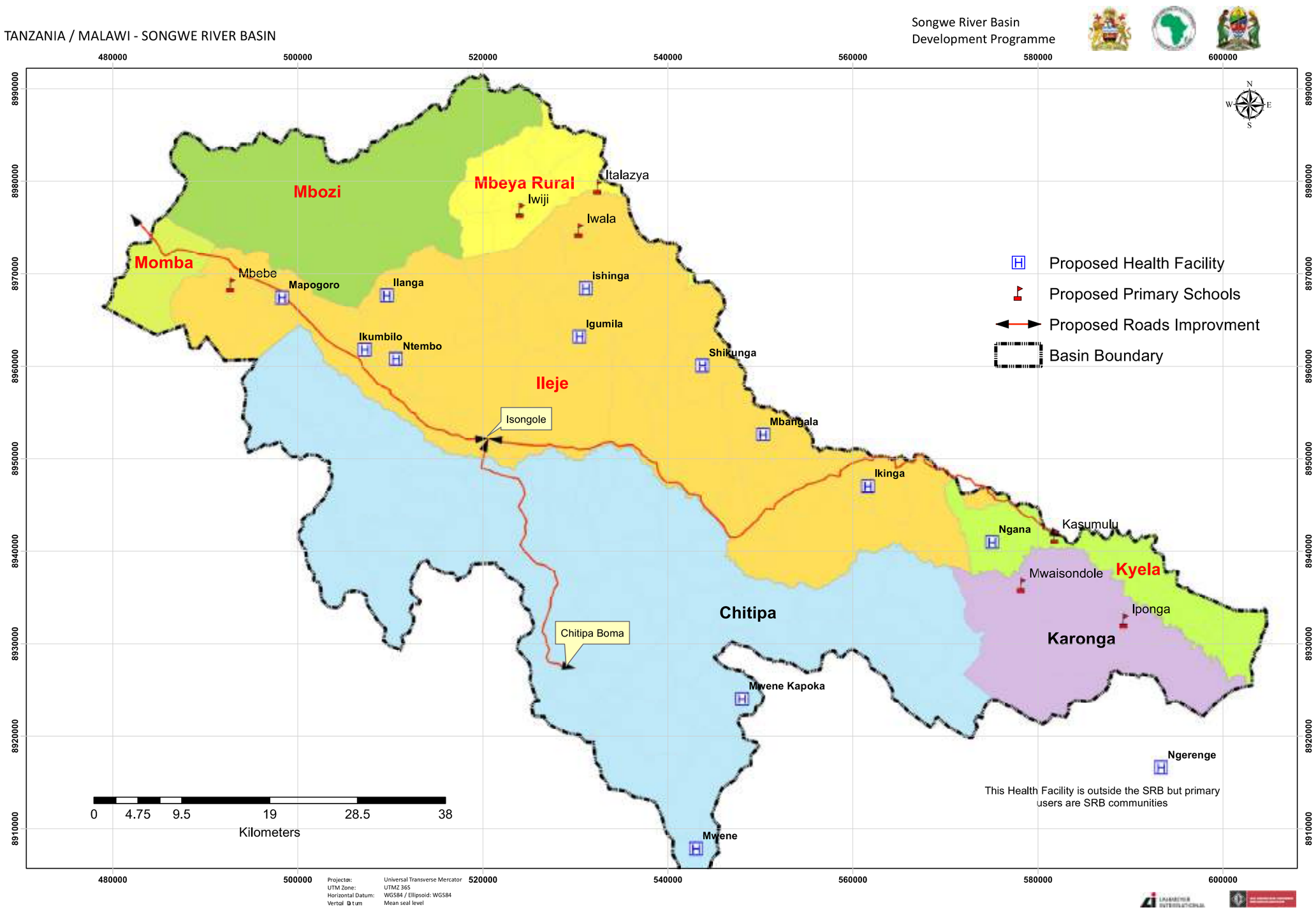


Figure 9-2: Proposed SRBDP Health, Education and Roads Programmes

9.2 SPECIFIC INFRASTRUCTURE PROJECTS

Table 9-1 provides a summary of the proposed projects under the Community Development Programme. Figure 9-2 above shows the specific projects for health, education and roads as outlined in this table. Those for water supply and rural electrification have been presented previously

Table 9-1: Summary of Proposed Priority Structural Projects

Type Of Project	Proposed Location	Estimated Costs (US$)	Beneficiaries
Primary School Projects			
2 New Schools	Mbebe and Itale in Ileje	2,524,272	7,349
1 New School	Lubele in Kyela	1,262,136	3,338
1 New School	Ihanda in Mbozi	1,262,136	8,253
24 Classrooms	Mbozi	466,008	
50 Staff Houses	Mbozi	1,335,000	
1 New School	Karonga	1,262,136	
34 Classrooms	Karonga and Chitipa	660,178	
50 Staff Houses	Karonga and Chitipa	1,335,000	
Secondary School Projects			
1 New School	Ihanda in Mbozi	1,310,680	8,253
1 New School	Mwakilimu in Kyela	1,310,680	7,066
4 Classrooms each	Kafule and Ileje in Ileje	77,668	
1 New School	TA Kameme in Chitipa	1,310,680	3,238
Health Facilities Projects			
1 New Health Centre	Chisansu in Chitipa	849,515	2,896
1 New Health Centre	Ngerenge in Karonga	849,515	-
1 New Health Centre	Ngana in Kyela	849,515	7,944
1 New Health Centre	Isuto in Mbeya	849,515	-
Rehabilitation of Rural Hospital	Kaporo in Karonga	424,757	
9 New Dispensaries	Various wards in Ileje	2,293,689	13,799
Water Supply Projects			
9 New Small Water Supply Schemes	Ileje	1,267,200	13,222
4 New Small Water Supply Schemes	Matipwa River-Chuba (Misuku)	952,000	1,320
	Chilughi River-Muwona (Misuku)		448
	Kameme Centre		2,576

Type Of Project	Proposed Location	Estimated Costs (US$)	Beneficiaries
	Ipenza (Near Songwe River)		1,644
1 New Water Supply Scheme	Momba (Nandaga Village)	238,000	2,742
Rehabilitation of 2 Water Supply Schemes	Ighembe and Iponga in Karonga		
Rehabilitation of 3 Water Supply Schemes	Chinthekwe, Ifumbo and Chinunkha in Chitipa		
Rehabilitation of 37 boreholes	Various locations in Chitipa	248,159	
Roads Projects			
Chitipa-Songwe Border (Isongole) via Kasisi, Mwankumbwa and Mbirima). Approx distance: 25.7km	To be graveled immediately	10,280,000	
	To be bituminized in future	20,560,000	
Itumba -Tunduma Highway to be bituminized in future. Approx. distance: 41km	Ileje and Momba	32,800,000	
Isongole – Ikinga (111.5km): High class graveling	Ileje	3,058,272	
Mwenitete-Ngerenge Kapoka via Sokola Rd	Karonga and Chitipa (About 60km)	1,638,360	
All Dam Access Roads to be bituminized (Include main roads through which access to dams will branch off	Lower Dam (From Malawi side: 24.42km and from Tanzania side: 13.6km)		
Total Estimated Cost		**91,275,071**	

Notes:
1) Costs for Dam Access Roads are not included as they are part of the overall costs of the dam and HPP
2) Costs for rehabilitation of water supply schemes will be determined after a thorough assessment is made
3) Appendix 1 provides a summary of sources of cost estimates.
4) Appendix 5 provides specific locations in Ileje District where dispensaries are proposed
5) Target population is for new facilities only. Isuto (Mbeya) and Ngerenge (Karonga) are out of the basin but a big population in the basin will benefit from these facilities

The construction of the two dams with associated access roads will result in an improved network of roads linking the two districts of Kyela and Ileje. Since construction of the middle dam is not expected soon, it is highly recommended that the section of this road

from around Ikinga to Isongole should be upgraded to high grade gravel all weather status as short term measure.

Through the projects shown in Table 9-1 above, it is hoped that the basin population will directly benefit from the investments under the entire Songwe River Basin Development Programme. Some structural projects expected to be funded by respective district councils or through other sources of funding are included in appendices.

As the DDIP-SRBDP project winds up in mid 2015, there is need for an Interim SRBC. The Interim SRBC will begin to work in October of 2015. There are several projects developed for the Interim SRBC, some of which are part of this CDSP, specifically:

Rehabilitation and Construction of New Schools - Phase 1 US$ 1,320,000

This first phase of the education programme focus on expanding existing schools through adding extra classrooms. These are in several villages in Karonga and Chitipa Districts in Malawi, and Ileje District in Tanzania improve access with the expectation of increased populations during the construction Phase of the projects.

Rehabilitation and construction of new Health Facilities - Phase 1: US$ 1,700,000

This first phase of the health programme includes 1 new Health Centre in each of Chitipa (Chisansu Village) and Kyela (Ngana Village) Districts to improve access with the expectation of increased populations during the construction Phase of the projects.

Water Supply – Phase 1 US$ 3,180,000

Phase 1 will serve the Town of Chitipa and the villages of: Kapenda, Zebedia, Kaseye, Syenye, Lufita, Mru. I[enza and Kameme in Malawi, and Itumba Town plus the villages of Iwiji, Izumbwe II, Kikota, Ndola, Isongole, Msia, Shinji, Haraka and Nandanga in Tanzania. The total population covered in Phase 1 will be 110,058.

9.3 PROJECT COST ESTIMATES

All the projects contained in the above table except access roads to the Lower Songwe Dam were proposed by respective district councils in the basin but there are no committed funds. Projects that have committed budgetary support from government and in some cases, donors are not appearing in the above table. The costing has been done irrespective of the fact that some of them will receive direct community contributions. Therefore, actual costs will vary considerably from one council to the other. On cost estimates for bitumen surfaced roads per lane km, the rate of $800,000 for Malawi has been used while for gravel surfaced roads, the cost estimate obtained from Chitipa of about $27,306 per lane km has been used.

The cost estimates for constructing new water supply schemes have been obtained from Chitipa District Council and are based on the fact that most new schemes are being proposed in Ileje District which has similar physical terrain as that of Chitipa. However,

actual costs will depend on length and size of supply network, size of water tanks, population to be served and physical terrain including prices of materials in individual countries. Appendix 1 contains details on the cost estimates for infrastructures in the basin.

9.4 IMPLEMENTATION SCHEDULE

Implementation of the proposed projects shall take the same approach as all other developments within the basin. It is expected that the SRB Commission will thoroughly engage the concerned district councils at appropriate time as priorities may change over the 10 year period of the SRBDP. It should be noted that a basin level integrated planning, budgeting, implementation and monitoring plan has been prepared and is presented in the SRBC Business Plan and not repeated here.

The success of all these initiatives will depend on active participation and full involvement of all actors at all levels of decision making organs for development in the Songwe River Basin. In this regard, it is recommended that physical development in the river basin should be highly integrated in order to comply with basic approaches adopted in the SRBDP. In this context, implementation of both structural and non-structural projects as shown in Table 9-2 and Table 9-3 will have a direct bearing on the economic development of the basin.

Implementation of non-physical interventions such as those in the agriculture sector, gender and women participation, population and migration, demographic and health delivery services, literacy improvements, support to credit access, extension and marketing services will be undertaken directly by the responsible sectors at district council level and have not been assigned costs. The role of the SRBC in these interventions will be to ensure that such interventions are linked with other programmes' interventions and are integrated in the overall development strategies of the Songwe River Basin. Above all, it will also be the task of the SRBC to provide grants for the implementation of some interventions to district councils that do not have the capacity to do so. This will be one way of achieving equitable development within the Songwe River Basin.

Table 9-2: Implementation Schedule for Structural Projects

Type Of Projects	Time Frame	Funding Source
Lower dam access roads: Bituminizing	2015 - 2025	Donors and SRBC
Isongole – Ikinga Road: High Class Graveling	2016 - 2018	District Council, Donors and SRBC
Isongole – Tunduma Highway: Bituminizing	2018 - 2022	District Councils, Donors and SRBC

Chitipa –Songwe (Isongole) Road: Graveling	2015 - 2017	District Councils, Donors and SRBC
Chitipa – Songwe (Isongole) Road: Bituminizing	2020 - 2025	District Councils, Donors and SRBC
Rehabilitation of Existing Water Schemes	2015 – 2025	District Councils, Donors and SRBC
New Water Supply Schemes	2015 - 2025	District Councils, Donors and SRBC
Health and Education Facilities	2015 – 2025	District Councils, Donors and SRBC
Rural Electrification	2020 - 2025	TANESCO, ESCOM, Governments and SRBC

Note: Interventions at Community level shall be implemented within sector budgets and priority and the SRBC is expected to assist in identifying sources of funding.

Table 9-3: Implementation Schedule for Non-Structural Projects

Sector	Project Purpose	Implementing Agency	Time Frame	Funding Source
Education	Facilitate the retention of girls in schools	District Education Office	2018 - 2025	District Council, Donors and SRBC
Health	Sensitize communities on HIV/AIDS	DHO's and NGO's	2016 - 2022	District Council, Donors and SRBC
Trade	Support communities in income generating activities and access to credit	Trade Office and NGO's	2017 - 2020	District Council, Donors and SRBC
Gender and Community Development	Support gender mainstreaming in development	District Community Development Office, NGO's	2016 - 2020	District Council, Donors and SRBC
Community Development	Facilitate openness and reduce political interference in decision making	District Community Development Office, NGO's	2015 - 2018	District Council, Donors and SRBC
Water and Sanitation	Improve sanitation in communities	District Water Office and DHO	2017 - 2020	District Council, Donors and SRBC
Agriculture	Improve marketing of agricultural products	District Agriculture Office	2015 - 2025	District Council, Donors and SRBC
Livestock	Increase livestock production	District Agriculture Office	2015 - 2025	District Council, Donors and SRBC

9.5 ROLE OF SRBC AND OTHER STAKEHOLDERS

Various stakeholders will play an important role in ensuring that projects and programmes proposed in the basin are implemented and become sustainable in the short to long term. These are discussed in the following sections.

9.5.1 The Songwe River Basin Commission

The Songwe River Basin Commission (SRBC) will play a central role of ensuring that there is coordination in the way all developments in the Songwe River Basin are being carried out. This will particularly be important because it will be responsible for managing investments being planned for implementation during the first phase running from 2015 to 2025. These investments (reservoir, hydro power plant, irrigation schemes and water supply scheme) are basically to be implemented within the lower basin. This implies that direct benefits from these investments will immediately be felt by communities in the lower basin. The question has always been about the benefits that will accrue to communities in the middle and upper basins, which incidentally is the larger part of the basin as a whole. If tangible benefits will not be extended to these communities, they will not appreciate the need to get fully involved in interventions aimed at sustainable utilization and management of natural resources in the entire Songwe River catchment.

Among others the SRBC shall ensure that it supports district councils that want to implement interventions whose impact will be felt beyond their boundaries such as soil and water conservation, reforestation projects and provision of other social facilities such as roads, schools, dispensaries and roads. The SRBC also needs to link up with all stakeholders that intend to implement various interventions in the basin to ensure that there are no conflicts and that any negative impacts from such interventions should be avoided at the onset.

The SRBC is expected to facilitate and support sector plans and initiatives directly or indirectly as is practically possible so that the overall goal of the SRBDP becomes achievable. The SRBC is also expected to link up with Central and Regional Governments on interventions that require high level collaboration. Major infrastructures such as roads, especially those proposed to connect districts need to be implemented within the context of national infrastructure plans and close coordination is integral to avoid duplication of efforts.

A complete Business Plan has been prepared for the SRBC, which is presented under separate cover. An organisation chart for the SRBC and its links to other stakeholders is provided in the Business Plan document.

9.5.2 The District Councils

District Councils in the basin are focal points or entry points to any interventions being proposed. Sector plans at district level need to take cognizance of the SRBDP objectives.

Just like any stakeholder, district councils need to collaborate fully among themselves and with the SRBC in order to extend benefits of their interventions beyond their boundaries. As a trans-boundary project, the SRBDP needs the support and contributions of all district councils in the basin even if a particular intervention is localized. This is in recognition of the fact that communities living along the Songwe River which acts as a boundary for two countries have a lot in common and share resources without any limits.

Each district council therefore shall be required to officially have link officers who will collaborate and coordinate with other stakeholders on developments intended for the Songwe River Basin. The Local Government Act in Malawi and Village Land Act in Tanzania already have provisions on joint local committees, especially for developments/interventions falling along boundaries of planning units such as wards and TAs.

9.5.3 Local Communities

One of the success factors of community development is that communities themselves should be organized and their aspirations should be reconciled with those of higher level authorities. Communities need to be involved in the planning, implementation and review of community projects and programmes as they are the primary beneficiaries of such interventions. As already explained in previous sections, all social facilities such as schools and dispensaries need the support and contribution of local communities. Most projects funded through Malawi's Local Development Fund and Tanzania's TASAF need communities to make a contribution of construction materials such as bricks, sand and in some cases, even labour force. This ensures local ownership of such projects.

To enhance local ownership, local communities shall be part and parcel of the whole implementation set up of all community projects and programmes in the Songwe River Basin. Local communities will therefore be expected to make the following specific contributions towards projects implementation:

- Participate in mobilizing materials for construction of community level facilities
- Check progress of projects and report implementation lapses if noted for appropriate action and ensure successful completion
- Contribute both skilled and non-skilled labour for community level projects where applicable
- Provide land for construction of community projects
- Members of local level development committees have the mandate to approve local projects before they are implemented

It is therefore strongly recommended that various interventions proposed in the basin should only be undertaken with full involvement, consent and contribution from beneficiary communities themselves. This is in line with decentralization principles and practices for both countries.

9.5.4 The Non-Governmental Organizations

Non-governmental organizations including civil society organizations are involved in various activities in order to achieve high level participation of communities in development endeavours. NGO's and CSO's are involved in civic educating the masses to actively take part in all community development initiatives and it is expected that they will continue to fulfil this role during implementation of various interventions in the Songwe River Basin.

NGOs and CSOs will play a critical role in assisting to mobilize local communities to contribute effectively in the realization of the Shared Vision 2050 through various programmes. It is also recommended that some interventions that the SRBDP intends to carry out should be implemented directly by these organizations. Resources may be channelled directly to the communities through NGOs and CSOs as they have also proved to be effective on issues of accountability and adherence to strict implementation guidelines.

9.5.5 Central and Regional Governments

These are expected to play a crucial role in the financing of major projects which cannot be funded through locally generated resources at district councils. In collaboration with the SRBC, the central governments need to engage donors to partly or wholly finance some interventions proposed in the Songwe River Basin. Central or Regional Governments need to coordinate projects such as major road construction as they go beyond district boundaries and sometimes beyond international boundary. The proposed upgrading of a road linking Chitipa and Ileje is a good example of a project that needs proper and sufficient coordination by both governments in order to ensure that the basin connectivity is achieved.

9.5.6 Development Partners

The contribution of donors needs no emphasis. Already, it is hoped that the donors will finance major investments in the lower basin and it is necessary that all parties should build on the existing mutual trust and cooperation to lobby for further financing of projects and programmes in the basin. The rationale for other donors to offer assistance towards developments in the Songwe River Basin is that communities in the upper basin also need to realize the benefits of protecting and conserving the Songwe River Catchment for current and future generations. Donors therefore should assist in providing funding on interventions that will transform people's lives for the better in the short and medium term. In the long term, road construction, water supply and electricity supply should also be considered for financing.

9.6 AWARENESS AND SENSITISATION

It is recommended that the Songwe River Basin Development Programme should be sold to as many people as possible through various forums, one of which is the mass media. Media groups should be allowed to play their role of informing the general public about the investments that have been earmarked in the basin and those proposed to be implemented in the first phase from 2015 to 2025. In addition, a clear and effective communication strategy should be developed and this should be used to relay details of the programme. The information and communication strategy shall assist in packaging the various projects so that they are well understood by all stakeholders. This will contribute in making communities and the entire population to be aware of what to expect in the basin.

9.7 MONITORING AND EVALUATION

The Songwe River Basin Commission will have an overall mandate to report on implementation progress, impacts (both positive and negative), challenges encountered and efficiency and effectiveness of the sub-programme interventions. It is worth to note that some interventions are proposed to be implemented by respective sectors in the context of their normal mandate. Therefore, it is quite a challenge to attach impacts to these specific interventions because they will largely be complementary to existing interventions. Additionally, provision of social facilities in the basin is intended to achieve wider socio-economic goals whose impacts are mostly indirect and therefore difficult to quantify.

For specific programmes, it will be necessary to develop a base line against which assessment will be based. The Community Development Sub-Programme contains basin wide, broad based interventions and respective implementing agencies as shown in Table 9-3 are urged to target interventions in specific areas depending on further assessment of the situation. Overall assessment of the impacts of the SRBDP is recommended to be undertaken between 2024 and 2025.

9.8 CONCLUSION

The basin already has the basic facilities and other social infrastructure that will anchor and contribute to overall development objective of the SRBDP. In brief, the social and cultural characteristics of the people evidenced by high level cohesion will support trans-boundary implementation of projects. Relatively high literacy rates, availability and use of health facilities are ideal conditions for improving the social and economic status of the basin. In addition, the existing institutional framework of the two sides of the basin is adequate to facilitate development. These conditions provide an environment in which the CDSP can be implemented successfully. As stated in the various strategies proposed, efforts shall be focused on attaining basic access to potable water, literate population, increased access to credit facilities, extension services, mobility of goods and people, increased agricultural productivity and overall reduction of poverty in the SRB.

The success of any development programme depends on a number of factors. The following are some of the preconditions necessary for the implementation of proposed interventions under the Community Development Sub-Programme.

(a) District Councils prioritizing the proposed projects. Most of the proposed interventions are key priorities of the communities in the Songwe River Basin and some originated from consultations done with district council officials at different occasions. The proposed interventions need to be on councils' priority list in order to benefit from any funding available. To this end, it is advised that councils' development plans should incorporate the proposed interventions where feasible.
(b) Priorities of communities do change due to various reasons. However, the ultimate long term goal of the proposed projects and programmes is to reduce poverty among the basin population. It is therefore assumed that the specific community projects such as schools and dispensaries including measures aimed at promoting agricultural production will be given priority by the basin communities themselves
(c) Funding towards community development is always a challenge mainly because these are projects and programmes which are normally implemented by stakeholders to fulfil social obligations and their impacts are quite often, difficult to quantify. Hence, it is recommended that deliberate efforts should be made by all stakeholders including donors to provide funding for the implementation of the proposed interventions. In this way, everybody will be seen to be contributing towards sharing national resources to achieve social equity.
(d) Local communities' commitment towards implementation of local projects will be vital to ensure success of the interventions. It was revealed during district consultations that there is a generally low community participation in local projects. One of the causes of low participation is mistrust between the communities and the implementers of projects. In this regard, NGO's should play a big role in sensitizing communities to embrace local projects as their own and contribute to their success
(e) Good governance is one of the pillars of community development. All governance aspects need to be observed starting with financial management, transparent selection of committees, respect for citizens' rights in all spheres of development, land and natural resources governance and respect for democratic institutions at all levels. Political will therefore will play an additional role in ensuring that communities benefit fairly in various interventions in the basin
(f) Collaboration between Songwe River Basin and District Councils has already been mentioned as a prerequisite for achieving success in the development of the basin.

All the three sub-programmes under the SRBDP feed into each other and are directly linked. Therefore efforts at all levels, vertically and horizontally need to be harmonized to prevent overlaps and duplication of interventions. As earlier stated, increasing agricultural productivity through opening more farmland will increase soil instability and result in erosion whose impact is sedimentation of the Songwe River. Yet increased agricultural productivity will lead to an increase in household incomes for the communities in the basin

thereby reducing poverty. Therefore, any interventions should use an integrated approach to ensure environmental sustainability for the whole Songwe River Basin.

There is a risk that some of the proposed projects may not be implemented within the proposed time frame and even beyond. Commitment at both district councils, regional and central government levels shall be of paramount importance. Political interference may also contribute to failure to implement these projects and programmes. Staff movements in implementing sectors may also negatively affect success of these interventions. These risks however, are not very serious if the SRBC shall become truly proactive in collaborating with all players including the donor community in identifying sources of funding and ensuring high levels of sectoral integration in all development initiatives.

10 REFERENCES

1. *Africon, (2008) Unit Costs of Infrastructure Projects in Sub-Saharan Africa, Report*
2. *Chiweza A. L., (2010) A Review of the Malawi Decentralization Process: Final Report*
3. *Chitipa District Socio-Economic Profile, 2013*
4. *Community Development: Principles and Practice,* http://www.ibrd.gov.nl.ca
5. *DDIP-SRBDP Inception Report, 2013*
6. *District Development Planning Handbook for Malawi, 2001*
7. *Karonga District Socio-Economic Profile, 2013*
8. *Malawi Constitution, 1995*
9. *Malawi Government, Ministry of Economic Planning and Development, 2011 Malawi Growth and Development Strategy I (201I-2016)*
10. *Malawi Government, Ministry of Women and Gender, 2008 National Gender Policy*
11. *Malawi Government, Ministry of Lands and Housing, 2002 National Land Policy*
12. *Malawi Government, National Statistics Office, 2012, Integrated Household Survey 3*
13. *Malawi Government, 2012, National Statistical Office, 2008 Population and Housing Census*
14. *Malawi Government, 2011, National Statistical Office, Population Projections*
15. *Malawi Government, 2012, National Statistical Office, 2010 Demographic and Health Survey*
16. *Malawi Government, 2010, National Statistical Office, 2008 Malawi Population and Housing Census*
17. *Mbeya Region Socio-Economic Profile 1997*
18. *Mbozi District Socio-Economic Profile 1997*
19. *Mkenda A. F., Luvanda E.G., Rutasitara L., Naho A. (2004) Poverty in Tanzania: A Comparison across Administrative Regions: A Interim Report*
20. *Momba Strategic Plan, 2014 – 2019, Momba District Council, 2013*
21. *Mussa R. and Pauw K., (2011) Poverty in Malawi: Current Status and Knowledge Gaps, Policy No. 9, IFPRI*
22. *NorPlan, 2003, Feasibility Study (FS) for the Stabilization of the Course of the Songwe River Basin*
23. *Participatory Development and Good Governance, Development Guidelines Series (1995), OECD*
24. *Shragge, Eric. "The Politics of Community Economic Development."Community Economic Development: In Search of Empowerment. Ed. Eric Shragge. Montreal: Black Rose Books, 1993.1-17.*
25. *Social Accountability Monitoring Report, 2012, Ileje District Council, 2010/2011*
26. *Songwe River Basin Qualitative Survey Report, 2013*
27. *Songwe River Basin Shared Vision 2050, 2013*
28. *Strategic Environmental and Social Assessment for SRBDP, 2014*
29. *Tanzania Malawi Historic Exchange Rates,* http://www.imf.org/external/pubs/ft/weo/2013/02/; http://www.oanda.com/currency/converter/ Accessed 30/11/2013

30. *Tanzania Statistics, 2012, http://www.ruralpovertyportal.org Accessed: 5/12/2013*
31. *The Constitution of the Republic of Tanzania, 1977 (Revised in 2005)*
32. *United Republic of Tanzania, Community Development Policy, 1996, Ministry of Community Development, Women Affairs and Children*
33. *United Republic of Tanzania, National Strategy for Gender Development, (No date)*
34. *United Republic of Tanzania, Ministry of Finance, 2005, National Strategy of Growth and Reduction of Poverty (MKUKUTA)*
35. *United Republic of Tanzania, Ministry of Finance, 2012, Poverty Monitoring in Tanzania 2011/2012*
36. *United Republic of Tanzania, Ministry of Finance, 2011, Poverty and Human Development Report*
37. *United Republic of Tanzania, National Bureau of Statistics, 2007, Tanzania Household Budget Survey*
38. *United Republic of Tanzania, National Bureau of Statistics, 2014, Annual Inflation Rates 2009-2013*
39. *United Republic of Tanzania, National Bureau of Statistics, 2013, Tanzania in Figures 2012*
40. *United Republic of Tanzania, Local Government System in Tanzania, 2006*

APPENDICES

Appendix 1: Cost Estimates for Infrastructure within SRB

ROAD CONSTRUCTION COSTS PER KM IN TANZANIA (2014)

Road Surface Type	Estimated Cost/Km (TZS)		Estimated Cost/Km (US$)	
	Minimum	Maximum	Minimum	Maximum
Earth surfaced road	1,800,000	2,500,000	1,125	1,563
Gravel surfaced road	25,000,000	45,000,000	15,625	28,125
Tarmac surface dressing road	580,000,000	1,000,000,000	362,500	625,000
Concrete asphalt surfaced road	1,500,000,000	2,000,000,000	937,500	1,250,000

Source: Mbeya District Roads Department, Tanzania (2014)

ROAD CONSTRUCTION COSTS PER KM IN MALAWI (2014)

Road Surface Type	Estimated Cost/Km (US$)
Construction costs of earth roads	255,000
Rehabilitation costs of existing earth roads to gravel surfaced road	400,000
Construction costs for a new bitumen surfaced road	800,000

Source: National Roads Authority, Malawi (2014)

Chitipa District Water Sector Plans Cost Estimates		
A.	**Name of Scheme**	**Estimated Cost (US$)**
1	Chinthekwe	552,000.00
2	Ifumbo	420,000.00
3	Chinunkha	528,000.00
	TOTAL	**1,500,000**

B. Estimated cost for the rehabilitation of a borehole=$ 4,000.00/borehole
C. Estimated cost for a new water supply scheme Proposed sites: a. Matipwa River-Chuba, Misuku = $ 960 000.00 b. Chilughi River-Muwona, Misuku =$ 960 000.00 c. Songwe River- Songwe Basin, Kameme = $ 2,400,000.00 **TOTAL 4,320,000**

Source: Water Supervisor, Chitipa District, 2014

MALAWI PUBLIC FACILITIES COST ESTIMATES 2014

Estimates based on designs made for the past 2-3 years without factoring in elements of devaluation and inflation. Individual cost items e.g. staff houses, laboratories, staff houses and hostel blocks where boarding facilities are preferred have been shown.

1. FULL PRIMARY SCHOOL	**UNIT COST (US$)**
a) 9No. Classroom blocks	
b) 15No. staff houses @ MK11,000,000.00 each	26,700
c) 1No. Administration Block	
d) 3 No. Ablution Block	
e) Plus associated works i.e.	
I. Football Pitch	
II. Netball pitch/ Volleyball Pitch	
III. Basket ball Pitch	
Estimated Cost = MK 520 Million Kwacha	1,262,136
NOTE: 2 Classroom Block @ MK8,000,000 each	19,417

2. FULL SECONDARY SCHOOL	
a) 9 No. Classroom blocks	
b) 15 No. staff houses @ MK11,000,000.00 each	26,700
c) 1No. Administration Block	
d) 3 No. Ablution Block	
e) 2 No. Laboratory (Chemistry and Biology Labs) @ MK10,000,000.00	24,272
f) Plus associated works i.e.	
I. Football Pitch	

II. Netball pitch/ Volleyball Pitch III. Basket ball Pitch	
Estimated Cost = MK 540 Million Kwacha	1,310,680
If it is going to be a boarding school (g) 1No. 120- student-bed hostel block @ MK 150,000,000.00	
Estimated Cost = MK 690 Million Kwacha	1,674,757
2 Classroom Block @ MK8,000,000 each	19,417

3. HEALTH CENTRE a) Dispensary & OPD - Out-Patient Department b) Maternity Block c) Laboratory block d) Waiting Home e) Guardian Shelter f) 1No. Professional House for the doctor g) 4No. Standard house for staff h) Service block	
Estimated Cost = MK 350 Million Kwacha	849,515
Dispensary only and two staff houses @ MK105,000,000	254,854
Rehabilitation of Kaporo Rural Hospital (Costs half of total cost of new H/Centre)	424,757

Source: Building Department, Malawi (2014)
NOTE: MAY 2014 EXCHANGE RATE: US$1 = MKW412
:MAY 2014 EXCHANGE RATE: US$1 =TZS1600

Appendix 2: Inflation, Exchange Rates, Annual Per Capita Consumption

Historic Exchange Rates		
Year	Malawi (MWK)	Tanzania (TZS)
2000	60	800
2001	72	876
2002	77	967
2003	98	1,038
2004	109	1,089
2005	118	1,129
2006	136	1,252
2007	140	1,245
2008	141	1,197
2009	141	1,320
2010	151	1,410
2011	157	1,574
2012	253	1,583
2013	366	1,622
30-Nov-13	386	1,576

Source of Present Exchange Rate
http://www.oanda.com/currency/converter/

National Inflation Rated		
Year	Tanzania	Malawi
2007		-
2008	8.4	-
2009	12.1	-
2010	5.5	7.41
2011	12.7	7.6
2012	16	21.4
2013	7.9	27.9
Jun-14	6.4	22.5

Tanzania: http://www.nbs.go.tz/
Malawi: http://www.rbm.mw/

Annual Per Capita Consumption Tanzania Rural		
Year	Poverty Line	
	TZS	US$
2007	290,604.00	233
2008	315,014.74	263
2009	353,131.52	267
2010	372,553.75	264
2011	419,868.08	267
2012	487,046.97	308
2013	525,523.68	333

Source: Household Budget Survey 2011/12, NBS

Annual Per Capita Consumption Malawi		
Year	Poverty Line	
	MWK	US$
2011	37,002.00	236
2012	44,920.43	177
2013	57,453.23	157

Songwe RB Poverty Line	
YEAR	US$
2012	272

Source: 2011Integrated Household Survey, NSO

Note: 2013 figures were calculated on the basis of official inflation and exchange rates

Appendix 3: Road Classification and Future Plans for Tanzania

District/Ward	Name Of Road	Classification /Type	Condition	Future Plans
MBOZI DISTRICT				
Iyula	Idunda-Ilomba (14 km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Iyula-Ipyana (9km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Iyula-Idunda (10km)	District	Poor	Rehabilitation
	Hezya-Idiwili (8km)	District	Good	Rehabilitation
	Idiwili-Ilomba (17km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Iyula-Mbewe (6km)	Feeder	Poor	Rehabilitate and upgrade to district road
Nyimbili	Nyimbili-Mpanda-Shititi (16km)	District	Fair	Rehabilitation
	Nyimbili-Hezya (6km)	District	Fair	Rehabilitation
	Masangula-Mlowo-Shidunda (12km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Mpanda-Nzovu (7km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Hezya-Namwangwa (18km)	District	Fair	Rehabilitation
Isandula	Chimbuya-Chizumbi (17km)	District	Fair	Rehabilitation
	Chimbuya-Mpanda (12km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Old Mvawa-Isandula (16km)	Feeder	Poor	Rehabilitate and upgrade to district road

District/Ward	Name Of Road	Classification /Type	Condition	Future Plans
	Msamba 1-Kilimampimbi (10km)	District	Fair	Rehabilitation
	Msamba1-Hantesya (8km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Msamba 1-Mbebe (21km)	District	Fair	Rehabilitation
Ihanda	Ihanda-Ipapa (32km)	District	Fair	Rehabilitation
	Ihanda-Uyole (16km)	District	Fair	Rehabilitation
	Ihanda-Nanyonyi (7km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Hanseketwa-Sumbaluwela (14km)	Feeder	Poor	Rehabilitate and upgrade to district road
	Hanseketwa-Ikomela (8km)	Feeder	Poor	Rehabilitate and upgrade to district road
ILEJE DISTRICT				
Itumba	Urban roads (69.4km)	Gravel/Bitumen	Fair	Immediate plans for rehabilitation
	Haraka-Izuba (17km)	Earth	Poor	No immediate plans
	Magereza-Isongole (8.8km)	Gravel	Good	Needs rehabilitation
	Itumba-Isongole (7.2km)	Gravel	Fair	No immediate plans
	Haraka-Nkaka (8km)	Earth	Poor	No immediate plans
Isongole	Urban roads (23km)	Gravel	Fair	Rehabilitation planned for the future

District/Ward	Name Of Road	Classification /Type	Condition	Future Plans
Ibaba	Ibaba-Katengele (20km)	Gravel	Good	Immediate plans for rehabilitation
	Shikunga-Lali (14.2km)	Earth	Poor	No immediate plans
	Shikunga-Mabula (12km)	Earth	Poor	No immediate plans
	Lali-Sheyo (9km)	Earth	Poor	No immediate plans
	Mdibe-Ibaba (30km)	Earth	Poor	No immediate plans
	Shikunga-Chilemba (10km)	Earth	Poor	No immediate plans
Itale	Iwiji-Itale-Ilomba (13.9km)	Gravel and earth	Fair	Immediate plans for rehabilitation
	Itale-Itega (14km)	Earth	Poor	No immediate plans
	Sheyo-Itega (16km)	Earth	Poor	No immediate plans
	Iwala-Itale (6km)	Earth	Poor	No immediate plans
Malangali	Malangali-Chembe	Gravel	Poor	No immediate plans
	Chunya-Bulanga (2km)	Earth	Poor	No immediate plans
Kafule	Isoko-Katengele (6km)	Gravel	Good	Immediate plans for rehabilitation
	Isoko-Kalembo (15km)	Earth	Poor	No immediate plans
	Isoko-Chikumbulu (10km)	Earth	Poor	No immediate plans
	Isoko-Ngulungulu (8km)	Earth	Poor	No immediate plans

District/Ward	Name Of Road	Classification /Type	Condition	Future Plans
	Isoko-Naulendo (6km)	Earth	Poor	No immediate plans
	Isoko-Lupaso (5km)	Earth	Poor	No immediate plans
	Kapelekesi-Banji (6km)	Earth	Poor	No immediate plans
	Ndembo-Ibeta (6km)	Earth	Poor	No immediate plans
	Lupembe-Kafule (7km)	Earth	Poor	No immediate plans
Ndola	Ndola-Itale (8km)	Earth	Poor	No immediate plans
	Ibezya-Ndola (12km)	Earth	Poor	No immediate plans
Ikinga	Ikinga-Mfulu (10.5km)	Earth	Poor	No immediate plans
Bupighu	Ibungu-Mabula (10km)	Gravel	Good	No immediate plans
	Bipighu-Ibaba (25km)	Earth	Poor	No immediate plans
	Chabu-Lupando(10km)	Earth	Poor	No immediate plans
Chitete	Ikumbilo-Mlale (14.15km)	Gravel	Good	Immediate plans for rehabilitation
	Mapogoro-Chitete (18km)	Earth	Poor	Rehabilitation planned for the future
	Ikumbilo-Ilanga (8km)	Gravel	Good	Rehabilitation planned for the future
Mbebe	Shinji-Hasongwa (5km)	Earth	Poor	No immediate plans
	Mbebe-Sasenga(6km)	Gravel	Fair	No immediate plans

District/Ward	Name Of Road	Classification /Type	Condition	Future Plans
	Mbebe-Kifumbi (4.3km)	Earth	Poor	No immediate plans
	Mbebe-Shinji (7km)	Gravel	Good	No immediate plans
KYELA DISTRICT				
	Mungano-Njisi (12km)	District (gravel and earth)*	Fair	No immediate plans
	Ngesi-Mpunguti (3km)	District (earth)	Poor	No immediate plans
	Katumba Songwe-Mpunguti (4.6km)	Feeder(earth)	Poor	No immediate plans
	Mungano-Ndwanga (5km)	Feeder (gravel and earth)**	Fair	No immediate plans
	Ndwanga-Mpunguti (4.3km)	Feeder (earth)	Poor	No immediate plans
	Kabanga-Katumba Songwe (7km)	Feeder (earth)	Poor	No immediate plans

SOURCE: Data Collection Exercise 2014

NOTES: *******Almost half of Mungano-Njisi road in Kyela is gravel surfaced and this section is quite good while the remaining half which is earth surfaced is in poor state.*
********About 3. 7km of Mungano-Ndangwa road in Kyela is gravelled and this section is in fairly good condition while the remaining 1.3km earth surfaced portion is in poor state.*

Appendix 4: Population Projections for the SRB

District	2009	2010	2011	2012	2013	2014	2015	2016	2017
Chitipa	87,404	90,358	93,394	84,546	99,698	102,968	106,346	109,823	113,392
Karonga	28,092	28,896	29,716	27,311	31,401	32,261	33,145	34,053	34,983
Kyela				32,207	32993	33755	34518	35284	36053
Mbeya				15,474	15852	16218	16584	16952	17322
Mbozi				45,057	46156	47223	48290	49362	50438
Ileje				100,155	102599	104969	107341	109724	112116
Momba				12,110	12405	12692	12979	13267	13556
TOTAL	**115,496**	**119,253**	**123,110**	**316,860**	**341,104**	**350,085**	**359,202**	**368,466**	**377,861**

2018	2019	2020	2021	2022	2023	2024	2025	2026
117,055	120,836	124,763	128,843	133,082	137,487	142,038	146,739	151,596
35,931	36,901	37,901	38,932	39,995	41,090	42,216	43,373	44,561
36821	37598	38392	39209	40052	40917	41809	42742	43716
17691	18064	18445	18838	19243	19659	20088	20535	21004
51512	52599	53709	54853	56032	57243	58491	59795	61158
114504	116920	119387	121930	124552	127242	130016	132915	135946
13845	14137	14435	14743	15060	15385	15721	16071	16438
387,359	**397,056**	**407,032**	**417,348**	**428,016**	**439,023**	**450,378**	**462,170**	**474,419**

Source: GIS calculations based on 2008 and 2012 Population Figures for Malawi and Tanzania

Appendix 5: Health Facilities Plan for Ileje District

Ward	Village	Type Of Existing Facility	Recommended Action
Mbebe	Mbebe	Dispensary	No action
	Mapogolo	None	Constructing new facility
	Shinyi	Dispensary	Completing construction
	Mtima	None	Constructing new facility
Chitete	Chitete	None	Constructing new facility
	Ikumbilo	Dispensary	Minor rehabilitation
	Msia	Dispensary	Minor rehabilitation
	Ntembo	None	Constructing new facility
Mlale	Mlale	Dispensary	No action
	Iluli	None	Constructing new facility
	Ilanga	None	Constructing new facility
Isongole	Isongole	Dispensary	Minor rehabilitation
	Izuba	None	Completing construction
	Ilulu	None	Completing construction
Itumba	Itumba	District hospital	Constructing OPD and theatre
		Prison health facility	Minor rehabilitation
		Dispensary	Minor rehabilitation
	Yezebwe	None	Completing construction
Ndola	Ishenta	Dispensary	No action
	Igumila	None	Constructing new facility
	Ndola	Health Centre	Completing construction
	Ibezya	None	Constructing new facility

Itale	Itale	Health Centre	Completing construction
	Iwala	Dispensary	Minor rehabilitation
	Itega	Dispensary	Completing construction
	Ishinga	None	Constructing new facility
Ibaba	Ibaba	Health Centre	Minor rehabilitation
	Shuba	Dispensary	Completing construction
	Sheyo	Dispensary	Completing construction
	Lali	None	Constructing new facility
	Shikunga	None	Constructing new facility
Bupigu	Bupigu	Dispensary	No action
	Mabula	Dispensary	Completing construction
	Ibungu	None	Constructing new facility
	Chabo	Dispensary	No action
Malangali	Malangali	Dispensary	Minor rehabilitation
	Bulanga	Dispensary	Minor rehabilitation
	Chembe	Dispensary	Completing construction
	Ilondo	Dispensary	Completing construction
Kalembo	Kalembo	Dispensary	Minor rehabilitation
	Kabale	None	Constructing new facility
	Mbangala	None	Constructing new facility
	Ibandi	None	Constructing new facility
Kafule	Isoko	Hospital	Minor rehabilitation
	Kapelekesye	Dispensary	Minor rehabilitation
	Kafule	None	Constructing new facility
	Banji	None	Constructing new facility

Ikinga	Ikinga	None	Constructing new facility
	Kikota	Dispensary	Completing construction
	Ibeta	None	Constructing new facility
	Bwipa	Dispensary	Minor rehabilitation
	Mgaya	None	Constructing new facility
	Kapeta	Dispensary	Minor rehabilitation

Source: Ileje District Health Office, 2014

Appendix 6: List of Officials Briefed in Momba District

MOMBA DISTRICT COUNCIL

ATTENDANCE LIST DURING THE MEETING ABOUT SONGWE RIVER BASIN DEVELOPMENT PROGRAMME (SRBDP) TO DISTRICT OFFICIALS AND HEAD OF DEPARTMENTS HELD ON 19TH MARCH, 2014 AT UKWILE COUNCIL HALL

NO.	FULL NAME	TITLE/POSITION	SIGNATURE
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Appendix 7: List of People Consulted in the SRB

ID	Name	Position	Phone	Email
1	Rosemary Mkandawire	Karonga DC		
2	Mr. F. Nthenda	Karonga District Forestry Officer	0884404359/ 099103489	karongadfo@gmail.com
3	Mr. Dick Kunsauko	Karonga Assistant Cooperative Liason Officer	0999475215/ 0882950050	dickkunsauka@gmail.com
4	Mr. Bezai	Karonga Assistant District Fisheries Officer	0991893553	
5	Mr.Soko	Karonga North Kaporo EPA	0888511251	
6	Mr A. Chaponda	Karonga District Water Supply	0999623911	
7	Mr Musyali	Karonga District Roads Office		
8		District Community Development Office, Karonga		
9	H. Matiya	Agriculture Office, Karonga	0995580643	hmatiya@yahoo.com
10	Zikonjani Chivunga	Agriculture Office, Karonga	0998664129	zikonjanichivunga@yahoo.com
11		District Health Office, Karonga		
12	Mr Kondowe	District Education Office, Karonga	0888683619/ 0999358134	demkaronga@gmail.com
13	Mr.Chusa Ghambi	Chitipa Logistical Officer National Registration Bureau	0999698904	

14	Mr.Rhobson Eric Ngozo	M&E Officer and Acting DPD	0883877487	rhobsonngozo@yahoo.co.uk
15	Grace Chirwa	District Commissioner, Chitipa		
16	Ida Mughogho	Chitipa OVOP Agribusiness Officer	0999398220/ 0884974938	
17	Mr. M.D Shaba	Chitipa District Forestry Officer	0888756429/ 0993373895	forestrypiu@gmail.com or masozidorothyshaba@yahoo.com
18		Chitipa Labour Office	01382221	
19	Mr. Kaunda	Chitipa Legumes Officer	0882567944	
20	Mr.Mzinza	Chitipa District Tobacco Officer	0884466876	
21	Lino Nyirenda	Lands Officer, Chitipa	0888522075/ 0999192308	linonyirenda@rocketmail.com
22	Mr Tambala	Water Supply Officer, Chitipa		btambala@yahoo.co.uk Cellphone: +265 999 369 422
23	Haji Mvula	Social Welfare Office, Chitipa		hbmvula@gmail.com
24	Mr.Nkhata	Chitipa Crops Officer	0888620884	
25	Gerald Edward Shayo	Mbeya Forestry Officer	0762 471373	Gerald.ewald@yahoo.com
26	Elizabeth Lyombe	Mbeya District Council Trade Officer	0767793512	liztlyombe@gmail.com
27	Mr.Mlelwa	Mbeya District Agricultural, Irrigation and Cooperatives Officer	0755555877	mlelwa@yahoo.com
28	D. S. Boay	DEO, Primary Schools, Mbeya	0754453663	

29	Martha W. Mgata	DEO, Secondary Schools, Mbeya	0755974562	mgata70@gmail.com
30	Dr K. L. Chombobo	Mbeya DHO	0758380306	lck_1974@yahoo.co.uk
31	Daudi Mwalusamba	Livestock Dept, Mbeya	0764757708/ 0713429534	dmwalusamba@yahoo.com
32	Ms Upendo Sanga	Mbeya DED	074631963	attusanga@yahoo.co.uk or mbeyadc@yahoo.com
33	Celestina M. Sembo	Mbeya District Fisheries Officer	0757242700	
34	Eng. Ackson Mwasyange	District Water Engineer, Mbozi	0762558847	
35	Theo Tim Mwamwongi	District Health Secretary, Mbozi	0763414247	
36	Dr Lusubilo	District Health Officer, Mbozi		
37	James Mwanalinze	Lands Officer, Mbozi		
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Appendix 8: Water Supply Facilities in Ileje District

ILEJE DISTRICT				
No.	**Name Of Water Supply Source**	**Type**	**State/Condition**	**Rehabilitation Plans**
1	Mtima Water Supply	Gravity	Partially working	Plans underway to rehabilitate
2	Chabu Water Supply	Gravity	Non-functional	Plans underway to rehabilitate
3	Bupighu Water Supply	Gravity	Working below capacity	Rehabilitation is planned in future
4	Ibungu Water Supply	Gravity	Working below capacity	Rehabilitation is planned in future
5	Msia Water Supply	Gravity	Partially working	Rehabilitation is planned in future
6	Ndola Water Supply	Gravity	Working partially	Plans underway to rehabilitate
7	Kapelekesi Water Supply	Gravity	Working partially	Plans underway to rehabilitate
8	Msia/Chitete	Boreholes	Hand-pump worn out	Plans underway to repair pumps
9	Ibeya/Ndola	Boreholes	Hand-pump worn out	Plans underway to repair pumps
10	Yenzebwe/Itumba	Boreholes	Hand-pump worn out	Plans underway to repair pumps
11	Mapozoro/Mbebe	Boreholes	Hand-pumps worn out	Plans underway to repair pumps
12	Ntembo/Chitete	Boreholes	Hand-pumps worn out	Plans underway to repair pumps

Source: Ileje Water Supply Office, 2014

Appendix 9: Plan for Educational Facilities, Chitipa & Karonga Districts

District	TA and Village	Type Of Proposal	Time Frame	Funding Availability
Karonga	**Mwakaboko**			
	Mwapa-Kalembo-Iponga	New school	Not yet set	Funding commitments to be made in future
	Kalulu	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Kangindwa	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Iponga	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Kabale	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Nakatendo	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Ighamba	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Ngana	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Ngisi	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Mayoka	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Kilipula			
	Ighembe	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Kakolya	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Kaporo	Additional classrooms	2015 to 2018	Funding commitments to be made in future

District	TA and Village	Type Of Proposal	Time Frame	Funding Availability
	Kaundi	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Ndemange	Additional classrooms	2015 to 2018	Funding commitments to be made in future
	Sherasongwe	Additional classrooms	2015 to 2018	Funding commitments to be made in future
Chitipa	Mung'ongo	Additional classrooms	2014 onwards	Community contribution and LDF
	Nanjiru	Additional classrooms	2014 onwards	Community contribution and LDF

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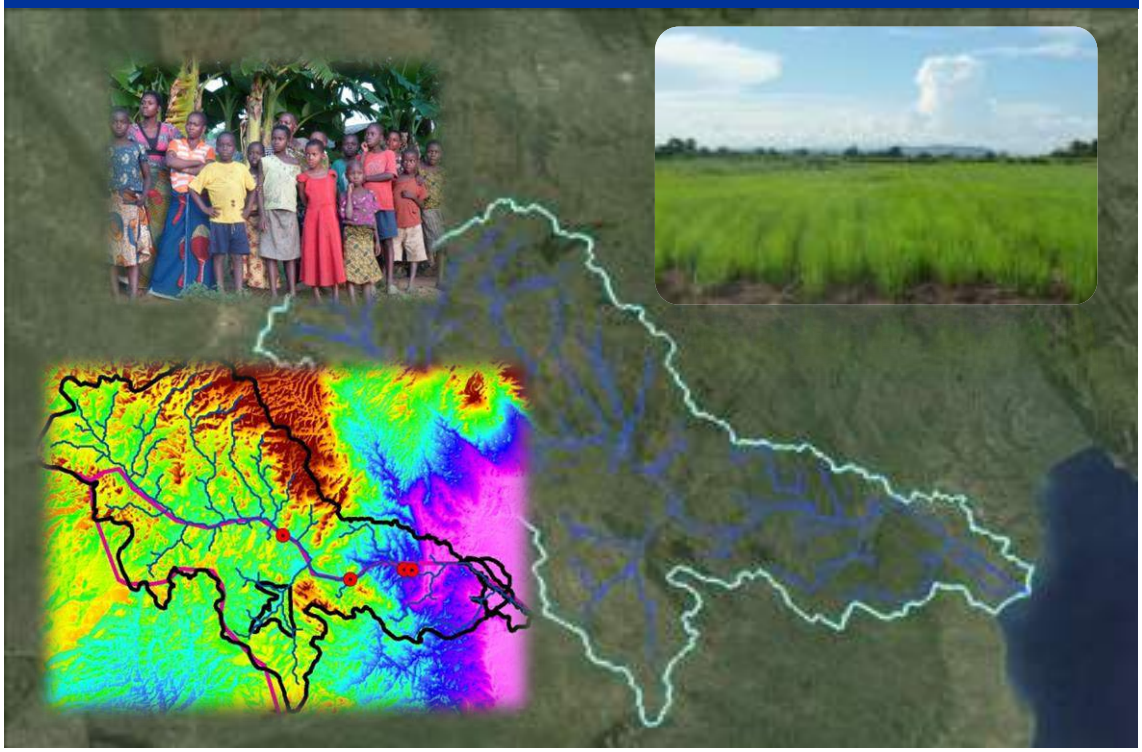
DETAILED DESIGN AND INVESTMENT PREPARATION PROJECT FOR THE SONGWE RIVER BASIN DEVELOPMENT PROGRAMME

SRBDP VOLUME 3

NATURAL RESOURCES & LAND USE MANAGEMENT SUB-PROGRAMME



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FINAL

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Acronyms and Abbreviations

ADC	Area Development Committee
CBNRM	Community Based Natural Resource Management
DANIDA	Danish International Development Agency
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EPA	Extension Planning Area
ESIA	Environmental and Social Impact Assessment
FS	Feasibility Study (referring to the 2003 Feasibility Study)
GIS	Geographical Information System
JFM	Joint Forestry Management
LIMS	land Information Management System
LSRM	Lower Songwe River Malawi (Irrigation and Drainage Scheme)
LSRT	Lower Songwe River Tanzania (Irrigation and Drainage Scheme)
NDF	Nordic Development Fund
NRM	Natural Resource Management
NRM LUM	Natural Resources and Land Use Management (Sub-programme)
NSGRP	National Strategy for Growth and Reduction of Poverty
PFM	Participatory Forestry Management
PLUP	Participatory Land Use Plan
SEP	Socio-Economic Profile
SESA	Sustainable Environmental and Social Assessment
SRBC	Songwe River Basin Commission
SRBDP	Songwe River Basin Development Programme
SRCTMP	Songwe River Catchment Trans-boundary Management Project
TA	Traditional Authority
UTM	Universal Transverse Mercator
VDC	Village Development Committee
VNRMC	Village National Resource Management Committee
WDC	Ward Development Committee
WUA	Water Users Associations
WWF	World Wide Fund for Nature

1 INTRODUCTION

1.1 REPORTING

This document is Volume 3, Natural Resources and Land Use Management Sub-Programme (NR&LUMSP) of the four volume Songwe River Basin Development Programme Final Report. It is prepared as part of the Detailed Design and Investment Preparation (DDIP) – Songwe River Basin Development Programme (SRBDP) project.

Volume 1 is the summary of the three Sub-Programmes with an Introduction to the SRBDP as a whole; Volume 2 is the Community Development Sub-Programme; and Volume 4 is the Economic Development Sub-Programme. This, Volume 3, is intended to be read in conjunction with the other three volumes.

Additionally, the DDIP-SRBDP project has produced several reports over the two years of the project. The documents with the closest links to this report are:

- Update of the 2003 Feasibility Study: April 2014
- Shared Vision 2050: April 2014
- Water Related Social Infrastructure: April 2015
- Business Plan for the SRBC: April 2014

The other documents prepared under this project are:

- Inception Report: May 2013
- Strategic Environmental Assessment for the SRBDP: April 2014
- ESIA Scoping Report: June 2014
- Convention for the Songwe River Basin Commission (SRBC): September 2014
- Songwe River Basin Development Programme: April 2015
- Detailed Design for the Stabilisation of the Lower Songwe River: April 2014
- Detailed Design for Water Supply for Kasumulu Town and Lower Songwe Communities: June 2015
- Detailed Design for Water Supply for Songwe Town and Lower Songwe Communities: June 2015
- Detailed Design and Tender Documents for the Lower Songwe Dam and HPP: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Tanzania Irrigation and Drainage Scheme: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Malawi Irrigation and Drainage Scheme: June 2015
- Environmental and Social Impact Assessment: April 2015
- Resettlement Action Plan for the Lower Songwe Dam and HPP: April 2015

- Resettlement Action Plan for the Lower Songwe River Irrigation and Drainage Schemes: April 2015

1.2 OBJECTIVES OF THE NR &LUM

The overall objective of the Natural Resources and Land Management Sub-Programme is to prepare a framework for the sustainable development and management of the natural resources of the SRB and to formulate a comprehensive land resources conservation framework for the basin. In this regard, this will be done through the following specific objectives:

a) Identify natural resources in the Songwe River Basin that require co-management and establish or strengthen community natural resources management committees
b) Develop methods of increasing agricultural productivity in the basin
c) Prepare a comprehensive land use plan for all land and enforce prohibition of environmentally unacceptable land use practices that can be applied to the whole SRB
d) Develop guidelines for facilitating land consolidation and formalization in the basin
e) Build capacity of district councils, officials and community based structures that carry out natural resources management
f) Strengthen institutional and human resource capacity in other sectors that deal with land management at district and regional levels
g) Develop guidelines for preparation of participatory land use and natural resource management plans for possible use in high impact areas with strong emphasis on integrating needs of different socio-economic groups including women

1.3 LAND USE PLANNING PRINCIPLES

In Malawi the mandate for communities to carry out natural resources and land use management within their areas is provided in the following principal legislations and policies: the National Land Policy, the Town Planning Act, The Land Act, the Local Government Act, the Environment Act, the Forestry Act, Fisheries Act, Parks and Wildlife Act and the Public Health Act.

For Tanzania, the mandate for natural resource and land use management is provided for in the Local Government Act and the Village Land Act. Additional legislations are also available for specific sectors such as water, forestry, environmental management.

The available legislative framework in the two countries provides for optimal use of land and natural resources focusing mainly on national and community priorities; physical and socio-economic condition; and a general forecast of future needs. Current land use planning principles therefore demand high level integration of physical developments and

natural resources utilization and management in order to achieve sustainable development for current and future generations.

1.4 LAND IN THE SRB

The SRB is, for the most part, a steep, mountainous catchment with an area of 4,243 km^2. About 55% of the catchment area is in Tanzania and 45% of the area is in Malawi. It is a steep, mountainous catchment with the upper part of the basin having elevations of 2000 – 2400 masl and peaks over 3,000 masl, and the lower part of the basin on the shores of Lake Nyasa / Malawi at about 470 masl.

The upper areas of the basin are relatively dry, with mean annual rainfall ranging from 900 mm to 1400 mm per annum. Unusually, lower down the basin on the floodplain near the lake, rainfall is as high as 3,200 mm per annum, probably due to the effect of Lake Nyasa / Malawi.

The Songwe River forms the border between Malawi and Tanzania over a distance of some 200 km. In the lower floodplain of the river, from Kasumulu to Lake Malawi / Nyasa, the straight line distance is 23 km but the length of river channel is more than 40 km due to its meandering nature. The course of the river is in constant flux due to erosion of the loose, unconsolidated, former lake bed sediments, and the very low slope of this section of the river. As the river channel is the international boundary, this has been a cause of concern.

The distribution of land by country and district that is within the basin is shown in

Table 1-1 below. The map of the SRB with District and Ward (Tanzania) and TA (Malawi) boundaries, is provided on Figure 1-1 following the table.

Land is the basic resource for people's livelihoods and it provides a common base for economic productivity for the communities within the basin. Natural resources and land use management is considered as one of the most important tools for sustainable rural development.

A land use plan which outlines what activities (consumptive and non-consumptive uses, conservation etc.) are permitted in which locations might help to serve as a clear and simple guide for responding to current investment interests and for attracting other beneficial investments for the people of the districts. It is also expected to improve management of natural resource based activities including agriculture, fuel-wood and timber harvests, fisheries, water extraction and other natural product harvests and use in the districts.

Table 1-1: Land Area in SRB By Country and District

Country	District	Area			
		Total	Total in Basin		District as % of Basin
		(km^2)	(km^2)	(%)	
Malawi (45% of Basin)	Chitipa	4,288	1,590	37%	37%
	Karonga	3,355	335	10%	8%
Tanzania (55% of Basin)	Mbeya Rural	2,432	136	6%	3%
	Ileje	1,908	1,500	79%	35%
	Kyela	1,322	118	9%	3%
	Mbozi	3,404	484	14%	11%
	Momba	6,275	80	1%	2%
	Total	**22,984**	**4,243**		100%

Source: DDIP-SRBDP Update of the 2003 FS Report, 2014

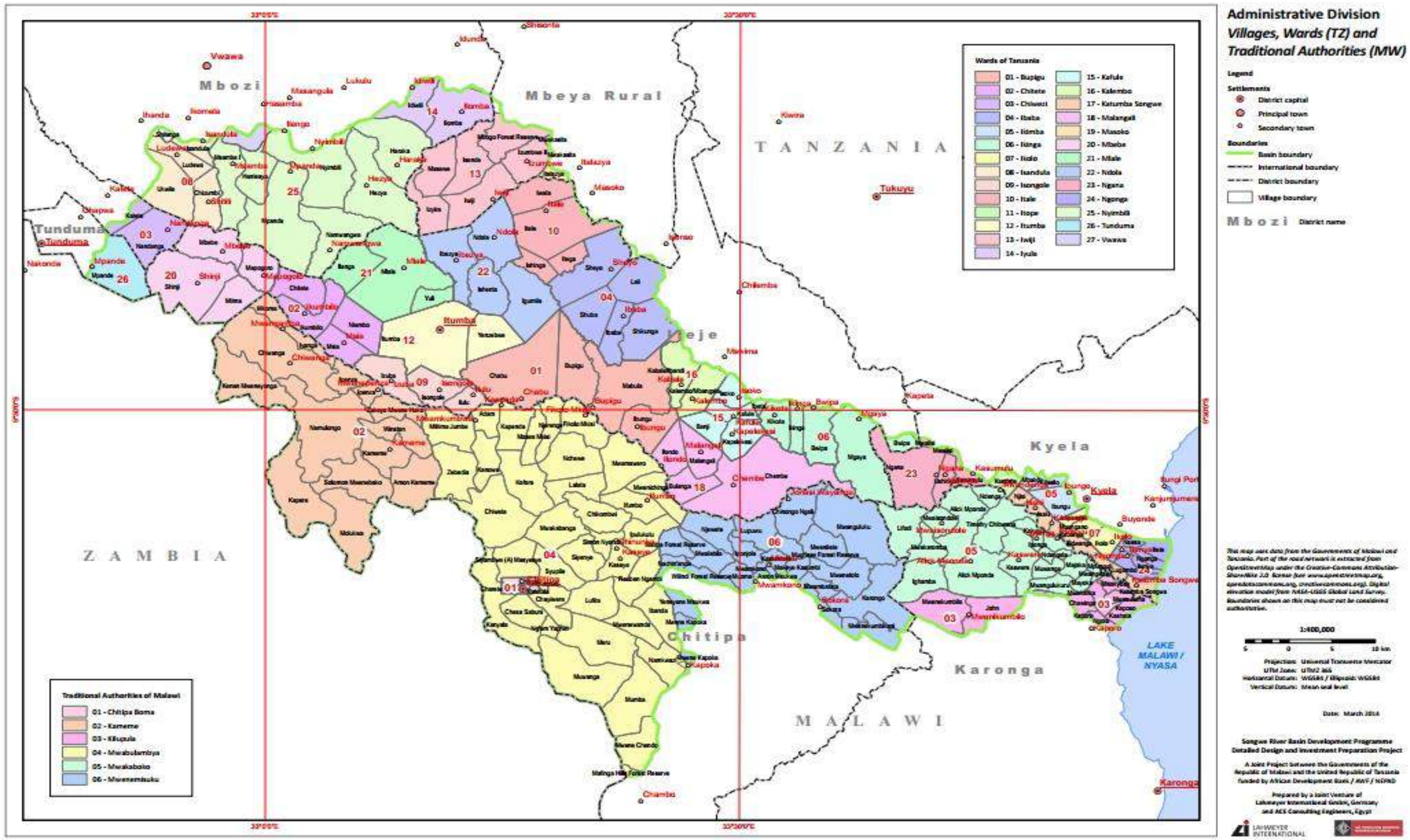


Figure 1-1: Administrative Divisions of the SRB

Source: Project Generated Data from District Information, 2014

Information anchoring the Natural Resources and Land Use Management Sub-Programme has been derived from a variety of primary and secondary sources. Existing documents on the Songwe River Basin such as the Songwe Atlas and SRCTMP reports, districts socio-economic profiles, other country reports, etc. form the backbone of this report. Consultations with various stakeholders in all the districts generated substantial amounts of information on land use, land surveying and land tenure; forestry and natural resource management; soil and water conservation and wide opinions on proposed strategies aimed at improving the natural environment. Recently prepared and adopted documents under the same SRBDP also provided some basic data for the smooth preparation of this report.

Appropriate strategies are required more than ever to counteract the consequences of the increasing pressure on land and natural resources, such as the increase of land conflicts and degradation, which hamper rural development and even may further marginalize the majority of the rural population. The participatory approach to natural resources management has become an accepted alternative for the conventional development strategies.

Since women use most of their time working on the land than men, efforts to enhance their involvement in the access, management and use of land may result in a better utilisation of land in the basin. The Natural Resources and Land Use Management Sub-Programme for the SRB is based on the current legal context. It is acknowledged that Malawi is in the process of formulating a new Land Law and a Customary Land Law. However, the proposals in this programme have assumed that the Land Laws in Malawi would have been passed by the time of implementation of the programme.

The provisions of this programme will be applied according to the local agro-ecological, socio-economic and cultural context of each district in the Basin.

1.5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Issues of natural resources management and land use planning will be carried out in the context of the existing policies and legislations. The two countries' policies and legislations are adequate to facilitate the implementation of various natural resources protection, conservation and management strategies including trans-boundary interventions in all matters to do with the environment. It is worth to note however that policies, which are generally regarded as just guides, are complemented by legally binding legislations. Whatever environmental conservation and management strategies to be recommended in the Songwe River Basin will have the support of the appropriate legislation. The main task, however, lies in the enforcement mechanisms, as experience has shown that it is one thing to have laws and regulations in place but it is another to have them adhered to. While the intention of the SRBC is not to introduce any additional laws and/or regulations, it will be relevant for the communities in the basin to come up with by-laws that will guide implementation of the recommended interventions for easy enforcement.

Several pieces of legislations and policies do exist and guide issues of natural resource planning, management and utilization in both countries. On the Tanzanian side, the following legislations and policies deal directly with environmental and natural resources management:

Table 1-2: Relevant Policies and Legislations in Tanzania

No.	Legislation / Policy	Provision / Objective Relevant to NR&LUMSP
1	Tanzania Constitution 1977	All natural resources are vested in the republic and everyone is responsible for managing, protecting and conserving present resources against undesirable destruction and misuse
2	Environmental Policy 1997	Ensure sustainable, security and equitable use of resources for present and future generations
3	National Water Policy 2002	Aims at promoting the optimal, sustainable and equitable development and use of water resources for the benefit of all
4	Agriculture and Livestock Policy 1997	Prioritizes promotion of integrated and sustainable use and management of natural resources (environmental sustainability)
5	National Land Policy 1995	Protect land resources from degradation for sustainable development
6	National Forestry Policy 1998	Ensure ecosystem sustainability through conservation of forest biodiversity, water catchments and soil fertility
7	National Beekeeping Policy 1998	Aims to enhance contribution of beekeeping to the sustainable development of Tanzania and conservation of its natural resources
8	Wildlife Policy 1998	To promote the conservation of wildlife and its habitats outside core area and co-operate with neighbouring countries in the conservation of trans-boundary ecosystems
9	National Irrigation Policy 2010	To abide by the Integrated Water Resources Management approach in irrigation development
10	National Fisheries Policy 2003	Promote conservation, development and sustainable management of the fisheries resources
11	National Livestock Policy 2006	Promote integrated and sustainable use and management of natural resources related to

		livestock production in order to achieve environmental sustainability
12	National Strategy for Growth and Reduction of Poverty (Mkukuta)	Overarching National Development Strategy
13	Environmental Management Act 2004	Major purpose of the EMA are to provide the legal and institutional framework for sustainable management of the environment
14	Water Resources Management Act 2009	Main objective is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in sustainable ways, prevents and controls pollution of water resources and protects biological diversity especially the aquatic ecosystems.
15	Irrigation Act 2013	Legal framework on the development, operation and maintenance of irrigation and drainage systems
16	Land Use Planning 2007	Facilitating the orderly management of land use and promoting sustainable land use practices
17	Water Supply and Sanitation Act 2009	Ensure the right of every person to have access to efficient, effective and sustainable water supply and sanitation services for all purposes by taking into account among others protection and conservation of water resources and development and promotion of public health and sanitation
18	Land Act No. 4 and Village Land Act No. 5 (1999)	Relate to land-use planning processes and land-use management and guidance to land ownership including right of occupancy, expropriation and compensation
19	National Forest Act 2002	Provisions on EIA requirements for any projects within forests
20	The Land Acquisition Act 1967	Provisions on land acquisition for public or private use but for national benefit
21	Wildlife Conservation Act 2009	Protect, conserve and administer areas with great biological diversity, including wetlands which are representative of the major wildlife habitats by also giving special conservation

		status to endemic, rare or endangered wildlife species
22	Fisheries Act 2003	Development and sustainable use of aquatic resources

Malawi also has policies and laws that aim at promoting sustainable management and utilization of its natural resources for the current and future generations. Some of these are contained in Table 1-3.

Table 1-3: Relevant Policies and Legislation in Malawi

No.	Legislation / Policy	Provision / Objective Relevant to NR&LUMSP
1	Malawi Constitution 1995	Managing the environment in order to prevent the degradation of land, provide a healthy living and working environment for the people
2	National Forestry policy 1996	Provide an enabling framework for promoting the participation of local communities and the private sector in forest conservation and management, eliminating restrictions on sustainable use of essential forest products by local communities
3	National Environmental Policy 2004	Protection and management of the environment and the conservation and sustainable utilization of natural resources
4	National Land Policy 2002	Enhance conservation and community management of local resources; extend land use planning strategies to all urban and rural areas and establish a modern land registration system for delivering land services to all
5	National Water Policy 2007	Sustainable and integrated water resources development, conservation and management that provides equitable access and use of water to all individuals and entrepreneurs
6	National Sanitation Policy 2008	Promotes issues aimed at improving hygiene practices, sanitation and waste management in rural areas through a National or Local Assembly sanitation programme

7	National Climate Change Policy 2012	Contributes to the attainment of sustainable development
8	National Irrigation Policy and Development Strategy 2000	Sets out the direction for irrigation development in Malawi.
9	Irrigation Act 2001	Provides for the sustainable development and management of irrigation and protection of the environment from irrigation related degradations
10	Malawi Growth and Development Strategy 2011-2016	Overarching Development Strategy for all sectors
11	National Biodiversity Strategy and Action Plan 2006	Protect, conserve and maintain protected areas, mountains and species within them
12	Land Act 1965	Land acquisition for national benefit, compensation, registration, rights and disposal of land
13	Environmental Management Act 1996	Every person has responsibility to protect and manage the environment; conserve natural resources and promote sustainable utilization of natural resources
14	Forestry Act 1997 (amended in 2013)	Promote involvement of all in protecting, managing and conserving trees on customary forests and forest reserves to maintain environmental stability. Advocates for the Community Forestry Management and transfer of forestry management to District/Local Councils
15	Town and Country Planning Act 1991	Provides a guide on the location of settlements, facilities and land uses in a district or region comprising parts of more than one district

1.6 COMMUNITY PARTICIPATION IN NRM

The National Land Policies and Local Government Acts in the two countries provide that local land use planning and natural resources management would be done in a participatory manner to involve the land holders and beneficiaries. The basic principle

requires a strong bottom – up planning approach hence the technical assistance to be provided in this process should be either facilitation or advisory. Overall, the techniques to be used should be low cost planning to foster active participation and consensus building among local communities.

There is very little experience in Malawi as compared to Tanzania on land use and natural resources/environmental planning which integrates rural community needs with ecosystem sustenance. Therefore capacity building at district level would be necessary. This capacity building work should involve land-use planning experts from the Ministries of Lands, Agriculture, Environment and Natural Resources, in the two countries. After the training of the district personnel, they will now engage the villagers/communities to come up with their priority land based needs and activities and decide whether those activities have been allocated the best suitable land for optimum return from the land. More details on participatory land use planning are provided separately in the guidelines that have been prepared.

2 DESCRIPTION OF NATURAL RESOURCES AND THE ENVIRONMENT

2.1 INTRODUCTION

The physical geography of the Songwe River Basin is varied. Generally, the climate of the basin is influenced by the topography, with mostly low lying areas of Kyela and Karonga experiencing high temperatures while the high altitude areas of Chitipa, Ileje, Mbozi and Mbeya Rural having moderate temperatures.

Rainfall however, follows a unique pattern with the low lying areas of the basin comprising parts of Kyela and Karonga experiencing high rainfall that reaches a climax in the month of May. Detailed geographical characteristics of the basin are provided in the sections below.

2.2 CLIMATE

2.2.1 Temperature

Figure 2-1, overleaf, contains mean monthly temperatures for Karonga Station recorded from 2003 to 2012. Mean annual temperature for Karonga, a town in Malawi which is just about 20 km out of the basin is about 25.47 °C. July is the month registering lowest average temperatures of about 17.28°C. October is the hottest month with average temperatures rising to 33.54°C. Generally, the temperatures of the lower parts of Songwe River are generally warm to hot and records from the above two stations attest to this (Sources: Final Update of the 2003 FS, and Karonga SEP, 2013).

Figure 2-2 overleaf is a summary of average temperatures for Tenende Station in Kyela District and these were collected from 1994 to 2010. Mean annual temperature in Tenende is about 24.46 °C. August is the month registering lowest average temperature of about 16.25°C. November is the hottest month with an average temperature rising to 32.2°C.

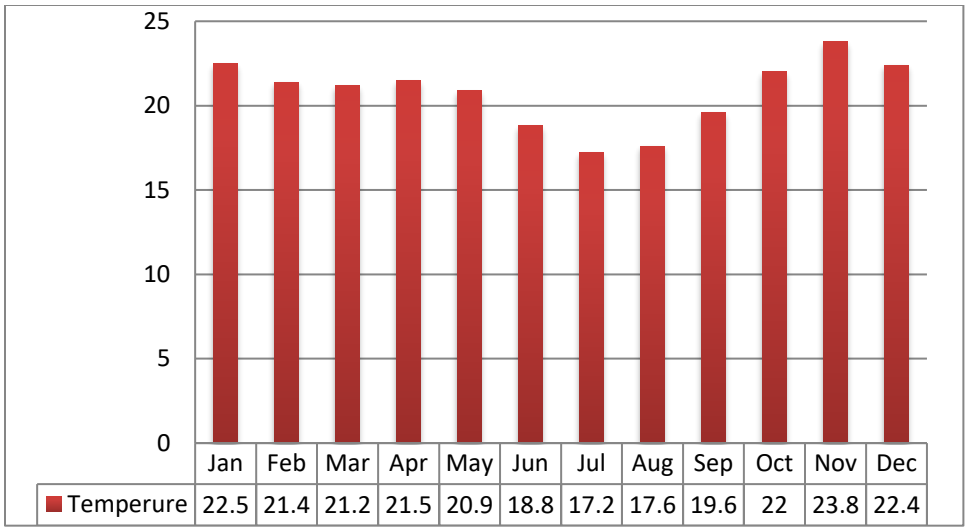


Figure 2-1: Mean Monthly Temperatures for Karonga (2003-2012)

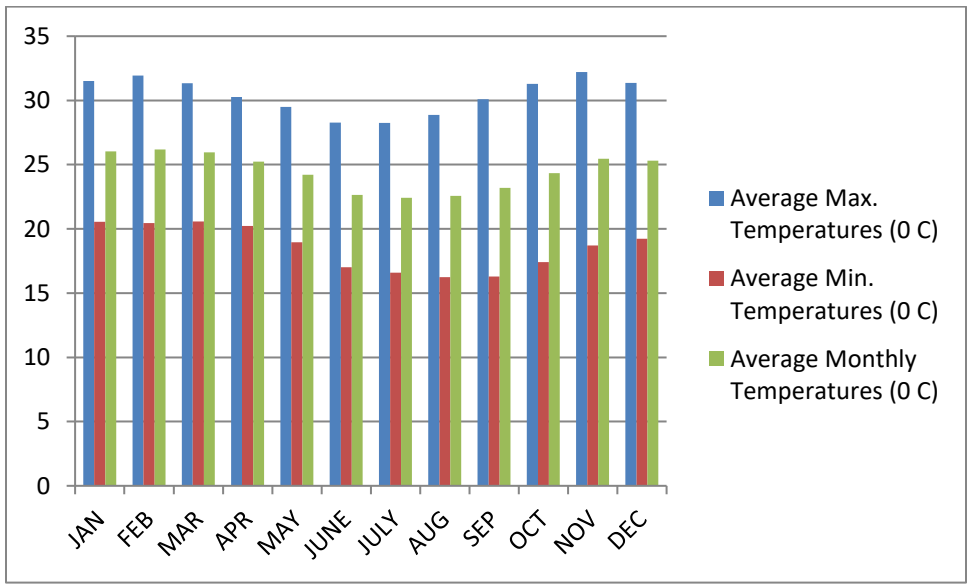


Figure 2-2: Mean Monthly Temperatures at Tenende in Kyela

The middle and upper parts of the Songwe River generally experience cool to warm temperatures. The average monthly temperature recorded over a 24 year period from 1955 to 1979 at Chitipa town located within the basin in the plateau zone, at an altitude of 1,285 masl, is about 21^0 C. Lowest temperatures of up to 7.5^0 C are recorded in the month of July at Chitipa Station (Source: Final SESA Report 2014).

2.2.2 Rainfall

2.2.2.1Upper Basin

Rainfall varies from less than 1000 mm/year in the south-western parts (Hanga basin) to 1400 mm/year in the hilly north-eastern parts (Mwati basin in Tanzania). The major part of the sub-basin, which is within Tanzania, is quite far from the nearest rainfall stations and the rainfall pattern is based on indirect and informal observations (vegetation, topography etc.). Rainfall figures in this area are therefore only considered as approximate. Kameme is the only rainfall station (approx. 900 mm/year) in the sub-basin. Mean annual rainfall for Karonga Station is shown in Figure 2-3. At Kameme rainfall station the rainfall is approximately constant in the four months December – March with 180 mm/month.

The Kameme rainfall station represents the lowest ranges of the rainfall in the Basin. Further northeast, in Tanzania, but still in the Upper Basin, the rainfall is likely to be up to 50 % higher. In this area, the isohyets are almost parallel to main Songwe, so rainfall increases rapidly when moving into Tanzania (Updated Feasibility Study 2013).

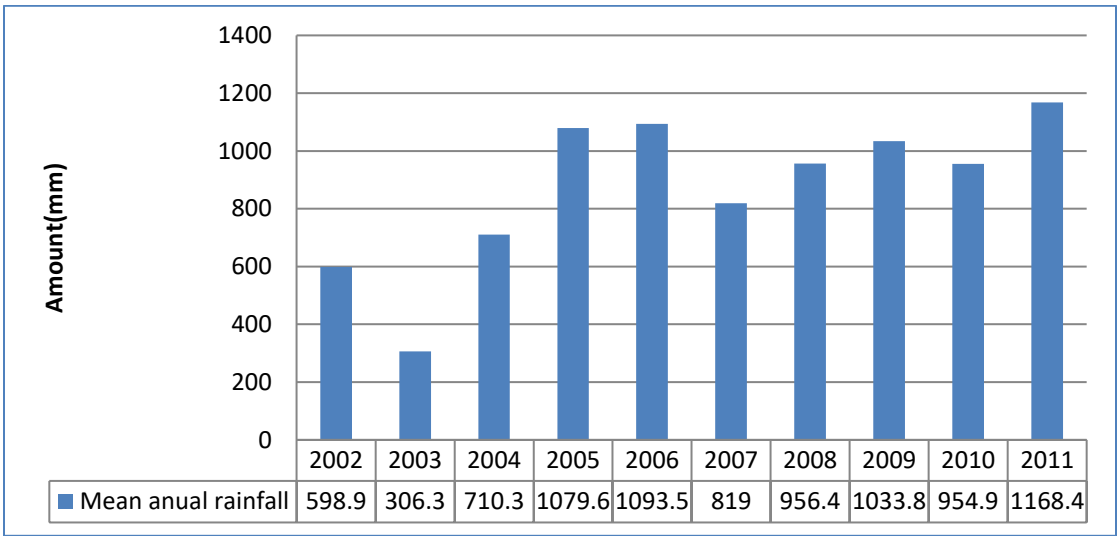
2.2.2.2Middle Basin

The Middle Basin consists of the areas draining to the Middle and the Lower dam, and continues a little below the Escarpment. Hydrologically, it is a very heterogeneous zone, since it includes very dry areas like the Bulambia/Kaseye plain and the much wetter areas around and below the escarpment. Within this sub-basin, rainfall varies as much as from 1000 mm/year in the western parts of the Bulambia/Kaseye Plain to 2500 mm/year in the lowest parts of the basin, on the Tanzania side. Thus, this sub-basin covers almost the entire range of rainfall variation of the entire Songwe Basin.

The period with maximum rainfall occurs earlier when one moves upstream in the Songwe basin. Thus, while the month of maximum rainfall in the floodplain is April, it is March in the Middle Basin. The Chitipa rainfall station is located most upstream in the sub-basin and has less rainfall than the two others, in accordance with the general pattern of rainfall decreasing when moving upstream. At this station, the rainfall in the months December-March is approximately constant, with slightly more in February (Update of the 2003 FS, 2014).

2.2.2.3Lower Basin

Rainfall varies from 1500 mm/year in the Kyungu catchment to over 3000 mm/year in the centre of the Songwe floodplain. Representative rainfall is the rainfall at Iponga on the flood plain and Chipya. Figure 2-3 shows rainfall recorded at Karonga Station. The month with most rainfall is April while on the floodplain; large amount of rainfall is still received in the month of May. This means that the heaviest rainfall in the Lower Basin occurs at least one month later than in the two other basins upstream (Update of the 2003 FS, 2014).



- *Source: Karonga SEP, 2013*

Figure 2-3: Average Rainfall Recorded at Karonga

2.3 GEOLOGY

The geological condition of Songwe River Basin is characterized by pre-Cambrian gneiss rocks of various types (Update of the 2003 FS, 2014), which cover almost 75% of Tanzania. These types include gneisses of Ubendian System, Karroo beds, Dinosaur beds, volcanic and the superficial. According to Norplan et al (2003), lithologically the area is comprised of metamorphosed greywacke, new micaceous gneisses that predominate in the upper parts of the Songwe River while volcanic, karroo, fluvial and lake deposits dominate in the lower parts near Lake Nyasa/Malawi. Karroo beds in the project area are found in the southern extension of the Songwe-Kiwira basin of Tanzania. They occur in the Ngana Basin in both Malawi and Tanzania. They are unconformable on the underlying gneisses in down-faulted zones a few kilometres upstream from the lakeshore plain. The Karroo rocks in Malawi stretch from the confluence of Makeye and Songwe Rivers for about two kilometres upstream. These rocks outcrop on both riverbanks all the way to the rapids above Ngana. They are divided into coal measures, sandstones and shales, basal beds (basal conglomerates, arkoses and flaggy shale) and Mwesia beds (green to grey green mudstones, arenaceous and argillaceous limestones).

The volcanic cobbles and boulders consisting of basalts and basaltic tuffs overlay the Karroo rocks. The volcanic rocks rest directly upon the Dinosaur beds in Malawi and overlie gneisses on the hills upstream the Ngana Basin. They are said to be deposited on an eroded surface under lacustrine conditions and are comprised of basaltic pebbles and cobbles. They are considered to be the southernmost extension of the Rungwe Volcanics of south-western Tanzania.

Gravels for construction of irrigation channels, hydropower plant, roads as well as dam structures are available within the catchment. Alluvium and beach sands occur downstream approaching the lakeshore. The effect of the retreat of the lake has caused the river to meander in the plain thus depositing a lot of sand along the bank. Beach sand and marshes are present on the lakeshore.

2.4 SOILS AND GENERAL LANDSCAPE

The upper catchment of the Songwe River Basin lays on a rocky basement with alluvial soils in its depression/valleys. This catchment is made up of arable and fertile alluvial soils. Additionally, latesols and calcimorphic soils are dominant in this sub-catchment and are found in both Tanzania and Malawi sides. According to the agricultural officials at Ileje district, this land was said to be well suited for agriculture and the trend to its encroachment is increasing.

The hilly highlands which are located above the plains are generally covered with residual soil formed from weathering and disintegration of the gneissic bedrock. These soils are red to brownish soils, normally with grain size of clays, silts and sands (Norplan et al, 2003). Generally, soil type is moderately shallow, overlying iron stone or deep sands with some better deep red soils. Gravel soils are also common in south-western plateau. In some areas, soil is loam and deep red with low natural fertility which is suitable for agriculture.

The overburden thickness varies highly and depends on the degree to which the disintegrated materials have been exposed to erosion (Norplan et al, 2003). The border between the residual soil and the bedrock is difficult to assess. A gradual transition from soil to solid rock is common. The refraction seismic survey carried out during the feasibility study at the proposed dam sites gave an indication of the variation in weathering depths. According to the results of these studies the weathering depths were found to be between 0.5 m and 40 m (FS, 2013).

With regard to erosion risk, the Songwe Atlas (University of Bern, 2009) has carried out a watershed classification for the area of the SRB. The approach considers elevation, slope and landform according to an equation1, from which the results have been assigned to 5 classes. Watershed class 1 (WSC 1) is the most sensitive, and watershed class 5 (WSC 5) is the least sensitive to water resource degradation by erosion.

Recommendations for sustainable land use in each class are then given as shown in Table 2-1. Table 2-2 and Figure 2-4 shows the distribution of these classes in the SRB. Figure 2.5 is a map showing the distribution of watershed classes in the Songwe River Basin according to the Songwe Atlas (2009) developed under the Songwe River Catchment Trans-boundary Management Project (SRCTMP).

Table 2-1: Watershed Classes and Land Use Recommendations

Class	Characteristics	Land Use Recommendation
WSC 1	Areas with very steep slopes and rugged landforms, commonly uplands and headwater areas. Critical areas for water and soil resources management	Protection Forest. Recommended land use is permanent forest cover
WSC 2	Areas with steep slopes, usually at higher elevation. Landforms are in general less susceptible to water and soil degradation than under WSC 1	Commercial Forest. Forest (conservation and production forests), agro-forestry and grazing recommended
WSC 3	Areas with moderate to steep slopes and less erosive landforms. Includes uplands and foot zones of slopes	Agro-Forestry. May be used for commercial forest, grazing and combinations of trees and agricultural crops
WSC 4	Gently sloping lands	Upland Farming. Wide range of land uses possible
WSC 5	Gently sloping land and flat areas	Lowland Farming. Wide range of land uses possible

Table 2-2: Distribution of Watershed Classes in the Basin

District and Area Sizes		Areas according to Watershed Classes (in percentage of areas of Districts inside the Basin)				
District	Area within SRB (km^2)	WSC 1 %	WSC 2 %	WSC 3 %	WSC 4 %	WSC 5 %
Chitipa	1,590	1.0	15	25	43	16
Karonga	335	0.3	7	38	39	15
Ileje	1,500	0.4	15	47	34	4
Mbozi	484	0.0	5	41	48	6
Kyela	118	0.0	0.0	1	24	75
Mbeya R.	136	0.4	15	50	32	1
Momba	80	0.0	2	15	50	33
Basin Total	**4,243**	**0.6**	**13**	**36**	**39**	**12**

Source: SESA Report, 2014

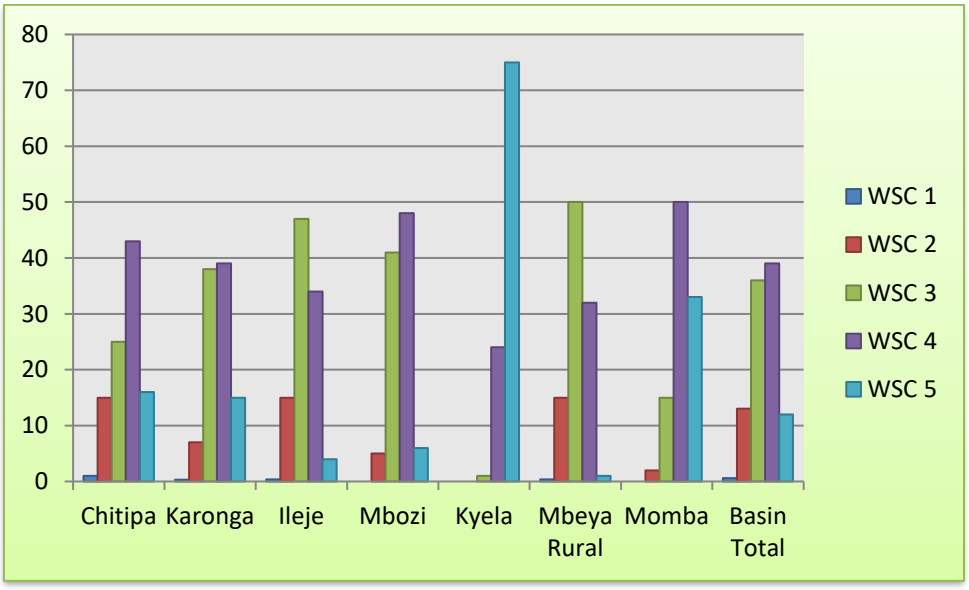
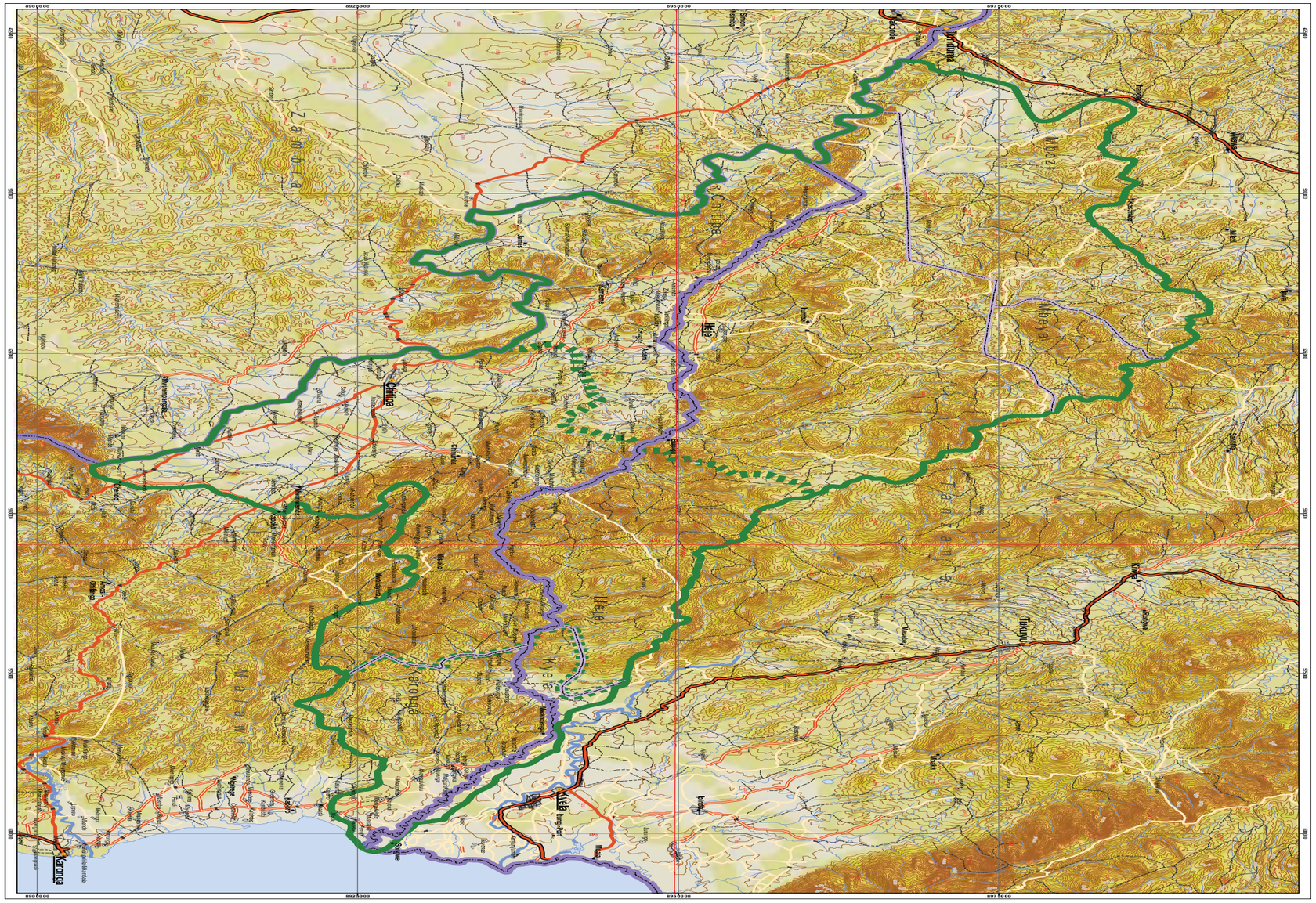


Figure 2-4: Watershed Classes in the Basin

Figure 2-5: Map of Watershed Classifications in the SRB

Source (SRTMP, Songwe River Basin Atlas 5 Conservation Areas)



6 Resource Management

2.5 ECOLOGY AND LAND USE

The Songwe River Basin is divided into Upper, Middle and Lower Basin (Updated FS, 2014). For the purposes of planning and managing natural resources, the river basin will be divided into the above sub-catchments and these will be the recommended planning units.

2.5.1 Upper Basin

The Upper basin is located at between 1,200 and 1,500 m asl in the plateau areas and up to 2000-2400 m asl in its highest mountains, which are the Ileje Range Mountains in Tanzania. On the Malawi side, the Chitipa highlands are on average around 1,300 m asl, and Kameme Hills reach about 1,600 to 1,800 m asl. The upper altitudes in the catchment in Tanzania lie in Ileje, Mbozi and Mbeya rural districts. The basin contains the headwaters and major tributaries into Songwe River. The ecosystem of the Upper Songwe River Basin has been adversely affected by human disturbances such as settlements, deforestation, bush burning and slash and burn cultivation as seen in Figure 2-6.

Figure 2-6: Slash and Burn Cultivation in the Basin
Source – Ileje District Profile

2.5.2 Middle Basin

The middle catchment lies within the two districts of Ileje in Tanzania and Chitipa in Malawi. The area is generally made up of flat to gently undulating surfaces reaching from 1,100 to >1,300 m above sea level. The Middle Basin covers the area between Misuku Hills in Malawi and Malangali Hills in Tanzania. The zone comprises the escarpment characterized by mountains and numerous tributaries. This covers Bulambia plains (Ileje District) in Tanzania and Kaseye Plains and Misuku Hills in Malawi. The latter ones are a characteristic feature of the landscape and host high altitude forest and grassland vegetation. However, species of montane rain forest are extensively cut down for cultivation of agricultural crops. Degraded miombo forest is common along Chitipa-Misuku road especially on hill bottoms and on Misuku hill slopes. Chitemele (shifting cultivation) for finger millet is commonly practiced and highly blamed for much of the environmental harm in the area.

The lower part of the middle basin is dominated by woodland cover. The slopes in this area are rather steep and population density is less. The vegetation changes from moist to dry towards the west. However, the riverine vegetation along Songwe River is characterized by tall trees with mixture of wild palms and *Kigelia Africana* and *Ficus Thorningi* (Mgwina) trees.

2.5.3 Lower Basin

The lower catchment is located between about 500 and 1000 m above sea level. The Lower Basin extends from the mouth of the river to Malawi/Tanzania Songwe River bridge border posts and extends to the Matuli falls. This part is dominated by the Songwe River floodplain and the Karonga Scarp. The riverine vegetation is dominated by *Phragmites spp*. and *Ficus spp*. Agro-ecosystems, especially rice/paddy cultivation, is the major component of the lower basin's ecosystems. In the rainy season the area is heavily flooded.

Swamps provide good habitat for crocodiles and other reptiles. Other pockets of natural vegetation provide habitats to small animals. Species diversity of herbs is particularly high. There is human settlement on the banks of the river. The area is densely populated and the people are intensively cultivating along the river banks, causing more erosion and sediment loading into the river and finally the lake.

2.6 ECO-ZONES AND ECOSYSTEMS

The ecology of the Songwe River Basin can be characterized by the following major eco-zones and ecosystems:

(a) High-altitude evergreen forest,
(b) Miombo Woodland,
(c) Open woodland, bush- and grassland,
(d) Forest plantation,

(e) Agro-ecosystem
(f) Flood plains, wetlands and riparian zone
(g) Aquatic ecosystem.

The ecosystems and their specific characteristics are described in the following sections:

2.6.1 High Altitude Evergreen Forest

This ecological zone is characterized by tropical forest dominated by Podocarpus, Pterocarpus Angolensis (Mninga), Khaya Anthotheca, Hagenia Abyssinica, Osyris Lanceolata, Parinari Curatellifolia (Mbula), Brachystegia Spiciformis and Breonadia Salicina. According to the consultation with District Forest Officer in Mbozi District, this ecosystem is found in the upper basin at the source of Songwe River in Umalila Forest Reserve in Mbozi and Mbeya District in Tanzania.

Podocarpus, Pterocarpus Angolensis, Khaya Anthotheca and Brachystegia Spiciformisare used for timbers, while Hagenia Abyssinica and Breonadia Salicinaare used for protection of water sources. Osyris Lanceolata and Parinari Curatelli foliaare fruits.

Currently, the Podocarpus Milanjianusis endangered species because of excessive timber harvesting while Khaya Anthotheca is a rare species as it is not found anywhere in the basin except in Ilomba forest in Mbozi District. The high altitude forests are generally in good condition. This is because most of them occur in inaccessible areas with low human population.

2.6.2 Miombo Woodland

The Miombo Woodlands cover a major part of the forests in the basin. Miombo trees are the dominating species in most of the forest reserves and non-protected areas. The species occurring in the basin include *Brachystegia Boehmii, Brachystegia Spiciformis, Combretum Molle, Combretum Zeyheri, Julbernadia Globiflora, Parinari Curatellifolia, Protea Gaguedi, Protea Rupense, Uapaca Kirkiana, Terminalia Mollis, Dombeya, OzoroaInsignis, Commiphora Africana, Cussonia Spicata, Hagenia Abyssinica, wild banana, Ocotea spp., Ficus spp., Entandophragma spp., Rapanea spp., Albizia spp., Podocarpus spp*.

The *OzoroaInsignis, Combretum Molle* and *Osyris Lanceolata* species are used for medicine. Currently Tanzania has declared that *Osyris Lanceolata, Uapaca Kirkiana, Pterocarpus Angolensis (Mninga), Adina Macroflora and Albizia (Mninga Maji) are endangered species.* In Tanzania, *Uapaca Kirkiana and Parinari Curatellifolia* are rare species.

Because of its flowers, Miombo woodland forests favour the husbandry of bee colonies. Miombo woodlands are also used as a source of fuel-wood, charcoal, fibre and building materials.

2.6.3 Open Woodland, Bush and Grassland

This ecosystem is characterised by the more open woodland and bushland of miombo vegetation and interspersed grassland. This vegetation type is widespread and is mostly found in the vicinity of the villages. The ecosystem harbours a couple of useful plants such as *Artemisia* plants which are used as medicine for malaria. Artemisia is reported to flourish well in Ileje District especially in Bundali division *(Source - Ileje District Profile).*

2.6.4 Forest Plantation

Forest plantations can be found all over the basin as communities are being encouraged to plant and protect trees in communal woodlots and in their homestead. Participatory Forestry Management Plans have been developed whose aim is to encourage planting more trees for environmental conservation in both countries. In Malawi, by-laws have been formulated to implement the community based management of forests and other natural resources.

Forest plantations were noticed in Itale and Katengele villages in Ileje district in Tanzania. Exotic tree species such as *Eucalyptus, Cupressus Lusitanica, Pinus Patula* and other pine species have been planted there. Further in Ileje District, the Roman Catholic Church and Moravian Church have forest plantations while in Mbeya Rural District an individual private owner has about 50 ha of forest plantations.

Forestry Department and to a lesser extent, some schools have their own woodlots. The trees planted are mainly *Eucalyptus* species in both Forestry Department and Council plantations and mostly *Senna Siamea* species within the school lots. However, due to lack of proper management and management plans (Source: Karonga District Profile 2013-2018) most of the Council plantations are in a very poor state or completely deforested. There is need therefore to carry out reforestation if they are to serve the purpose to which they were intended.

The only protected areas in the basin are forest reserves. The forest reserves available in the Basin are owned by the Central Government, District Councils and Village Governments in Tanzania. In Malawi the forest reserves are owned by the Central Government, villages and private entities.

In Tanzania the forest reserves are governed by the Forestry Policy of 1998 and its Act of 2002 as well as the supporting by-laws. The forests established in Tanzania are catchment forests, forest reserves and forest plantations. In the catchment forests, the harvesting is restricted while in normal forest reserves and forest plantations, regulated harvesting is allowed.

In terms of management, both the national and district forest reserves are managed by the district councils while the village forest reserves are managed by the local communities through the village government. These reserves will be managed to produce important resources from trees like wood, traditional medicines, fruits, etc., and for protection of the forest in order to ensure that the environment is taken care of and that

the forest will be there in the future. The management of forest reserve in the country is based on the Forest Management Plan for those forests which have developed the Forestry Management Plan. Forest reserves in the SRB cover about 48,075 ha. Figure 2-6 shows the land cover in the SRB.

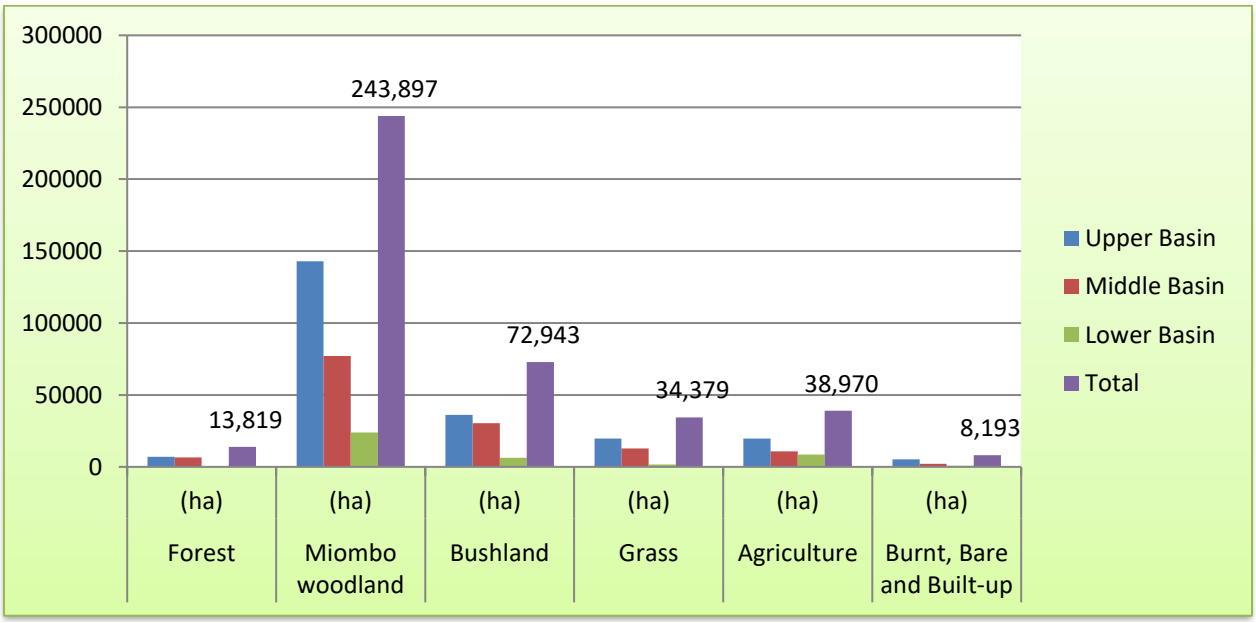


Figure 2-7: Land Cover in the Basin

Source: Songwe Atlas, 2009

According to the above figure, miombo woodland and bushland are the dominant land use cover in the Songwe River Basin comprising of a total of about 316,840 ha, representing 76% of total land use. This is followed by agriculture and grassland.

In Malawi the forest reserves are governed by the National Forest Policy of Malawi of 1996 and Forestry Act 1997. The management of the Government forest reserves is vested in local community in which every village has established the Village Natural Resources Management Committees for management of the forest reserve in collaboration with the forest extension officers in their respective villages. The management of the private forest is vested in individuals with advice from the Forest Extension Officer.

2.6.5 Agro-Ecosystem

Agro-ecosystems cover a significant part of Songwe River Basin and are found in lowland and medium altitude areas of the basin. Farming is characterized by small-scale cultivation of food and cash crops. The food crops grown are maize, banana, beans, rice, sorghum, wheat, sunflower, groundnuts, Irish and sweet potatoes, finger millet, cassava,

soya beans, cow peas, pigeon peas, cocoa yams, sesame and vegetables. Furthermore fruits are grown, such as citrus fruits (oranges, tangerines, lemons and grapes), guavas, paw paws, avocado pears, mangoes, peaches and apples. According to the observation in the field, the fruits are mainly grown at the homestead.

The major cash crops are coffee, sunflower, wheat, cocoa, palm oil, cotton and pyrethrum. However, in excess of consumption, maize, rice, beans, banana, soya beans, cow peas, pigeon peas, cocoa yams, sesame, vegetables and fruits are also used as cash crops. Coffee is mainly grown at Misuku hills in Chitipa District in Malawi and Ileje and Mbozi Districts in Tanzania. Pyrethrum is grown in Ileje district while Cocoa and palm oil are grown in Kyela district in Tanzania. In addition, in some areas people are practicing agro-forestry methods and plant fast growing teaks (*Tectona Grandis*).

2.6.6 Flood Plains, Wetlands and Riparian Zones

The flood plains and wetlands are found in the lower basin including the river mouth at Lake Malawi/Nyasa. Also some few wetlands can be found in the upper and the middle basin. During dry season these wetlands remain grasslands.

The natural vegetation in these ecosystems is of tropical savannah forest and grassland with lagoon vegetation on the swamps and river mouth to the lake (*Source- Kyela District Profile).* The vegetation also comprises bamboo trees and reeds. Bamboo trees are currently used for fencing at household level and can also be used to produce marketable products such as table mats, coffee table, winnowers and trays.

Most of forest vegetation in this ecosystem, particularly in the lower basin, has been replaced by cultivation; mainly paddy and maize. Solitary exotic species of mangoes and *Cedrella* are common in the area. The river bank is typified by the presence of reeds. Along the Songwe River, common species include *Ficus Thorningi (Mgwina), Phragmites (matete)* and wild palms. On elevated grounds, cotton wood (*Bombax Rhodognaphalon*) is found. The vegetation of the levees of the floodplain is mainly remnants of forests interspersed with tree crops. The rest of the floodplain is dominated by wetland cultivation and some planted trees of fruits and other crops around homesteads.

2.6.7 Aquatic Eco-Systems

The value and importance of water resources can only be understood from the context of economic and social activities associated with its direct uses such as irrigation farming and domestic use, apart from being habitat for various fish species. The true value of water and the entire aquatic ecosystem can be measured and quantified by assessing the economic, social and financial benefits that water plays in human development. Water is a resource that plays an integral role in many activities both within and outside the SRB. It is therefore very important to properly manage water resources from both quantity and quality perspectives. A separate assessment of fish and fishery resources which are water based has been completed and is presented as part of the Water Related Social Infrastructure component of the overall SRBDP project. Its findings in terms of

development plans and economic impact are related in the Economic Development Sub-Programme associated with this document.

2.7 WILDLIFE RESOURCES

There are no protected areas for wildlife in the Songwe River Basin. However, some of the forest reserves host wildlife species such as the black-and-white colobus monkey (*Colobus angolensis*) in Iyondo/Mswima, Itale and Umali Forest Reserves. In parts of the Katengele mountainous forest, red and white colobus monkeys are found (Source - Ileje District Profile). Red colobus – if Udzungwa Red Colobus (*Procolobus gordonorum*) is referred to – is listed as an endangered species in the IUCN red list.

Other abundant wild animals include blue monkey (*Cercopithecus mitis*) Vervet monkeys (*Chlorocebus pygerythrus*) and Greater kudu (*Tragelaphus strepsiceros*).

In Tanzania, wildlife species occur predominantly in the natural forest habitat of the upper basin, while there is no notable wildlife in Chitipa and the Songwe River Basin on the Malawi side. However in natural forest wild pigs, hare and snakes like python and cobra are found.

In the lower Songwe River, crocodiles (*Crocodilus niloticus)* are reported and also hippos (*Hippopotamus amphibius)* (IUCN category —vulnerable) are said to be found.

A large number of bird species also occurs in the SRB. In the lower basin, the birds found include pigeons, francolins, helmeted guinea fowl, spur-winged goose and white backed duck. The crocodiles, frogs and fish of different types are found in or near streams. Insects like bees are also found in the basin for both Malawi and Tanzania area.

2.8 SUMMARY OF LANDSCAPE AND LAND USE FROM DISTRICTS

2.8.1 Introduction

Land in the basin districts has been classified according to its suitability in terms of major uses. Agriculture is the major land use and intensity of farming activities varies from one area to the other. Based on this, five classes were identified and these are low land or gently sloping or flat areas; marginal land or foot zones of slopes; upland areas; protected areas and lastly lakeshore plain. In real sense, these land categories and their principal uses and activities are not much different from those outlined in section 2.6 and will act as a good reference mark for further analysis. The main challenge however is that there is no data indicating specific area of land under each category; neither are maps available delineating each category.

Mbozi District mentioned that they have five major land uses. On agricultural land, a variety of crops ranging from coffee to maize and beans are grown. Grazing land is reserved for free range grazing of animals. Settlements also occupy a significant portion of land and three types of settlements are identified, namely scattered, nucleated and linear. Forestry covers a large portion of land in the district and consists of natural and planted trees. Water resources, mainly constituting of rivers, wetlands and water sources is another category of land use. Although all these land use categories exist in the district, it was not possible to allocate specific areas for each of them. Table 2-3 shows the land uses in the SRB in Chitipa District.

Table 2-3: Land Uses in the Basin in Chitipa District

Extension Planning Area	Arable Land (ha)	Marginal Land (ha)	Non-Arable Land (ha)	Total (ha)
Kameme and Mwamukumbwa	50,000	9,000	10,400	69,440
Lufita	54,900	13,700	15,775	85,375
Misuku	25,700	6,200	39,725	71,625
Total	**130,600**	**28,900**	**65,900**	**226,440**

Source: Chitipa Socio-Economic Profile, 2013

2.8.2 Low or Flat Areas or Gently Sloping Land

This type of land is found in all the traditional areas within the basin. They occur in all four agricultural planning units called Extension Planning Areas of Kameme, Mwamukumbwa, Lufita and Misuku. A variety of crops are grown in these areas ranging from maize, tobacco, groundnuts, soya beans, sunflower, beans, sweet potatoes, pigeon peas and upland rice. Various fruits like mangoes, guavas and oranges are also grown. It is very difficult to give precise amount of land under this classification because settlements, nucleated and dispersed, urban and rural are found within these lands. The presence of settlements in these areas has given rise to ancillary land uses such as graveyards, grazing land and village forests.

2.8.3 Marginal Land or Foot Zones of Slopes

This type of land is also found in all traditional areas and wards within the basin and also occurs in all extension planning areas as mentioned above. Crops grown are almost the same as those grown in lowland flat areas. Few settlements are also found on such land but there is also significant grazing taking place in these areas on the Malawian side.

Local level land management on the Tanzanian side helps the village council to reserve some land within their villages for grazing of animals.

2.8.4 Upland Areas

This type of land is dominant in TA Mwenemisuku and is within Misuku EPA in Chitipa District. The common crops that are grown are coffee, bananas, beans, upland rice, makondo, potatoes, peas, avocado and oranges. Other activities taking place within these areas are bee keeping, village/farmers forests and reforestation projects. These areas sparsely populated and the few settlements that exist are nucleated. Other districts in the basin also have high altitude areas such as most parts of TA Mwakaboko in Karonga.

2.8.5 Settlements

Settlements also occupy a significant share of land in the Songwe River Basin. Notable among these settlements are Chitipa Town in Malawi and Isongole and Itumba Towns in Ileje. The others are isolated but compact semi-urban settlements that are scattered all over the basin. In the absence of local level planning where each semi-urban centre should have clearly defined boundaries, size of land under all settlements in the basin is just an estimate. The Draft Economic Development Sub-Programme estimates that about 17% of the basin's population is living in semi-urban centres while the remainder is rural. Incidentally, the rural population is scattered, especially on the Malawi side, because establishment of villages is not regulated as they are on the Tanzanian side. Settlements are found in all categories of the landscape except in protected forest reserves and they are interspersed with farming activities. A more detailed analysis of settlements is presented in Section 5.7.

2.8.6 Forestry and Protected Areas

These are areas where protected forests, communal and village forests are located and such areas occur in TA Mwenemisuku and within Misuku EPA in Chitipa District. Major activities in such areas are bee keeping, collection of firewood and mushrooms and also scarce trees, flowers and herbs. Protected areas are also potential tourist attractions with the availability of rare monkey species as those in Mbozi District. All other districts in the basin have large swathes of protected areas such as Mporoto, Umalila and Mapara forests in Mbeya Rural District; Ilomba Forest in Mbozi District and several national and district forest reserves in Ileje District, as listed in Appendix 4. Details of other forests and forest reserves within the basin are provided under each specific sub-basin as indicated below:

2.8.6.1Upper Basin

The main forest reserve in the upper basin is Umalila lying within Mbeya Rural District and it consists of about 41.2 km^2. The other forest reserves in Mbozi District are Ntazucomprising 6.6 km^2 and Fonera whose size is about 0.9 km^2. Longisonti Forestry Reserve in Mbozi District, whose size is about 6.6 km^2 lies just outside the river basin but

any human and natural activities inside this forest have a direct impact on the upper catchment of the Songwe River Basin. Three wards in Ileje Districts, namely Mlale, Mbebe and Itumba have three forests each while Itale has one. The Upper Basin has a total of 55.3 km^2 under forestry and these are considered protected areas.

2.8.6.2Middle Basin

The middle basin has the following forest reserves;Mwabulambya (22 km^2), Matipa (10.7 km^2), Wilindi (9.4 km^2) and Mughese (7.4 km^2) in Chitipa District and Iyondo (8.7 km^2) in Ileje District. Additionally, there are two forests, one each in Malangali and Ikinga wards in Ileje District. A total of 58.2 km^2 is under forests and all these are regarded as protected areas.

2.8.6.3Lower Basin

The major forest reserves in this section of the basin are Kabulo (30.6 km^2) in Ileje and Nambatata (3.6 km^2), Kapembe (9.3 km^2), Karonga North Escarpment (83.3 km^2) and Ighembe (4.8 km^2) in Karonga District. Kyela District has a number of forest reserves especially in the northern side whose preservation has a direct impact on the Songwe River ecosystem. These forest reserves are however, not shown on the map as they largely lie outside the basin. The Lower Basin therefore has approximately 131.6 km^2 under forestry. Appendix 4 is a summary of the forest reserves found within the Songwe River Basin.

2.8.7 Lakeshore Plains

The vast lakeshore plain within parts of both TAs in Karonga District, Kilipula and Mwakaboko, and parts of Kyela District is a unique landscape that differentiates these two districts from the others in the basin. Major soil types in the lake plain areas of TAs Kilipula and Mwakaboko in Karonga and the wards of Ikimba, Ikolo and Ngonga in Kyela are sand, sandy loam, alluvial and clay. The dominant crop is rice, grown mainly during the rainy season and cassava, grown soon after harvesting the rice.

Table 2-4 below is a summary of broad land uses reported in five districts in the basin. As shown in this table, more than 50% of total land is under agriculture and more land is being opened up for agricultural activities. This is exerting pressure on land that previously was thought to be non-arable such as steep slopes.

Table 2-4: Summary of Land Use Classes from the Districts in the Basin

District	Arable/agric. (ha)	Forestry (ha)	Settlements and Others (ha)	Water (ha)	Open (ha)
Mbozi	255,300 (75.0%)	34,040 (10.0%)	44,252 (13.0%)	6,808 (2.0%)	NA
Momba	401,700 (64.1)	122,800 (19.6%)	46,790 (6.6%)	35,140 (5.6%)	NA
Ileje	101,600 (53.2%)	46,496 (24.0%)	38,018 (20.0%)	3,415 (1.8%)	NA
Kyela	48,128 (36.4%)	6,320 (4.7%)	30,880 (23.3%)	45,000 (34.5%)	1,872 (1.4%)
Chitipa	246,140 (59.8%)	40.2% comprising about 165,465 ha is non-arable land			

Source: District Socio-Economic Profiles (NA = not applicable, this type of land use class not present or not listed)

NOTE: Land for investment (land which can be allocated to non citizens for investment purposes only) in Ileje amounted to 1,270 ha (0.7%) while Momba has 211.7 km^2 of reserved land. In Chitipa, all other non arable land totals 97,800 ha. This includes forestry, settlements and open spaces but it excludes Nyika National Park.

2.9 AGRICULTURE ACTIVITIES IN THE SRB

Agriculture is one of the major land uses in the Songwe River Basin. Various crops are grown on both rain fed and irrigated land parcels. A list of irrigation schemes is contained in Table 5-2. According to baseline data collected in the basin, a variety crops are grown in the basin such as maize, cassava, rice, soya, sunflower, beans, coffee, groundnuts and various fruits and vegetables. The type of crops grown varies according to the climate and physical configuration of the basin. Popular crops during winter cropping (irrigated land) are maize and vegetables.

2.9.1 Mbozi District

During the 2012/13 growing season, it was reported that a total of 142,507 hectares of land was used to grow three major crops; maize (72,840 ha), beans (29,340 ha) and coffee (40,327 ha). However, according to official records at the District Agriculture Office, only about 38,724 hectares of land within the river basin in Mbozi District was used for growing various crops in 2012. The largest share of farming land was for maize (12,853 ha) followed by coffee (12,628 ha).

2.9.2 Kyela District

The farming system widely used in Kyela is mixed cropping for almost all crops except paddy (which is grown as pure mono-cropping). The major cash crops are cocoa and

palm oil. These two crops contribute about 65% of the income of the people and 70% on the district's GDP. There is high land pressure in Kyela compared to other districts because of the high population density and farming is done on small clan owned plots largely not exceeding 2 ha. About 48,128 hectares of the total district's land is used for farming activities. As of 2012, official records showed that about 8,088 hectares of land was put to farming where crops of various types were grown, the major one being paddy taking about 3,416 hectares, followed by maize covering about 1,523 ha.

2.9.3 Ileje District

The basin area in Ileje had about 33,513 hectares of land under farming in 2012 according to data provided by the District Agriculture Office. Out of this, 23,294 ha were planted with maize, followed by beans (5206 ha). The entire district's arable land is estimated to be 82,881 hectares.

Mbeya Rural and Momba Districts had 16,606 ha and 6,905 ha respectively under crop production in 2012 according to the districts' agricultural offices. These are districts whose shares of the basin land are quite small, hence the small farming areas reported.

2.9.4 Chitipa District

In the 2012/2013 season, farming in Chitipa District was done on about 76,072 ha, which is roughly 33.5% of the total basin's land in the district, with about 31,294 ha being under maize cultivation and the other crops sharing the rest of the land. However, narrowing down to the basin wide assessment, a total of 50,964 ha of land was used for farming in 2012, with maize dominating coverage at 23,238 ha. Coffee is another crop that takes much land but there were no readily available figures of amount of land under coffee growing.

Karonga District reported that 20,989 hectares were cultivated and used for different crops in 2012. The major use was maize covering about 9,028 ha followed by paddy being grown on 7,398 ha. This is against a total land of about 335 km^2 that forms part of the Songwe River Basin.

2.10 ANALYSIS OF LAND COVER CHANGE

Available district data does not give a detailed guide to facilitate analysis of land cover changes from 2004 to present. The latest data that is available for Malawi dates back to 2010 but there is no similar data for Tanzania. Assessment of the land use cover for Malawi is also complicated by the fact that land use categories are not those in the Songwe Atlas (2009) or Norplan (2003). This analysis therefore is focused on two sources of information; the Songwe Atlas (2009) and the Malawi Land Cover summaries derived from Landsat 2010 which was conducted by Ministry of Agriculture.

Analysis of land cover in the Songwe Atlas (2009) shows that purely agricultural land covered about 11.1% but additional cultivation was taking place in land use category

given as miombo dry land. Therefore agriculture as a land use had a combined cover of about 55.9% of the basin on the Malawi side. The pattern shows that built up areas increased to 2.1% of total land while land under forestry decreased by 6.1% over a 6 year period. It may be concluded therefore that as the population of the basin increases, there is a corresponding increase in agricultural and settlement land. Table 2-5 provides more details on land cover changes in Malawi.

Table 2-5 Land Cover Change on the Malawi Side of the Basin

Land Use Category	Percentage Coverage		
	2004	2010	Change (%)
Agriculture (all categories)	55.9	60.0	4.1
Forestry	39.7	33.6	-6.1
Built Up Areas (Settlements)	0.3	2.1	1.8
Water Bodies	0.2	0.2	0
Others	3.9	4.1	0.2
TOTAL	**100**	**100**	

Source: Atlas of Malawi Land Cover and Land Cover Change 1990-2010.
Note: Water bodies may have changed in area but not measurably, and so are shown as zero change.

2.11 ENVIRONMENTAL THREATS TO THE SRB

Prior to the SRTCMP, baseline studies as well as stakeholder consultations identified threats associated with certain localities which were eventually designated as priority conservation areas. Agricultural activities and deforestation were singled out as the major threats to the catchment resources. Poor farming practices, including cultivation on steep slopes and along the banks of the river which is accompanied by deforestation has been on the increase due to population pressure. It was also noted that sedimentation was affecting the habitat of some economically important riverine fishes in the lower part of the basin (Ref. Chafota, 2009). Table 2-6 summarises the environmental threats to the SRB.

Table 2-6: Environmental Threats to the Basin

No.	Threats Reported in 2004	Threats Reported in 2014
1	Soil erosion	Soil erosion
2	Siltation	Siltation
3	Deforestation	Deforestation
4	Overgrazing	Overgrazing
5	Fish resources depletion	Fish resources depletion
6	Water resources degradation	Flooding and poor drainage
7	Human habitat degradation	Steep slope cultivation
8	Pollution	Bushfires
9	No reported threats	River bank cultivation
10	No reported threats	Brick burning (by using firewood)

It was therefore apparent that the whole biodiversity of the Songwe River Basin was facing a serious threat and that there was an urgent need to address these threats which were being driven largely by socio-economic factors such as population growth, illiteracy, inadequate development policies and absence of environmental awareness (Ref. Chafota, 2009).

The main human activities that result in deforestation are timber and fuel-wood production, charcoal production, expansion of farmland (including shifting cultivation) and establishment of new settlements.

The increase in the number of threats to the Songwe River and its catchment as seen in the above table is of serious concern because it suggests that the communities and the respective districts are not implementing environmental conservation strategies currently in place in districts or that their efforts are not significant enough to have a major positive impact on the basin environment.

3 EXISTING SOCIO-ECONOMIC CONDITIONS

3.1 INTRODUCTION

The socio-economic conditions of the Songwe River Basin are adequately covered in the Community Development Sub-Programme and the Sustainable Environmental and Social Assessment (SESA) report. In brief, the basin is characterized by subsistence farming, with moderate access to education and health services. Access to potable water is also moderate with Chitipa reporting a 70.4% in 2012 while Karonga reported 70.3%. Mbozi and Momba Districts reported very low access to safe potable water. The SESA reported 22% for Mbozi and 67.5% for Kyela as the level of access to potable water. Access to sanitation services in the basin is average.

3.2 POPULATION AND DEMOGRAPHY

Table 3-1 indicates the population statistics and distribution in the SRB.

Table 3-1: Population Data for the Basin

District	Area in Basin (km^2)	% of Total Area	Pop. 2013	2013 Pop Density capita/km^2	Pop. 2026	2026 Pop Density capita/km^2
Chitipa	1,590	37%	99,698	63	151,596	95
Karonga	335	8	31,401	95	44,561	134
Mbeya Rural	136	3%	15,852	102	21,004	135
Ileje	1,500	35%	102,599	71	135,946	95
Kyela	118	3%	32,993	180	43,716	239
Mbozi	485	11%	46,256	97	61,158	128
Momba	80	2%	12,405	159	16,438	211
	4,243	**100%**	**341,104**	**80**	**474,419**	**111**

Source: SESA, 2014

A detailed description of the population and demography of the Songwe River Basin is contained in the SESA report of 2013 and the Community Development Sub-Programme of 2014. According to the basin assessment, the population is expected to grow up to 474,419 in the year 2026. The table above gives a summary of other population indicators for the basin.

As shown on the Table 3-2, data was not readily available for all the years, hence the demographic indicators have different reference points. This creates problems when analysing impacts of various interventions. Overall, fertility rates in the basin range from 5 to 7 while life expectancy is as low as 45 for Kyela and 60 for Chitipa District.

Table 3-2: Demographic Indicators for the Basin

District	Year	Fertility Rates	Life Expectancy	
			Female	Male
Momba	2013	7.0	50 (for both female and male)	
Mbozi	2013	7.0	58.0	57.0
Mbeya Rural	2010	5.4	58.3	56.5
Ileje	2008	6.1	58.2	48.4
Kyela	2013	5.1	45 (for both female and male)	
Karonga	2012	5.7	60.8	58.1
Chitipa	2010	6.5	61.0	55.9

Sources: District Data and Population Census Reports and Tanzania Demographic and Health Survey (2010)
NOTE: The total fertility rate for Ileje District which is predominantly rural, has been obtained from the national rural fertility rates for Tanzania (Tanzania Demographic and Health Survey, 2010).

3.3 HEALTH SERVICES

Issues of health are prioritized in the development strategies of the two countries. The MGDS II covering 2011-2016 has set prevention and control of all kinds of diseases as its priority while the NSGRP of 2005 goal number three focuses on improving survival, health, nutrition and well being, especially for children, women and vulnerable groups. Both countries have also prioritized reduction of the spread and mitigate the impact of HIV/AIDS. Tanzania has also set provision of at least a health centre in every ward and a dispensary in each village as its target.

Based on the above, health services are fairly distributed in the Songwe River Basin. Each district except Momba has a referral hospital located at the district headquarters. In addition, there are lower level health facilities such as health centres, dispensaries and clinics both static and mobile.

However, challenges in the health sector are quite many. In Chitipa, access to health services is hampered by long distances that some sections of the population have to cover. Chitipa District Hospital is not centrally located such that some people cover more than 100km to access it. The poor condition of the roads is another major constraint to improved access to health services for the basin population. Other problems in the

delivery of health services are shortage of medical personnel, inadequate medical supplies and poor infrastructure. Some areas of the basin still do not have health facilities within walking distance as seen by average distances that communities travel to access nearest facilities. Table 3-3 indicates the health facilities available in the basin by District.

Table 3-3: Health Facilities in the Basin

District	Health Facility			Total
	Hospital	Health Centre	Dispensary/Health Post	
Chitipa	2	4	63	69
Karonga	2	4	44	50
Ileje	2		9	11
Kyela	2		35	37
Mbozi	2	3	39	44
Momba	0	6	26	32
Mbeya	2	3	51	56

Source: Summary from the Community Development Sub-Programme, 2014

3.4 EDUCATIONAL SERVICES

Chitipa and Karonga Districts reported literacy rates of 77.9% and 74.9% respectively in 2011. As these are district summaries, levels of literacy in the Songwe River Basin are varied. According to the SRB household survey on the Malawian side, about 71% of the sampled basin population could read and write the local language while on the Tanzanian side, the rate was 88%.

Education facilities are fairly provided in the basin. Major challenges are experienced mainly on the Malawian side of the basin in Chitipa because of poor road network. Learners take about 3.8 km to reach schools compared to the average of 1.7 km on the Tanzanian side of the basin according to the baseline survey. Other challenges include lack of adequate teaching staff that forces the available ones to combine classes, a situation which is more acute in Malawian schools than those on the Tanzanian side. All sampled schools mentioned inadequate teaching and learning materials as another major challenge. More details are provided in the Community Development Sub-Programme. Table 3-4 shows the available education facilities in the basin.

Table 3-4: Education Facilities in the Basin

District	Pre-Schools	Primary Schools	Secondary Schools
Mbeya	No data	23	2
Kyela[#]	98	99	26
Ileje[#]	81	83	21
Mbozi[#]	No data	160	55
Momba[#]	83	95	15
Chitipa	347	118	16
Karonga	58	42	3

Source: District Data Collection, 2013Note: [#] Covers whole district
Note: No data for pre-schools was available for Mbozi and Mbeya

3.5 WATER SUPPLY AND SANITATION

The overall access to safe and potable water in the Songwe River Basin is moderate. In some districts such as Karonga and Chitipa, access to potable water is as high as 70% whereas in the basin area of Mbozi District, it is around 22%. Though there are such high rates of access in Chitipa and Karonga District, most water facilities are not in working condition. Water supply facilities in Chitipa District such as boreholes and communal taps are not functioning. The water table in Kyela and Karonga, which lie in the lower section of the basin, is high due to the districts' proximity to Lake Malawi. However, excessive flooding also hampers availability of potable and safe water in the strict sense. From the sampled households in the baseline survey, about four out of five reported the existence of a potable water point in the village while in terms of supply, 82% of Malawian households reported to have water throughout the year compared to 67% for the Tanzanian households.

Use of standard sanitation facilities is limited in the basin. The household sample survey results showed that about 80% of the households use pit latrines in Tanzania while in Malawi, households using pit latrines was about 56%. Use of flush toilets was reported on the Malawi's sampled households at only 1%. It is evident therefore that there is still existence of open defecation among some sections of the basin population although this was not officially reported in the survey.

The rural population also generates a significant amount of solid waste which in most cases is dumped behind homesteads where it is either burnt or left to decompose and used as manure. Some waste also ends up being dumped in river/stream courses thereby contributing to river ecosystem pollution.

3.6 ENERGY

The energy situation in the basin is characterized by a high level of firewood use for cooking and paraffin for lighting. Other sources of energy are solar power, diesel powered generators and to a lesser extent, hydro electricity. Although the basin is connected to the national electric grids of the two countries, electricity is unreliable because of low production and also unaffordable connection charges. Details on this section are contained in the Community Development Sub-Programme.

3.7 TRANSPORT AND COMMUNICATION

Movement of people within and outside of Songwe River Basin is through road transport. A number and classes of roads exist but the major ones are Karonga – Chitipa, Karonga – Songwe, Kasumulu Border – Isongole, Isongole – Tunduma Highway and Isongole – Chitipa. There are other minor roads that connect ward headquarters and other smaller settlements within the basin. Movement of people is mainly through bicycles, motor cycles and motor vehicles. Major challenges exist in the road transport sector because of the poor condition of most roads such that some areas are inaccessible especially during the rainy season. The poor condition of some roads negatively affects access to critical services and facilities such as health centres, schools and produce markets.

Major communication facilities do exist in the basin although this is largely restricted in urban centres. Ground and mobile phone access is possible especially in all towns within the basin. Mobile phone network coverage is however very poor or non-existent in remote parts of the basin. As the entire basin is being developed, it will also be necessary to give special consideration to the information, communication and technology (ICT) sector. Priority areas should be improving communication in and around the project sites and in large settlement areas.

3.8 SOURCES OF LIVELIHOODS

The basin population is dominated by subsistence farmers. Sources of livelihoods comprise incomes realized from the sale of crops and livestock, salaries for a small employed population, various business enterprises and from other sources. Agriculture and Livestock is the main source of income contributing more than 80%, with the remaining 20% attributed to small scale businesses, mining, charcoal and timber harvesting. Others are bee keeping, fishing and small industries. As an agro-based basin, specific focus should be made on farming and related infrastructure. Attention should be given to sustainable agricultural practices that will be in tandem with the overall objective of conserving and managing natural resources within the Songwe River catchment.

The major source of income is agriculture and estimates in the Economic Development Programme show that rain-fed agriculture contributes about 68% of the basin's gross domestic product. However the challenge for farming is scarcity of inputs. This is mainly due to poor road network. Additionally, non-subsidized agricultural inputs are generally unaffordable to many subsistence farmers. The majority of the people in Chitipa have no

food between November and February. The common trend in Chitipa is that while it has been registering food surpluses in previous years including in 2013, there remained significant gaps in terms of food security at household level. Therefore some households still had to depend on other sources of food to see them through the lean period. During this period most of the people resort to marketing of livestock, as a coping mechanism. Maize and cassava account for about 60% of the total crop areaand these are main food crops for Karonga district.

Just like other districts in Malawi, agriculture is the economic mainstay for these two districts. On average, the agriculture sector employs about 90% and 88% of the population of Ileje and Mbozi respectively.

A small population in the Songwe River Basin is on salaried jobs. This is common for the urban population of Chitipa, Itumba/Isongole in Ileje and other smaller urban centres.

3.9 HOUSING AND SETTLEMENTS

3.9.1 Introduction

The Songwe River Basin is generally sparsely populated as large parts of it are covered by forests. The overall population density is 74 people / km^2. Apart from population concentration in district towns of Ileje and Chitipa, high population density is noted in Kyela. A large number of settlements are located near water sources, especially along the Songwe River on both sides, although there are more villages on the Malawian side. This is likely to have implications during implementation of some environmental conservation interventions in the basin.

3.9.2 Housing and Settlement Planning in Tanzania

Regional and district land use planning has been done in a disjointed manner in the Mbeya Region. The Agriculture Office has been championing preparation of participatory land use plans through their planning unit but it was reported that this unit no longer exists. Mbeya Regional Office, where regional land use planning is coordinated, indicated that all the districts in the basin do not have district land use plans. However, land use planning, as guided by the Land Use Planning Act of 2007, requires that the process should start at village level and then at district level. Thereafter, a regional or sub-regional land use plan becomes feasible. Thorough coordination is therefore expected between and among districts in order to achieve harmony in land use planning.

Currently, plans are underway to prepare a multi-disciplinary Southern Highland Zone Plan but the major focus of this will be to guide investments. It is worth mentioning that individual sectors such as water have been preparing their own master plans but it was not possible to access any such plans.

Hierarchy of Settlements in Tanzania

There are seven levels of settlements in Tanzania according to the national hierarchy of settlements. These are villages, trading centres, minor towns, towns, municipality, cities and megacities. The Songwe River Basin has only four types of settlements namely villages, trading centres, minor towns and towns. Villages are settlements with less than 10,000 people and have a limited number of services and facilities. Trading centres also have less than 10,000 people but have services such as retail shops, market places, primary schools and dispensaries. Minor towns have a population of above 10,000 but below 30,000. In addition, these are ward headquarters and also have facilities such as health centres, secondary schools, at least 20 licensed shops and primary court.

Towns have a population of less than 30,000 in addition to having at least 50 licensed shops, hospital and police station.

A settlement qualifies to be a village if it fulfils the guidelines stipulated in the Human Settlement Development Policy of 2000. Thus, the settlement should have a minimum of 250 households and less than 10,000 people. In practice, the whole process is frustrated by political influence especially towards election period. The demand to establish new villages is a result from the desire to fulfil the conditions for some wards to be eligible to elect ward representatives (councillors) during elections.

Land use planning principles and practices in all the districts in the river basin are normally applied in urban areas of Mvawa and Mlowo (Mbozi District), Itumba and Isongole (Ileje District) and other small urban areas. While the Village Land Act, Urban Planning Act and the Human Settlement Policy have guidelines for land use planning at all levels of settlements in Tanzania, emphasis is placed on towns and cities where land is under the direct control of the Commissioner for Lands. Major land use categories in rural areas are agricultural, pastoral/grazing, conservation/forestry, residential and institutional. Land use categories in urban areas include all the above except pastoral/grazing land. Preparation of village land use plans is hampered by lack of funds. In Mbozi for instance, the only two villages of Harungu and Ipungu that have land use plans were funded by the Ministry of Lands Headquarters.

In Ileje District, Mabula village has a land use plan that was prepared through the Songwe River Trans-Boundary Management Project. Some of the underlying principles and guidelines that were used shall be adopted in the formulation of the framework that will be used to prepare land use plans for the areas/communities that will experience significant impacts from the major project interventions, such as dam construction and irrigation schemes and in new settlements that will be established through inevitable resettlement.

The village councils are responsible for guiding the pattern and direction of physical development in villages in Kyela and other districts in the basin. That is, although there is no formal village level land use plans with land clearly assigned to specific uses, de facto planning still exists in rural parts of Tanzania.

3.9.3 Housing and Land Use Planning in Malawi

No formal land use planning exists in Malawian village settlements in the Songwe River Basin. Save for towns such as Chitipa, where urban land use planning is practiced, villages are established and developed without any proper guide. Unlike in Tanzania, where villages have maps and village councils know the exact boundaries of their villages, Malawian villages do not have clearly distinct boundaries. Maps at local level are prepared by the National Statistical Office for the purpose of collecting data and are called Enumeration Area maps. They do not in any way coincide with village boundaries. In addition, new villages are also being created with the principal purpose of facilitating national social benefits such as subsidized farm inputs and monthly honoraria that village leaders receive from government.

The National Physical Development Plan (1987) has some guidelines on the hierarchy of urban and rural settlements in the two districts of Karonga and Chitipa.

Urban settlements are generally ranked according to the level and influence of services available at each centre. In order of ranking, starting with the highest to the lowest, urban settlements in Malawi are ranked as national centres, regional centres, sub-regional centres, district and/or main market centres, rural market centres and village centres. The Songwe River Basin therefore has Chitipa as district centre and several rural market centres, namely Misuku, Kameme, Ifumbo and Kapoka and Kaporo, Iponga and Ngana in Karonga District (Source: National Physical Development Plan, 1987).

Based on the above situation, it is possible to suggest a harmonized hierarchy and pattern of settlements that exist in the basin and suggest the future pattern that is likely to develop and which may help to shape the level and pattern of future settlement growth.

3.10 LAND TENURE AND LAND ALLOCATION MECHANISMS IN THE SRB

Land tenure is defined as the mode by which land is held or owned and / or the set of relationships among people concerning land or its products. Property rights are similarly defined as a recognized interest in land or property vested in an individual or group and can apply separately to land or development on it (Payne, 2000). The land tenure and land allocation systems in the two countries are clearly provided for in the Land Acts and related legislations (1965 for Malawi and 1967 for Tanzania) and supporting Land Policies (1995 for Tanzania and 2002 for Malawi).

3.10.1 Land Tenure in Tanzania

All land in the United Republic of Tanzania is public and is vested in the President as a trustee on behalf of all citizens. Owners of land enjoy equal rights irrespective of tenure category.

Land tenure and ownership in Tanzania is in two categories; customary right of occupancy and granted right of occupancy. Registration of land in these two tenure categories is different. Customary right occupancy is registered at district level and a land certificate is issued at district level. Land under the granted right of occupancy is registered and the certificate is issued at zonal office or the central government level (Ministry of Lands).

Land occupancy without legal right is also recognized if the occupant of the land in question has been staying there for long time and the surrounding community accepts the occupants' presence of being there. The village council knows residents in their areas or villages and do easily recognize the occupants of such land and therefore supports and protects the occupants' interests. Village councils do keep records of various land transactions for their villages.

3.10.1.1 Types of Land in Tanzania

There are three types of land, which are general land, reserved land and village land.

General land means all public land which is not reserved land or village land and includes unoccupied or unused village land. General land is the type of land which is under the Commissioner for Lands at the ministry level and it is the Commissioner who has the power to decide on change of use of general land.

Reserved land is land that is normally set aside and assigned a specific use using provisions from various legislations. Reserved land therefore serves various public functions, notable being nature conservation, recreation and utilities and infrastructures. Details are given below:

(a) Land reserved, designated or set aside under the provision of:
    (i) Forest Act
    (ii) National Parks Act
    (iii) Ngorongoro Conservation Area Act
    (iv) Wildlife Conservation Act
    (v) Marine Parks and Reserves Act
    (vi) Town and Country Planning Act
    (vii) Highway Act
    (viii) Public Recreation Grounds Act
    (ix) Land Acquisition Act
(b) Land parcel within a natural drainage system from the water resource of the concerned drainage basin originates
(c) Land reserved for public utilities
(d) Land declared by order of the Minister, in accordance with the provisions of this Act, to be a hazardous land

Village land consists of land within the boundaries of a village registered in accordance with relevant legislations in force and all land designated as such under the Village Land

Act (1999). Village land is tied to a particular registered village. Management of village land is done by the village council which acts as a trustee on behalf of beneficiaries. Allocation and use of village land is directly guided by the villagers themselves through the village councils.

Acquisition of land by government for public facilities is done on village land and this is only after payment of compensation as provided for in the Land Act 1999.

3.10.1.2 Assessment of Land Rights in Tanzania

As already mentioned, there are two types of land tenure in the country. Granted Right of Occupancy and Customary Right of Occupancy and the title holders have different rights. Table 3-5 below is a summary of rights associated with each tenure category.

The title holder under both the granted and customary right of occupancy is obliged to undertake various requirements to ensure that the agreement is seen to be valid and normal. On the other hand, the landlord is also expected to fulfil several obligations to ensure that the title holder is benefiting from the tenancy agreement. Table 3-6 below is a summary of obligations for both tenants and landlord for both land tenure arrangements.

The landlord may grant right of occupancy which is rent free for both customary or granted land tenure if the land is to be used exclusively for religious purpose or nominal rent for non-profit charitable organizations. Table 3-6 indicates the obligations of landlords and tenants in Tanzania.

Table 3-5: Land Rights in Tanzania

Type of Land Tenure	Description	Rights of Title Holder
Customary Right of Occupancy	• Applicable to village land • There is no time limit	• Right to transfer by way of sale (to members of the same village) • Right to dispose of as gift or inheritance • Right to mortgage • Right to use
Granted Right of Occupancy	• Lease granted up to and not more 99 years • Applicable to general land	• Right to transfer (sale) if there are improvements • Right to mortgage • Right to dispose of as gift or inheritance

Table 3-6: Obligations of Landlords and Tenants in Tanzania

Type of Land Tenure	Obligations of Tenant	Obligations of Landlord
Customary Right of Occupancy	• Pay annual ground rent • Pay premium (for non villagers) • Use the land for intended purpose • Conserve the environment • Protect the boundaries	• Prepare Village Land Use plans • Protects tenants' land rights • Collect ground rent • Inspect what is happening on land
Granted Right of Occupancy	• Pay premium • Pay annual ground rent • Conserve the environment • Protect the boundaries • Develop according to permitted use • Permit official inspections	• Provide social services such as roads and utilities • Collect ground rent • Monitor what is happening on the land

3.10.1.3 Penalties for Breach of Lease Covenants

Land laws provide for penalties for breach of any of the conditions of tenancy agreements. Major examples of breaches of agreements are non-payment of ground rents, failure to use the land as recommended and failure to conserve the environment. Landlord imposes penalties once it is noted that the tenant is failing to rectify the violations of the conditions of the agreement.

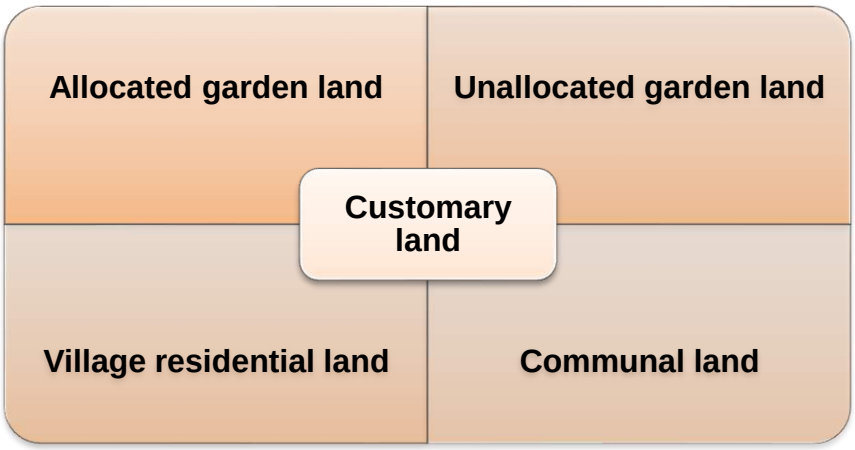
Penalties imposed include 10% surcharge (penalty) on ground rents, demolition of unacceptable structures at tenant's cost and in extreme instances, revocation of the title. If the breach is for granted right of occupancy, once the title is revoked, the land is reallocated to another person. As for customary right of occupancy, once the title is revoked, the village council decides what to do with the land according to customary law. It must be emphasized that penalties imposed on breach of lease covenants whether for customary or granted right of occupancy are a last resort. The landlord provides an opportunity to the violator to be heard and to rectify the alleged breach wherever possible according to the Village Land Act 1999 and Land Act 1999.

3.10.2 Land Tenure in Malawi

Most land in the two districts of Chitipa and Karonga, just like all land in the rural areas of Malawi is under customary status. Its allocation and use is guided by the provision of Customary Land Act. Traditional leaders popularly called chiefs have custodial role over customary land. Ownership of customary land is passed on from one generation to the other. In other words, customary land practically belongs to individual families and chiefs have an overseer role. The basin has three categories of land according to the existing classification provided in the Land Act. These are customary land, public land and private land. Private land is derived from customary or public land. However, the Land Policy has streamlined the land tenure categories into private, public and government land.

3.10.2.1 Framework of Customary Land in Rural Areas

The matrix shown on next page refers to customary land that is purely not registered to reflect official and legal ownership. However, the categories shown in the matrix exist in de-facto form and are accepted and respected by the community at large. Even government authorities cannot just move into the community and enter somebody's land without approval from the owner and the responsible chief. Figure 3-1shows a typical layout of customary land in Malawi.



Source: Adapted from Land Policy (2002)

Figure 3-1: Typical Description of Customary Land in Malawi

3.10.3 Characteristics of Customary Land in SRB in Malawi

3.10.3.1 Allocated Garden Land

The rural areas of Malawi have parcels of land that are used for growing various crops both for consumption and sale and this land is available to individual families. Although the families cultivating such land have no official/legal title, they have exclusive user rights which are protected by the entire community and respected by authorities. In the event that the family wants to lease the land, there is always no objection from the community. The role of the chiefs in this type of land is that of custodial. However, they do have an influential role in deciding its disposal if the concerned family wishes to do so.

3.10.3.2 Unallocated Garden Land

This is land that is available in the community but it is not restricted to individual families. Mostly, this land is used subject to approval of the respective chiefs. Often, this is the land that is allocated or rented to migrants who have moved into the area from other rural areas and this is done at the discretion of the chiefs who, in most cases, benefit from such arrangements. Usually, annual payments in form of cash or kind (crop produce) or both are made to chiefs as a token of appreciation (Peters and Kambewa, 2006).

3.10.3.3 Communal Land

This is land that comprises parcels which can be described as “land for the commons”. Pasture land, river banks and forestry areas fall under this category. Its use is open to all members of the community. The chiefs only regulate its use by allocating it to those families who want to use it for their benefit especially for irrigation farming when it is along river banks. Chiefs have exclusive power to allocate such land. However, when a family

has been cultivating on parcel of such irrigable land for a long time, it retains de-facto ownership which is also respected by the entire community. It is mainly forestry areas that permanently remain under communal ownership.

3.10.3.4 Village Residential Land

Villages in rural Malawi comprise land that could be described as belonging to the community itself simply because members of the community are allowed to construct their houses anywhere they want within the village residential land. Anybody who has constructed a house within this land may be allowed to lease such land on very exceptional circumstances because the villages are not planned and it is very difficult to define boundaries of individual family households in the villages. Allocation of such land to individual villagers is done by the chiefs.

3.10.3.5 Assessment of Land Rights in Malawi

The existing Land Act in Malawi provides three main land tenure categories namely private land, comprising leasehold and freehold; public land and customary and their descriptions are given below:

(i) Customary land is the land that is held, occupied and used under customary law. The chiefs have ultimate role in the access, occupation and regularization of this type of land.
(ii) Private land is such land that is owned, held or occupied under freehold or leasehold title and chiefs have no role whatsoever on this type of land.
(iii) Public land on the other hand is that land which is occupied, used or acquired by government and all other land that is not customary or private. Once government has declared any land to be public under the current law, chiefs automatically lose authority over it (Malawi, 1965)**.**

Title holders have different rights over their properties. The main focus of this assessment is on registered private land and customary land. Although customary land is not registered in Malawi, owners do enjoy de-facto rights which are communally and officially recognized by government. Public facilities occupy public land and user institutions also enjoy some rights and have obligations expected to be observed. Table 3-7summarises the land rights in Malawi.

Table 3-7: Land Rights in Malawi

Type of Land	Description	Rights of Title Holder
Private	LEASEHOLD STATUS	• Right to transfer if developed • Right to surrender to legitimate beneficiary • Right to mortgage • Right to be compensated for loss • Can sub-lease with landlord's approval
	FREEHOLD STATUS	• Right to subdivide • Right to dispose by way of sale or as gift • Right to mortgage • Right to be compensated for loss • Right to sub-lease
	CUSTOMARY STATUS	• Right to be compensated for loss • Right to use it as the village sees fit • Right to "transfer" as gift to dependants • De facto right to let out to others
Public / Government	LAND USED FOR PUBLIC SERVICES AND FACILITIES	• Government has absolute control over this type of land. No personal rights exist • Government has authority over how it can be used and managed • Individual public institutions have a right to use the land according to the prescribed uses

Private ownership of property in both countries is associated with obligations and these are stipulated in the lease covenants. Title holders and landlords therefore have obligations as shown in Table 3-8.

Table 3-8: Obligations of Tenants and Landlords in Malawi

Type of Land	Description	Obligations of Title Holder	Obligations of Landlord
PRIVATE	LEASEHOLD STATUS	• Pay ground rent to landlord • Use it as stipulated in the agreement • Being a custodian	• Collect ground rent • Ensure that lease agreement is complied with • Impose penalties for breach of covenants
	FREEHOLD STATUS	• Use the land according to permitted uses	• Impose penalties on breach of use
	CUSTOMARY STATUS	• Use it according to permitted uses	• Provide guidance on management and administration
PUBLIC/GOVERNMENT	LAND USED FOR PUBLIC SERVICES AND FACILITIES	• Public institutions to use the land according to permitted uses • Protect it against encroachments • Keep it in an environmentally acceptable manner	• Ensure compliance of use of land • Overall mandate of managing the land • Protect the interests of users

Breach of lease covenants is common among all land tenure categories. The common examples are use of land other than the intended purpose, failure to pay ground rent for leased land and underutilization of land. In addition, property owners also engage in sub-leasing of land without prior consent of the landlord and this contributes to carrying out environmentally destructive activities on the land. Landlord therefore impose penalties such as 10% penalty on failure to pay annual rent, requiring the violators to remedy the environmental damage done to the land and in extreme instances, leases are revoked.

Malawi's land laws do have adequate provisions for the protection of private property rights. However, owners of customary land do not have rights that can make their property attractive to money lending financial institutions. In the absence of amendments to the land law, customary land plays second fiddle to private registered land. Therefore, harmonization of land law and land policy is very crucial for the successful management and administration of land in the Songwe River Basin on the Malawian side.

3.11 LAND CONSOLODATION AND FORMALIZATION IN THE SRB

3.11.1 Introduction

The proposed irrigation schemes, LSRM and LSRT for Malawi and Tanzania respectively are on customary land where only de-facto land rights exist. It is therefore recommended

that the SRBC should facilitate the formalization of land ownership so that beneficiary farming families should invest on secure land.

Cadastral land surveying is a critical technical activity that supports land consolidation and formalization. For land consolidation and formalization to be undertaken successfully in the irrigation schemes, it is necessary to analyse this critical technical process in terms of existing challenges and opportunities. Refer to Section 3.12 for details on cadastral land surveying.

Loosely defined, land consolidation involves pulling together irregular land parcels that belong to different owners for the purpose of achieving orderly and efficient use of land. The primary objective of land consolidation is to improve agricultural production and enhance the environment and overall rural development (Konguka, G. O. 2013). The process of land consolidation has a long history dating back to the 18th century. Land consolidation therefore is a land management approach that can benefit communities in the Songwe River Basin especially those in the proposed irrigation schemes.

3.11.2 Land Consolidation and Allocation

Information obtained from three of the district councils in the basin, namely Chitipa, Mbozi and Kyela, shows that land consolidation in the rural areas is done especially on irrigated land, although the land owners participate in this process without technical understanding of the concept itself.

In Chitipa for instance, all irrigation schemes are owned by the communities themselves through the Water Users Association, although some individuals also own parcels of irrigated land. Land for irrigation is found mostly along water sources such as rivers and lakes and, according to the Land Act, such unallocated communal land is public land but it is managed on behalf of government by the local leaders. In situations where such land is allocated, members of the association pull their land together, have irrigation infrastructure provided and do winter cropping (irrigation farming) based on the land allocation criteria agreed as a group. However, during the rainy season, land is left to individual owners to farm it as they wish. A typical example of land consolidation that was given is for Chibula Irrigation Scheme in TA Mwaulambya covering about 17.0 ha. In this scheme, owners retain ownership of land but as members of the Water Users Association, they follow the guidelines outlined below:

- Members apply for land
- Members pay a fee
- Irrigation land is allocated based on agreed criteria

Individuals still own the land in this scheme. However, since the scheme is managed by an association, it is permissible to register the land for the entire scheme as private land through the leasing process and a title bearing the name of the association and the entire membership could be prepared. In Chitipa, the following irrigation schemes are

communally owned; Namwali, Chipakawa, Mwakasole and Mwatengo while Chibulais owned by a legal entity in form of an association.

Ngana irrigation scheme in Kyela is communally owned and has a constitution apart from by-laws that were formulated for the district to guide operations of the irrigation schemes. Land consolidation has also been practiced in this scheme.

In Ileje District, allocation of land for irrigation purposes is the responsibility of the village council which acts as a trustee and has the custodial role as laid out in the Village Land Act. The village council therefore distributes the available irrigation land to the farmers equally who retain exclusive use. Some irrigation schemes such as Sasenga and Mapogoro are communally owned but the rest of the schemes which are in the basin namely; Jikomboe, Ikombe, Nguvukazi, Mkombozi, Azimio Jitegemee and Muungano are individually owned.

3.11.3 Proposed Land Consolidation in SRBDP I&D Schemes

The main purpose of land consolidation is to achieve efficiency of use. There are various approaches to land consolidation but all depend on the status (tenure), ownership and organizational and institutional arrangements of the beneficiary communities. Land in the proposed scheme in Karonga (LSRM) is largely customary and an assessment of records at the Lands Registry in Malawi's Lands Office in the Northern Region showed that there are no registered private interests in the proposed irrigation scheme. The proposed irrigation scheme in Kyela (LSRT) is on village land, which is almost equivalent to Malawi's customary land.

Based on the above situation, land consolidation is proposed to be done according to the procedure outlined below:

(a) Formation of beneficiary groups in the schemes such as Water Users Associations or Irrigators Associations
(b) Identifying and recording all land parcels against their owners. This should include establishing the size of each land parcel. This should include a perimeter survey of each land parcel
(c) Establishing proportion of each land parcel against the total scheme land
(d) Land pooling: All land needs to be pooled together and a precise determination of size should be done (cadastral surveying).
(e) All the pooled land should be zoned. The zoning plan should include irrigation land parcels, access roads, canals, river buffer zone, settlements and tree belts along boundary of the entire irrigation scheme
(f) Once all necessary irrigation infrastructure is provided, the planned land should be allocated to the members of the scheme.

It must be stated that upon completion of provision of necessary irrigation infrastructure, the land shall automatically gain in value because of the high potential to produce more crops (usually two to three times annually). Beneficiary communities need to understand this so that they can appreciate perceived loss or gain in terms of actual land size during

the allocation. Therefore, allocation of irrigation land in these schemes shall respect the existing claims as recorded in (b) above and also take the following considerations:

- Members being duly registered. This shall include but not be limited to paying some sort of small fee
- Proportional allocation based on (c) above
- Consideration of acceptable minimum land holding size for irrigation farming (0.2 ha has usually been considered as a minimum in Malawi)
- Physical conditions of the scheme

3.11.4 Proposal for Land Formalization in SRBDP I&D Schemes

Ownership of land in the schemes is recommended to be formalized to enhance tenure security. The concept of land formalization will set into motion serious debate on security of land tenure in the schemes. The three authorities (WUA's / Irrigators Associations, districts councils and the SRBC) shall decide how land tenure security in the schemes will be addressed. However, there is convergence of opinion among various stakeholders that the SRBDP should contribute towards the attainment of land tenure security in the basin; hence the following procedures are recommended for formalization in the irrigation schemes:

(a) Cadastral surveying of the entire scheme to affix boundary marks (beacons)
(b) Cadastral surveying of the individual irrigation land parcels as designed and producing deeds plans
(c) Individual beneficiary families of irrigation land applying for titles. This is a task that the SRBC, district councils and WUAs or Irrigators Associations should undertake in a coordinated manner to ensure that the process is enhanced
(d) Individual Lands Offices should then prepare land titles and register them in the name(s) of families. It must be emphasized that the authorities stated in (c) above for both countries should ensure that no gender discrimination practices are tolerated in the way land titling is handled in the schemes.

The above processes form the basis for ensuring that land consolidation and formalization is achieved. However, at the time of project implementation, individual families in the schemes through their Irrigators Associations or WUAs may decide whether or not it is important and indeed beneficial to undertake land formalization considering that majority of customary land in the basin is not titled. This, coupled with the high costs attached to the process of land formalization, it is recommended that the SRBC should incorporate this element in its operations.

3.12 CHALLENGES AND OPPORTUNITIES OF CADASTRAL SURVEY IN THE SRB

3.12.1 Challenges and Opportunities in Malawi

The Department of Surveys in Malawi is responsible for all survey matters in Malawi and its mandate is derived from the Land Survey Act. Major survey functions in Malawi are handled at regional level although some districts have offices. Karonga is one of the districts where a local survey office is available. Information on challenges and opportunities concerning cadastral survey has been obtained through consultations with district councils and the Northern Region Survey Office in Mzuzu. The Department of Surveys, being a public organization in Malawi is mandated to carry out cadastral surveys on all types of land. However, individual land owners are also free to contract any private, licensed surveyors to carry out cadastral surveys on their land provided that prior written approval is granted by the Surveyor General.

Once a cadastral survey is done and all data processed, the survey report including drawings are sent to Survey Department headquarters for approval by the Surveyor General. The act mandates the Surveyor General as the approving authority but the Deputy Surveyor General can also approve in his absence. The whole process of cadastral land surveying follows numerous steps which sometimes discourage some land owners from getting titles. Figure 3-2 is a diagram of the processes.

Once a survey is approved, the process ends in the preparation of deeds plans which form an integral part in the process of preparing land titles by landlords for clients' properties. If on the other hand, a survey is not approved, it is referred back to the concerned surveyor to rectify any mistakes that may have been identified.

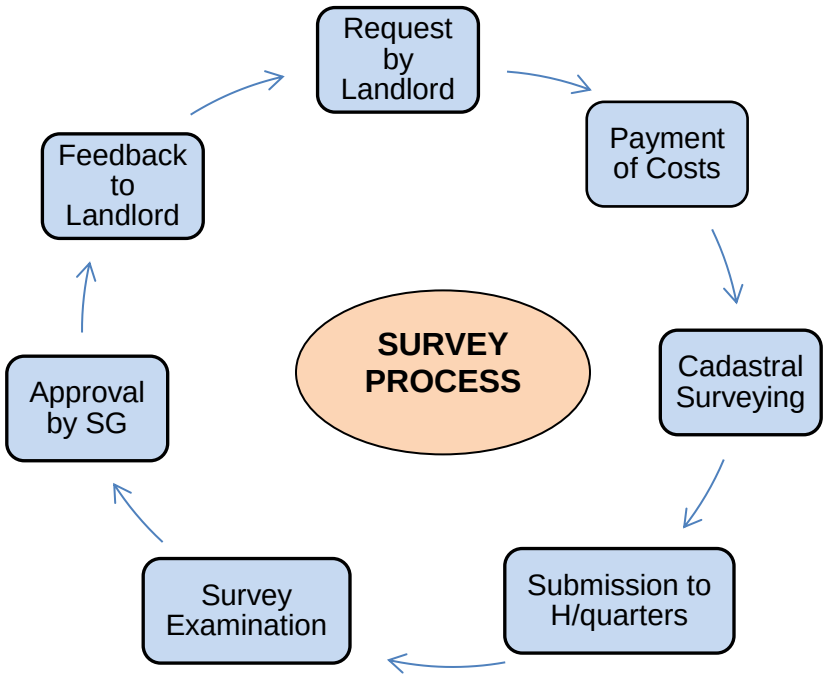


Figure 3-2: Survey Process in Malawi

3.12.1.1 Challenges in Land Surveying

The liberalization of survey work has brought exciting opportunities in the field which has compromised adherence to professional ethics to some extent. Some surveyors do not see through the whole survey process such that once boundary beacons are placed on a client's land, it is seen as an end of the survey process. This creates problems when clients want their land to be registered. Challenges in the field of cadastral land surveying are experienced at various stages and have negative effects on outputs. These challenges are outlined in Table 3-9 below.

3.12.1.2 Staff Adequacy and Skills

The critical technical staff in cadastral surveying consists of surveyors and chainmen. These are available at Karonga District Office but none in Chitipa District. Surveyors at both Karonga and Regional Office in Mzuzu are moderately skilled and adequately competent to carry out their duties. In terms of staffing levels, however, they are not adequate enough to handle all survey matters in the whole region. On the other hand, chainmen are highly skilled and competent to carry out their responsibilities although the staffing levels are also quite low.

Table 3-9: Challenges in Cadastral Surveying in Malawi

Area	Challenges	Ranking		
		High	Moderate	Low
Actual land surveying	Poor knowledge of survey rules by some surveyors		✓	
	Inadequate computation skills by some surveyors		✓	
	Mishandling of survey equipment		✓	
	Lack of interest to use other survey equipment other than GPSs by surveyors	✓		
Data processing	Lack of in-depth knowledge on software capabilities		✓	
	Lack of knowledge of software linkages		✓	
	Inadequate computers especially high capacity ones	✓		
	Inadequate licensed software	✓		
	Lack of software processing dongles	✓		
Survey equipment and mobility (vehicles)	Survey equipment is not adequate	✓		
	Inadequate resources for managing and servicing vehicles	✓		
Survey approval processes	Lack of enough personnel at headquarters		✓	
	Lack of necessary training for personnel		✓	
	Lack of follow up procedures (feedback)	✓		

Another serious challenge concerns survey costs. All revenue from survey work goes to central government accounts and this leaves the office with no resources for normal office and field activities. The monthly funding provided by Central Government to the Regional Office is always inadequate to support cadastral surveys services for the whole region.

3.12.1.3 Opportunities in Land Surveying in Malawi

Surveying activities are decentralized up to regional and district levels. This in itself is an opportunity that any land registration projects may take advantage of. Karonga District has a survey office, which in principle is supposed to handle all cadastral survey issues. Chitipa District does not have an office but is served by the Karonga Office and the Regional Office. One of the greatest opportunities in land surveying is the fact that the survey activities are liberalized. Any licensed private surveyor is free to carry out cadastral surveys upon obtaining consent and this is an opportunity because land owners have a wide choice. This also encourages competition and eventually leads to improved quality

of survey products. Additionally, this has also lessened the burden on Regional Offices as work is being shared among private practitioners. The prior granting of approvals by the Surveyor General to private surveys promotes quality and ensures that clients' interests are also served.

On actual surveying and data processing in the field, the Regional Survey Office has the ability to process data right in the field because of the modern surveying equipment and highly trained staff and this helps to produce high quality survey products. The available survey equipment allows accurate and speedy processing of data in the field. This has considerably improved service delivery in the Survey Department.

The Regional Survey Office has vehicles that are suitable for rough terrain and this is an opportunity for surveying work because survey controls and benchmarks are often located in remote areas only accessible by strong and reliable utility vehicles.

3.12.2 Challenges and Opportunities in Tanzania

Officially, the Department of Surveys is responsible for all cadastral surveys in Tanzania and Land Survey Act No. 4 of 1999 provides for all urban areas surveys while No. 5 regulates surveying in rural areas. Once a survey is carried out, it is sent to headquarters for approval. At most, a survey gets approved within a period of 2 months, a period considered by many as long. Private licensed surveyors also carry out cadastral surveys upon obtaining written permission from the Director General.

The procedures for carrying out cadastral surveys in Tanzania are not much different from that of Malawi. Challenges and opportunities in cadastral surveying in Tanzania are almost the same. The main difference is that most survey work in Malawi (Northern Region) is done by the Regional Survey Office, whereas in Tanzania, districts are actively involved in survey work.

Cadastral surveying in Mbeya is faced with serious challenges that impact negatively on the overall output. Firstly, the current Survey Act only mandates the Director General to approve all cadastral surveys done throughout the country. This leads to delays in the processing of land titles by the district. Secondly, the office is still using old survey equipment (theodolites) which retards the process. This is aggravated by a shortage of staff in the district; the whole district has only three surveyors. Thirdly, survey work is impacted by lack of reliable utility vehicles and very little financial resources. Lastly, fees in Mbeya District do not reflect the cost of carrying out the survey itself as they are heavily subsidized with the purpose of assisting more people to have access to land titles.

Cadastral land surveying challenges are more acute in some districts such as Mbozi and Ileje where there are no district surveyors. The assessment in the Table 3-10 below is therefore a summary for the two districts in the basin.

Table 3-10: Challenges of Cadastral Surveying in Tanzania

District	Challenges	Ranking		
		High	Moderate	Low
Ileje	Prolonged survey approval procedures	✓		
	Delays feedback on submitted surveys	✓		
	Centralization of approving authority		✓	
	Inadequate financial resources	✓		
	Removal of beacons resulting in boundary conflicts		✓	
	Lack of adequate survey equipment		✓	
	Shortage of staff		✓	
	Lack of modern survey equipment	✓		
	Lack of utility vehicles	✓		
Momba	Lack of adequate survey equipment		✓	
	Centralization of approving authority		✓	
	Manual submission of surveys		✓	
	Inadequate financial resources	✓		
	Shortage of staff		✓	
	Removal of beacons	✓		
	Lack of modern survey equipment		✓	
	Lack of data processing softwares		✓	
	Absence of digital data (topographic sheets)		✓	
	Lack of utility vehicles	✓		

Mbeya district council also has no modern survey equipment, an absence of utility vehicles, inadequate funding, delayed survey approvals and inadequate skilled manpower. Just like in other districts, centralization of survey approvals is seen as a critical challenge contributing delays in approving submitted survey work.

Opportunities in Cadastral Surveys

Ileje did not report any specific opportunities as the district council does not have any surveyor. Below is a summary of major opportunities reported in the basin districts on Tanzanian side:

- The involvement of private surveyors has created an opportunity to enhance cadastral survey work

- Highly qualified and competent staff for Mbeya District only contribute to increased number of surveys being carried out
- Data compilation and production of deed plans has been computerized which has resulted in speeding up the whole survey process in Mbeya District only
- All villages in Tanzania are surveyed and this simplifies harmonization and linkage of data when cadastral surveys in rural areas are done.

3.12.3 Summary of Challenges and Opportunities in Surveying

The existing situation regarding cadastral surveys in all the districts of the basin in Tanzania cannot adequately support the developments in the Songwe River Basin. However, as is appropriate to modern approaches to IWRM, the SRB Commission will neither have the authority nor an interest in carrying out land registration, as had apparently been envisaged earlier in the preparation of the DDIP-SRBDP Tor. Therefore, with deliberate prioritization, the available districts surveyors can adequately contribute towards provision of survey services within the basin as needed.

The Songwe River Basin Commission will not undertake land titling and registration in the Songwe River Basin. However, it was necessary to identify the existing challenges and opportunities to be able to inform the level of capacity development assistance that may be required for the sector to contribute effectively in carrying out cadastral surveys for the land parcels that will be affected by the programme. In a nutshell, it is proposed that cadastral surveying will be required for the following projects and programmes under the SRBDP:

a) Sites accommodating reservoirs and hydro electric power schemes
b) Sites that will accommodate site buildings (offices and houses) during construction phase and permanent buildings after the completion of construction
c) Surveying routes for high voltage transmission lines
d) Surveying routes for main canals for water supply to the irrigation sites
e) Perimeter surveying of irrigation schemes
f) Assisting in surveying routes for new access roads to the dam site

It will therefore be necessary to build capacity in survey teams from both countries in order for them to be able to effectively undertake cadastral surveying tasks in the irrigation schemes.

3.12.4 Proposed Strategies to Overcome Challenges

Substantial interventions are required to improve survey services in the districts to ensure that they contribute effectively to the projects and programmes in the basin. Nationally, there is an urgent need to review the Land Survey Act in Tanzania to provide for approval of cadastral surveys to be done at divisional or regional level. In addition, it is also recommended to review and amend the Land Act and Regulations. These

recommendations are in line with overall reforms focusing on regularization of urban informal settlements. At district level, the following specific measures are recommended:

- Computerization of the whole survey process, starting from field data collection and processing, office computation and production of deed plans
- Procurement of up to date spatial data for production of maps
- Training and recruitment of additional surveyors to improve efficiency and meet demand for services. This needs to be complemented by the procurement of utility vehicles to assist in mobility.

On the Malawi side, there is also an urgent need to amend the Land Survey Act in order to make survey services responsive to modern demands. With the easy and cost effective availability of modern technologies in data capture and processing, it is necessary to have amendments to the law to address emerging issues connected with these modern technologies. Another area that the new survey act should address is the approval and feedback processes. This is an area of great concern as information on surveys submitted for approval does not flow as it should. It requires intensive follow-ups for feedback to be accessed. Other specific interventions recommended to be addressed are indicated below:

- Procurement of more computers for data processing and computing
- Procurement of more plotters for printing deed (survey) plans
- Connecting the office to the internet. This will assist in the data processing using licensed dongles
- Provision of adequate resources for cadastral survey work. Allocation of financial resources should be based on volume of work and revenues generated
- Procurement of appropriate software and software processing dongles

3.13 REVIEW OF ACTIVITIES OF SRCTMP

3.13.1 Introduction and Background

The governments of the Republic of Malawi and the United Republic of Tanzania implemented a two phase Songwe River Trans-boundary Catchment Management Project (SRCTMP) with technical assistance provided by World Wide Fund for Nature (WWF) with funding from Swiss Agency for Development Cooperation (SDC). The first phase ran from 2004 to 2008 and the second phase ran from 2008 to 2010. The two governments provided counterpart funding in kind (personnel and office space).

The principal objective of phase one of the project was to ensure that the Songwe catchment natural resources were being used sustainably and adverse impacts on the river and the lake ecosystems minimized, thereby improving human livelihoods and contributing to poverty reduction. In the second phase, the main purpose was to have in

place a sustainable and integrated water resources management system with respect to land, forest and fisheries in selected areas.

The map in Figure 3-3 shows six key priority conservation areas as contained in the Songwe Atlas (2009). The environmental issues in these areas were deforestation, soil erosion, sedimentation, fish spawning and aquatic weeds.

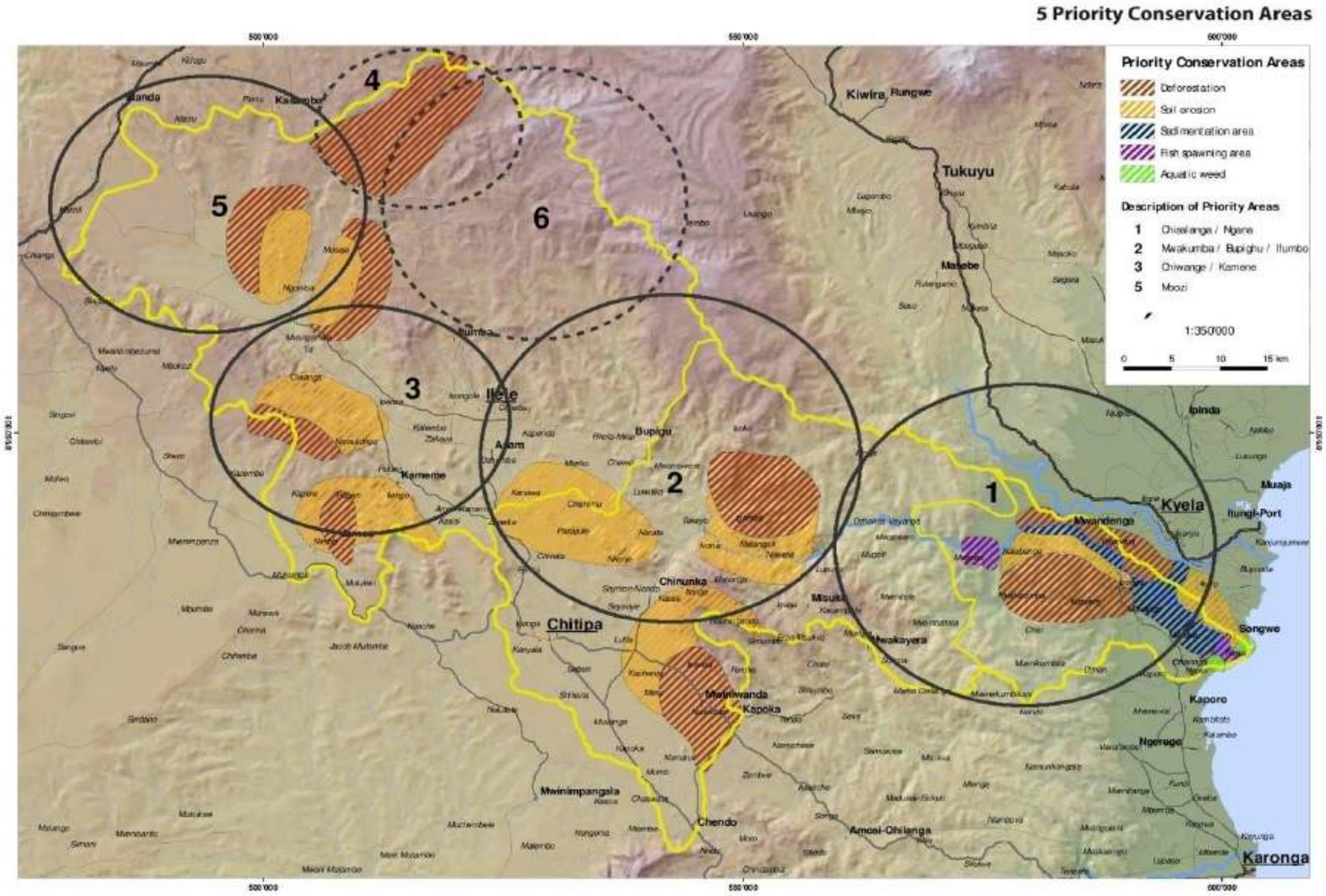


Figure 3-3: Conservation Priority Areas in 2004

Source (SRTMP, Songwe River Basin Atlas 5 Conservation Areas)

3.13.2 Major Activities and Outputs

3.13.2.1 SRTCMP Phase One

The main purpose of Phase One of SRTCMP was to ensure that Songwe catchment natural resources were being used sustainably and adverse impacts on the river and lake ecosystems minimized, thereby improving human livelihoods and contributing to poverty reduction.

In this regard, the project focused on putting in place systems and procedures for integrated natural resources management and the target areas were two districts of Ileje (Mabula Village) in Tanzania and Chitipa (Ifumbo Village) in Malawi which were experiencing severe deforestation and soil erosion. For the fisheries aspects, Karonga (Malawi) and Kyela (Tanzania) were target districts and as shown on the above map, these are areas that were experiencing sedimentation, invasion of aquatic weeds and unsustainable fishing practices. The following were activities under phase one of the SRTCMP:

- Participatory Land use Planning
- Participatory Forest Resource Management and Planning
- Participatory Fisheries Management Planning
- Natural resource based income generating activities supporting improved livelihoods
- Legal, institutional and capacity framework for sustainable NRM

From a broad perspective, the project was expected to result into the reduction in sedimentation and pollution loads and increased incomes of beneficiaries and household food security.

3.13.2.2 SRTCMP Phase Two

The main purpose was to put in place a sustainable and integrated water resources management system with respect to land, forestry and fisheries in selected areas and to assist communities and officials in these areas practices for sustainable natural resources planning, management and operations on an ongoing basis. Outputs from Phase Two are shown in Table 3-11.

Table 3-11: Key Outputs and Indicators under Phase Two

Outputs	Performance Indicators
The development of selected tools (including the integrated catchment database, management plans) completed or updated and their use facilitated Integration of participatory NRM planning and operations at the community and district levels facilitated Appropriate training, awareness raising and relevant capacity building in participatory NRM planning and operations facilitated The SRTCMP is efficiently and effectively managed	Local enabling institutional and legal framework is in place and operational including improved service provision by local institutions in at least two hot spots by 2008 Database continues to be used to enhance decision making in NRM as from July 2008 Awareness of stakeholders of existence and importance of sustainable NRM on an ongoing basis Appropriate participatory land use plans (PLUP, Forestry, Fisheries) and flood preparedness strategy are used for social, economic and environmental betterment in the selected sites/areas of the catchment as from Dec. 2009 Capitalization on experience is evident in NRM decision making SRTCMP managed in selected hot spots within budget and programmatic targets At least one strategic alliance successfully put in place during the project period

Two sites which were considered to be hotspots were selected; Mabula Village comprising 2,420 ha in Ileje District (Tanzania) and Ifumbo VDC consisting of 4,300 ha in Chitipa (Malawi). In addition, the two districts of Kyela and Karonga in the lower basin were selected for the implementation of fisheries management and flood protection initiatives. According to the final evaluation of the project (Chiuta M. T. and Johnson S., 2010), the planned actions for phase two of SRCTMP included the following:

- Completion and or updating of the various tools (PLUPs PFiMPs, PFoMPs, CAPEX Livelihood Assessments, etc)
- Promoting and facilitating the use of the tools
- Producing relevant users' manuals
- Assessing the levels of use/uptake of the tools
- Documenting experiences

However, there are no monitoring reports to indicate the level of adherence of the participatory land use plans that were prepared for the two sites of Mabula and Ifumbo.

This is an aspect that needed comprehensive assessment so as to draw lessons and input into future participatory land use plans for the Songwe River Basin.

3.13.3 Specific Benefits, Achievements and Lessons

Through the SRTCMP, the two countries were able to realize benefits which are ecological, social, political and institutional in nature. In the final evaluation report of the project a number of major lessons learned were also reported which are worth repeating. Benefits and lessons from SRTCMP are summarised in Table 3-12.

Table 3-12: Benefits and Lessons of the SRTCMP

Area of Benefit	Description
Ecological	Protection of the natural resources of the watershed: pollution control, reduction in soil erosion and sedimentation and improving productivity of fishery resources
Cultural and Political	Ethnic cohesion and building trust among border communities and trans-boundary collaboration between the bilateral government agencies
Socio-economic	Livelihood improvement options, protection of critical parts of the watershed and maintaining water quality and reducing impacts associated with floods
Institutional	Sharing of information and expertise, transfer of technology, natural resource monitoring and initiating the harmonization process of legal and legislative frameworks

3.13.4 The SRTCMP Achievements

1. Complementing major stakeholder interests: Interests of three major stakeholders were satisfied as follows:
    a. SDC (donor): The project facilitated the emergence of progressive farmers whose livelihood improved through the adoption and application of different technologies and whose success was expected to trickle down

   b. WWF: Through the resource management tools, the project demonstrated the importance of linking social and ecological initiatives to achieve biodiversity conservation
   c. The project complemented the larger development goal of the SRBDP through generation of trans-boundary cooperation and sustainable natural resource management in the entire catchment
2. Participation for development: The participating communities and district level technical staff representing national partner departments were actively involved in problem identification and providing solutions towards improving the quality of the natural environment. Chiefs on the Malawi side and elected structures in Tanzania played a pivotal role in supporting the interventions
3. Developing natural resource management tools: Development and application of tools and formulation of by-laws ensured effective management of natural resources. Some of the tools are: participatory riverine, forestry and land use plans, by-laws, monitoring and evaluation framework, flood preparedness and contingency plans and atlas of the entire Songwe River Basin
4. Developing human and institutional capacity towards improving natural resources management. The project imparted various skills and knowledge in various areas of integrated management of natural resources such as awareness of biodiversity dynamics, identification of livelihoods improvement techniques, water monitoring techniques etc.
5. Linking natural resource management to livelihood improvement. This was demonstrated through participatory process of livelihood assessment, identification and promotion of incentives most of which were linked to agro-forestry
6. Use of GIS as a tool for planning and managing natural resources at village and basin level. This is evidenced by the fact that most of data generated through this project has formed a solid background for the broader SRBDP under preparation
7. The project also demonstrated that threats to the natural environment originating at local level can be solved through communal awareness, consensus and action. It could however, not provide evidence of basin wide improvement of the biodiversity and ecosystem services because implementation was confined to a very small area; hence the need to consider a larger spatial area for possible greater impact
8. Trans-boundary collaboration was reinforced through joint activities in the planning, review meetings and exchange visits including joint NRM committees
9. Project activities were highly integrated into the district development plans. The inclusion of government structures at all levels ensured integration of the project in all aspects of development thereby streamlining processes for managing trans-boundary supervision
10. Valuing the natural resources: The project raised awareness to communities to start valuing the mutual benefits/losses on sustainable and unsustainable use of natural resources respectively. For instance, soil degradation upstream ends up into high levels of sedimentation downstream resulting in the negative impacts on fish breeding grounds downstream.

In addition, the project managed to register achievements in various areas. Firstly, the project succeeded in complementing major stakeholder interests. Interests of multiple stakeholders such as two governments, donor and technical partners were satisfied. Secondly, it succeeded in canvassing local participation in finding solutions to local problems. Thirdly, the project registered success in developing local tools (bye laws) which were being used in managing natural resources with significant success. In addition, human and institutional capacity both at local and district level was built for the purpose of managing natural resources and the general environment. Lastly, communities were made to understand the linkage between livelihoods and natural resource management, an area that draws strong resistance in local communities with high illiteracy rates.

3.13.5 Key Outputs for Possible Inclusion in the SRBDP

- Only two out of six conservation priority areas were considered. Even the two that were considered, coverage was for very small areas. There were other hot spots which were experiencing similar or same environmental challenges. By excluding them, the perception of people in those communities was that their areas had no serious challenges.
- Large amount of data generated need to be properly kept as it will act as benchmarks for future interventions and will assist in future project designs. The SRBC is mandated to mobilize these data and keep them for future designs.
- A variety of tools that were developed for the two priority areas should be adapted and be used in a wider trans-boundary natural resources management (Available tools are: PLUP, PFoMP, PFiPM, GIS Atlas, Kyela District Flood Preparedness Contingency Plan, Flood Preparedness for Lower Songwe, Participatory Livelihoods Assessment Tools, User Manuals for NRM and Local Bye Laws). Some of these will be used during detailed designs of specific projects by the SRBC.
- Specifically, the following outputs from the SRCTMP have been considered and partially used under the NRLUM and will also be vital for future projects under the SRBC:
    - Participatory Land Use Plans developed for Mabula and Ifumbo villages have provided input for the proposed guidelines for land use planning in the basin. See Appendix 3 for details.
    - Proposed improved forestry management for the four forest reserves in the basin as detailed in Section 5.1.1 should receive inputs from the Participatory Forestry Management Plan prepared under SRCTMP

Proposed sites for integrated soil and water conservation are taken from conservation priority sites identified prior to the SRCTMP as seen in Section 5.4 and also Figure 3-3 and Figure 6-2, which shows the location of proposed projects under this NR&LUM Programme.

3.14 SOIL AND WATER CONSERVATION IN THE SRB

3.14.1 Soil and Water Conservation in Tanzania

3.14.1.1 Momba District

Momba District is currently implementing various activities aimed at conserving water. As already mentioned in the Community Development Sub-Programme, access to potable water in Momba District is very low because of many factors, one of which is the lack of reliable and adequate water sources. There is also uncontrolled encroachment into river banks, water sources and catchments. It is therefore imperative that the available water sources should be protected and conserved. There are a number of initiatives being undertaken in all wards that fall in the basin, especially Tunduma and Chiwezi. Specifically, the following activities are being undertaken:

- Tree planting is being done at water sources
- Maintaining a 60m reserve around main water sources
- Demarcating and putting boundary beacons around water sources
- Formation of village water committees
- Formulation of bye laws to conserve water sources

The district also intends to carry out awareness campaigns in all the wards and also extend the above interventions to all wards in the districts.

In Momba District, the main activities towards soil conservation are tree planting (afforestation) and reduction of overgrazing in wetland and forestry areas. Both of the two wards that are in the basin are implementing these interventions. The main interventions in Mbozi District include the following:

- Soil health testing in Nyimbili ward
- Application of minjingu phosphates and other organic manure to crops in all wards

Other strategies being used in wards outside the basin are crop rotation, agro-forestry especially on coffee plantations, use of inoculation on beans and practicing mulching and zero tillage. These are initiatives that may also need to be introduced in the wards within the basin. Terrace cropping is being proposed in Iyula and Nyimbili wards.

3.14.1.2 Mbozi District

Major interventions aimed at conserving water exist in all the three wards of Iyula, Nyimbili and Isandula such and details are give in Table 3-13 below. The district also plans to increase the number of schools involved in planting and raising seedlings and form and strengthen bee keeping groups around water sources.

Table 3-13: Soil and Water Conservation in Mbozi District

Intervention	Ward	Major Villages
Identification of catchment area	Isandula, Iyula and Nyimbili and other wards outside	Selected villages
Mapping and demarcation of catchment area	Nyimbili and other wards outside	Selected villages
Awareness on cautioning of human activities in the catchment area	Nyimbili and other wards outside	Selected villages
Establishing water users groups (Irrigation schemes)	Nyimbili and Iyula	Selected villages
Use of primary schools and farmer groups to raise water friendly tree seedlings	Nyimbili and Iyula and other wards outside	Selected villages
Supply of tree seeds and equipment to groups and schools raising tree seedlings	Nyimbili and Iyula and other wards outside	Selected villages
Unscheduled inspection of water sources	All wards	Selected villages

3.14.1.3 Mbeya Rural District

Mbeya Rural as a district has a generally a rugged and undulating landscape and this necessitated significant efforts being put into soil and water conservation strategies. Through the Agriculture Office, the district is involved in training farmers in construction of soil erosion control structures such as contour terraces.

The Agriculture Office is also involved in assisting villages to produce participatory land use plans where land is assigned to specific uses depending on the general landscape. Only one village (Nsheha) within the basin area is being planned and the broad land uses currently proposed are agriculture, settlements, livestock grazing, forestry and community services such as cemeteries.

Wetland conservation is being practiced in Santiliya ward. This involves banning any human activities in the wetland to allow it to rejuvenate.

3.14.1.4 Ileje District

The district is also actively involved in implementing strategies in the area of water conservation. Most of these are implemented across all wards and villages in the district. Notable strategies are:

- Preventing human activities including agriculture, cutting trees and grazing around water sources
- Planting water friendly trees annually around water sources and follow up on their survival
- Enforcing existing laws, regulations and by laws for water sources preservation and general environmental conservation
- Raising awareness to the communities on the economic, social, cultural and political importance of water resources on the individual and national well being

The district also plans to engage communities in income generating activities with the purpose of reducing reliance on activities that are damaging to the environment. The proposed activities are poultry farming, bee keeping and aquaculture (fish ponds). In addition, the district intends to introduce penalties to violators of natural resources conservation laws, regulations and by-laws.

Efforts to get detailed information about soil and water conservation activities for the areas of the basin in Kyela District were unsuccessful up to the time this report was being finalized. Suffice to mention that incidents of soil erosion is low due to the fact that land is very flat and where there are slopes, the land is covered by vegetation which reduces water flow forces.

3.14.2 Soil and Water Conservation in Malawi

3.14.2.1 Chitipa District

The District Agricultural Development Office in Chitipa is promoting the conservation of soil and water through farmers across all the three TAs in the Songwe River Basin. There are basically four Extension Planning Areas in the basin namely, Lufita, Kameme, Misuku and Mwamukumbwa and these strategies are being implemented in all EPAs. As the table below indicates, some strategies are applicable in particular EPAs due to the nature of the existing landscape. It is not possible to give a precise area of land where these interventions are being practiced as this can only become available through intensive mapping on the ground. Soil and water conservation strategies in Chitipa District are shown in Table 3-14.

Table 3-14: Soil and Water Conservation in Chitipa District

Soil and Water Conservation Strategies Promoted	Extension Planning Area (EPA)	Traditional Authority
Contour ridging (pegging marker ridges, ridge alignment, box ridges, tie ridges)	Kameme, Mwamukumbwa, Lufita	Mwenekameme and Mwabulambya
Establishment of strips of bush along contours (including vetiver hedgerows establishment)	Kameme, Lufita, Mwamukumbwa and Misuku	Mwenekameme, Mwabulambya and Mwenemisuku
Agro-forestry (woodlots establishment)	Misuku	Mwenemisuku
Terraces construction	Misuku	Mwenemisuku

Source: Chitipa District Agriculture Office, 2014

The district intends to continue with these conservation measures and also introduce construction of storm drains in all the three TAs.

Specific water conservation strategies are being practiced in the entire district. Notable ones are construction of livestock ponds (small earth dams) in Mwamukumbwa EPA, TA Mwaulambya; stream bank protection (planting water retaining trees like katope, mkuyu, mbawa and mung'wina along stream and river banks) in Lufita EPA, also in TA Mwaulambya. It is recommended that these interventions should be replicated in all EPA's in the basin.

3.14.2.2 Karonga District

Various interventions aimed at conserving water are being implemented in Karonga District and the district agriculture office is using all methods available to reach as many farmers as possible. The table below is a summary of the interventions and these are implemented in all TAs in the district. Soil and water conservation strategies in Karonga District are shown in Table 3-15 below.

The district council reviews the strategies being implemented at all levels to assess success or failure of implementation and effectiveness of the interventions in conserving soil and water. Although information on the reviews carried out so far was not readily available, the district council indicated that these interventions are contributing to the improved soil fertility and will continue to be implemented.

Table 3-15: Soil and Water Conservation in Karonga District

Soil and Water Conservation Approaches	Specific Activities
Training of farmers and staff in soil and water conservation and fertility improvement	Pegging and construction of marker ridges, Ridge realignment, Box ridges, Swales, Raised foot paths, Hedgerow planting, river bank protection and restriction on marginal land cultivation. Other activities include catchment conservation (agro forestry, reforestation, and regeneration)
Promotion of low cost soil and water conservation and soil fertility improvement technologies	Manure making, Agro-forestry tree planting, Crop residue incorporation, Under sowing
Mobilization of local leaders so that they should lead in conservation efforts	Village meetings, ADC and VDC meetings
Conducting environmental education in schools and villages	Lectures at village level, in schools and specifically in environmental clubs
Formation of committees to oversee conservation activities at village level.	Village Natural Resource Committees, Catchment Conservation Committees
Water harvesting technologies	Above ground and underground tanks, In-situ technologies (where rainwater is collected right in the fields)

Note: This information is applicable to the whole district of Karonga.

4 KEY ISSUES FOR THE NR&LUM SUB-PROGRAMME

4.1 INTRODUCTION

The Songwe River Basin has a number of issues that need to be addressed in order to curb the negative environmental impacts being experienced, especially in the lower parts. An example of such issues is shown in Figure 4-1. Assessment of threats to the catchment done in 2013 shows that there are no significant positive impacts on the environment resulting from the mitigation measures that have been undertaken so far. This therefore calls for a multi-sectoral, integrated and holistic approach to the natural resource conservation efforts in the basin.

Source: Chafota 2009

Figure 4-1: Excessive Soil Erosion in the SRB

4.2 ENVIRONMENTAL ISSUES AND PEOPLE'S LIVELIHOODS

The Songwe River Basin's economy is predominantly based on agriculture and, as already pointed out, this sector accounts for about 80% of the region's GDP. About 88% of the people are engaged in farming and farming related enterprises. This argues strongly for the need for sustainable agricultural practices in the basin.

Analysis done in the Economic Development Sub-Programme of this SRBDP document shows that the area under cultivation is steadily increasing for various reasons, some of which are the increase in population and the general desire to expand farming land in order to increase family incomes. The area cultivated in the basin increased by 5% between 2010 and 2011 and increased again by 6% in the period 2011 to 2012. Further assessments show that there are several unsustainable agricultural practices which have a damaging effect on the environment, such as:

- Shifting cultivation. This practice is also called slash and burn. Farmland is opened in previously uncultivated areas mostly covered with trees. Trees are cut and burnt and the mixture of ash and the soil provides very good nutrients for the growing of various crops. Unfortunately, as with the term itself, farmers abandon this farmland once it starts showing loss of fertility in favour of new land. The negative impact on the environment is that almost all trees are cut and the burning prevents them from regenerating. Thus, such farmland is highly exposed to excessive run-off that eventually leads to erosion

- Steep slope and river bank cultivation (see examples in Figures 4-2 and 4-3). This leads to soil instability and exposes it to severe surface run-off. Massive soil erosion takes place in such areas and most of the sediments end up into the Songwe River.

Source: Chafota, 2009

Figure 4-2: Steep Slope Cultivation in the Basin

Source: Price Waterhouse Coopers, 2007

Figure 4-3: River Bank Cultivation in the Basin

- Trading in forestry products: There is significant evidence supporting the existence of trade in forestry products within the basin. As already highlighted in the Community Development Sub-Programme, there is unsustainable harvesting of forestry products such as timber, charcoal and firewood. Every day, bicycles carry bags of charcoal to Kyela and surrounding centres. The situation is the same for other districts in the basin. Reliance on firewood as a source of energy for cooking and lighting is very high, at about 45% for Mbeya Region as a whole, and even higher when urban areas within the region are excluded. There is also evidence that a significant amount of forestry products from the basin are consumed outside.
- Overgrazing: Overgrazing is reported to be a major issue in Mbozi, Ileje and Chitipa Districts. Specifically, Mbozi indicated that the arrival of pastoralists in the district has increased incidents of overgrazing and resulted in human and animal conflicts. Chitipa reported high cases of overgrazing in TA Mwenemisuku where animals do graze in protected forests thereby contributing to soil erosion. There are also reported cases of encroachment into protected areas and water sources in Mbozi District.

4.3 COMMUNITY ASPRIATIONS

The process of identifying community aspirations was ably carried out when the Songwe River Basin Development Programme Shared Vision 2050 was being formulated. Consultations were undertaken at all levels from Ward/TA up to national levels. Environmental and natural resources management issues in the 2050 Vision fall under policy focus area called Ecosystem, Natural Resources and Environment. Under this focus area, environmental issues and community aspirations have been well articulated.

The main areas of concern include increased pressure on water resources, habitat loss across the basin, forest degradation, floodplain degradation, decrease in fish biodiversity,

pollution from agricultural runoff and wildlife degradation due to loss of habitat (forests) and poaching (Shared Vision 2050, 2014). Community aspirations are as diverse as the physical and climatic conditions of the basin itself. Therefore the basin population has set the following priorities towards the sector of environment and natural resources management:

- Properly coordinated legislation and regulations
- Improvements in the adherence to legislation and regulatory provisions
- Reduced deforestation and wild fires
- Increased community share of benefits from the natural resources
- Balanced participation of men and women in decision making on exploitation and management of natural resources
- High level capacity in protection and management of water resources at district and community levels (Water Resources Management Committees)
- Participatory and well developed land use and land management plans
- Greater coordination among various departments on land use practices
- Urgent review of land and related laws, especially on the Malawi side
- Reduction in cultivation and animal grazing along the river banks
- Increased protection of water sources
- Reduction and eventual non-use of burnt bricks
- Proper control and management of pollution and waste at all levels
- Elimination of the practice of shifting cultivation
-

The aspirations of the communities as outlined above are in tandem with the direction which is being advanced in the overall sector of natural resource management for the two countries as stipulated in the various legislations and policies.

4.4 SPECIFIC ISSUES FROM SRBDP PROJECTS

Three major investments in the basin are likely to generate land use management issues that require special attention. In addition, there will also be significant impacts on the natural environment. The Strategic Environmental and Social Assessment (SESA) and the Environmental and Social Impact Assessment (ESIA) contain a thorough analysis of the expected impacts of these projects and have suggested measures to mitigate negative impacts on land and the general environment in the basin. The immediate major projects that have been assessed are the irrigation and drainage schemes of Lower Songwe River Tanzania (LSRT) and Lower Songwe River Malawi (LSRM), Lower Songwe Dam and Hydropower Plant, which is at the border of Chitipa and Karonga in Malawi, and in Ileje District in Tanzania. Table 4-1below provides a summary of issues that have significant impact on the land and the environment.

Table 4-1: Specific Environmental Issues from DDIP-SRBDP Proposed Projects

Proposed Project	General Land and Environmental Issues
LSRT and LSRM Irrigation Schemes in Kyela and Karonga Districts	▪ 3,709 ha to be irrigated in Kyela ▪ 3,740 ha to be irrigated in Karonga ▪ Land readjustment that leads to loss or gain of land ▪ Agriculture intensification shall increase volume of chemicals discharging into the lake ▪ Regulated river flow
Feeder Canals for the above schemes (20 m reserve)	▪ 28.5 km for Karonga scheme (0.57 km^2) ▪ 19.0 km for Kyela (0.38km^2) ▪ Total land required for main canal including way leave 0.95 km^2(95 ha) ▪ Unavoidable damage to trees and other vegetation
Lower Songwe Dam and Hydro Power Project	▪ Clearing of vegetation and soil excavation ▪ Unstable large volumes of soils may end up into the river ecosystem if not well protected ▪ Concrete open quarry ▪ Dust emission ▪ Land acquisition ▪ New settlements ▪ Land use restrictions around the reservoir buffer ▪ River diversion during construction
Power Transmission Lines (132kv: 40m way leave)	▪ Creation of way-leave (buffer) for high voltage line (25km to Kyela and 45km to Karonga Sub-stations) ▪ About 280ha will be needed to carry these electricity pylons ▪ Loss of farm land and settlements in some cases
Kasumulu Water Supply Project	▪ Land acquisition for the main distribution line, tanks and pump house
Songwe Town Water Supply Project	▪ Land acquisition for the main distribution line, tanks and pump house

The anticipated level and magnitude of negative impacts on the environment arising from these proposed projects have guided their rating. Among the main mitigation measures proposed are given below:

- Compensatory afforestation: The reservoir, dam and other associated hydropower infrastructure will require about 1,160 ha and loss of vegetative cover needs to be

compensated elsewhere. This is a recommendation that will be elaborated in the latter part of this document.

- Preparation and implementation of Environmental Management Plans: Each project has unique environmental issues and these will require to be addressed through their own EMPs.
- Resettlement of people is one of the strategies of compensating for loss of land and other properties through the above mentioned investments. Appropriate compensation and resettlement procedures as provided for in the national legislations and donors' guidelines should be undertaken targeting the affected communities. Consideration should be made on any loss of public facilities that may also occur so that it can be adequately covered through relevant sectors.
- Projects sites, especially the hydropower scheme site will soon act as growth corridors and will immediately start attracting settlements. Sustainable land use practices should be designed in and around project sites to prevent land use conflicts arising from new developments.

Implementation of such large scale projects needs strong stakeholder participation. Collaboration is therefore required at all levels to ensure that various negative impacts identified in the SESA and mitigation measures recommended are adequately addressed within the context of national legislations and international practices.

4.5 SPECIFIC ISSUES FROM SRTCMP

As already highlighted in Section 3.16, the SRTCMP had limited coverage both in spatial and goals contexts. The Project could not demonstrate basin wide improvement in biodiversity and ecosystem services because it had to work on a much reduced micro-scale and with very limited funding (Chafota, 2009).The assessment done before 2003 showed that the SRB was experiencing serious environmental degradation ranging from deforestation, soil erosion, river sedimentation, overgrazing to encroachments into water sources among others. These are environmental problems that continue to impact the basin.

The SRTCMP did not have an explicit objective of developing market structures, small scale industries or facilitation of financial mechanisms (such as savings groups) as in many other development projects around the world, all of which would have directly strengthened income opportunities and livelihood security. This is an area where the project may have missed opportunities because it was assumed that livelihoods which encompass social, environmental and economic aspects would be improved by working principally on environmental and secondarily on social aspects of sustainability alone (Chafota, 2009).

It is in this regard, therefore, that the DDIP - SRBDP Project has adopted an integrated approach where social, economic and environmental needs of the communities are reconciled so that livelihoods improvement strategies can be identified, promoted and

sustained in order to reduce overall poverty at community level. This in turn will help them to appreciate sustainable utilization of the natural resources and the general environment.

Documentation on the level of uptake of tools that were developed under SRCTMP is not available. Quite often, government sectors are recognized and applauded for formulating and developing very good strategies but implementation is always a challenge. A typical case within the basin concerns environmental legislations for both countries which provide for the prohibition of human activities in river banks. There are very serious violations on this provision.

4.6 DETERMINING THE LAND USE PLAN

4.6.1 Introduction

The main purpose of preparing an overall land use plan is to guide major activities in the specific use categories so that only those that have positive impacts on the general environment and contribute towards sustainable livelihoods are permitted. This is a tall order considering that the basin spans two countries with different approaches to land use planning and local level land management. However, the main thrust of the plan is to act as guide for major decisions on resource uses. Regional level land use plans need to have strong basis and inputs from lower level plans. Therefore, what is contained in the plan shown in Table 4-2 (see below) needs to trickle down to lower levels as conditions stipulate. In addition, Appendix 3 contains proposed guidelines for the preparation of Participatory Land Use Plans at local level.

Principal factors that shall be considered in assigning uses of land in the basin are taken from observations of existing socio-economic, physical and environmental situation, past and current challenges and anticipated future needs and perceived negative impacts of the current natural resource consumption levels and expected damage to the environment likely to be caused by the proposed investment projects in the basin. In addition, Watershed classes identified in 2009, land use recommendations and patterns of deforestation and erosion have contributed to the determination of the broad land uses in the basin.

Table 4-2: Proposed Broad Land Use Zoning in the Basin

Land Use Planning Category	Description of Current Situation	Area (ha)
Small Settlements	• Small settlements, usually headquarters of wards or major centres within TA • Have no land use plans	2,102
Major Settlements	• District towns or other lower level urban areas • Have some limited land use planning	2,465
Mixed Uses	• Areas surrounding major settlements • Areas with generally high population density but also significant agricultural activities • No land use planning in practice	13,632
Moderate farming	• Moderate slope areas • Medium agricultural activities • Scattered trees within cultivated areas • No land use planning in practice	166,177
Intensive Farming	• Lowland or flat areas with high rates of cultivation • Includes lake plain where irrigation farming is common • No land use planning in practice	106,536
Village Forest Areas	• Medium to steep areas • Scattered trees or low tree cover • Some areas should be utilized for agro-forestry • Areas requiring co-management • No land use planning in practice	97,433
Forest Reserves/Protected Areas	• Gazetted forests usually in hilly areas • Environmentally fragile areas • Areas requiring co-management • No land use planning in practice	9,800
Other uses (river and road reserves)	This category is not shown on the Land Use Plan as it constitutes small spaces along rivers and roads	26,155
Total		424,300

Notes: (a) Protected areas that go beyond the basin and water bodies have not been included. (b) Some surrounding major settlements but are outside the basin have been included (Kyela, Tunduma and Ihanda). (c) Above land use categories are proposed in the Land Use Plan shown in Figure 4-4

4.6.2 Features of the Land Use Plan

The main land use planning principles in the two countries require that preparation of any spatial plan should have involvement of all key stakeholders including the local communities themselves. In addition, the basic approach of preparing a regional land use plan, according to the consultations done with district councils in Tanzania, stipulate that the process should start at village level, then moving to the district level and finally at regional or sub-regional level. In the current situation, no attempt has been made to prepare village land use plans which should have provided inputs into the district plans. Therefore, only broad land use categories are proposed based on what is described in Section 4.6.1, with the main categories being: forest reserves/protected areas, village forest areas, intensive farming, moderate farming, mixed uses, major settlements, small settlements and water bodies. The detailed description of the SRB Land Use Plan is contained in Table 4-2 while Figure 4-4 shows the recommended broad land use zones for the basin.

At local level, communities are in a better position to understand and allocate land for various uses according to local current and future needs and physical and environmental characteristics. Participatory land use plans will therefore be expected to be prepared based on the proposed guidelines as contained in Appendix 3.

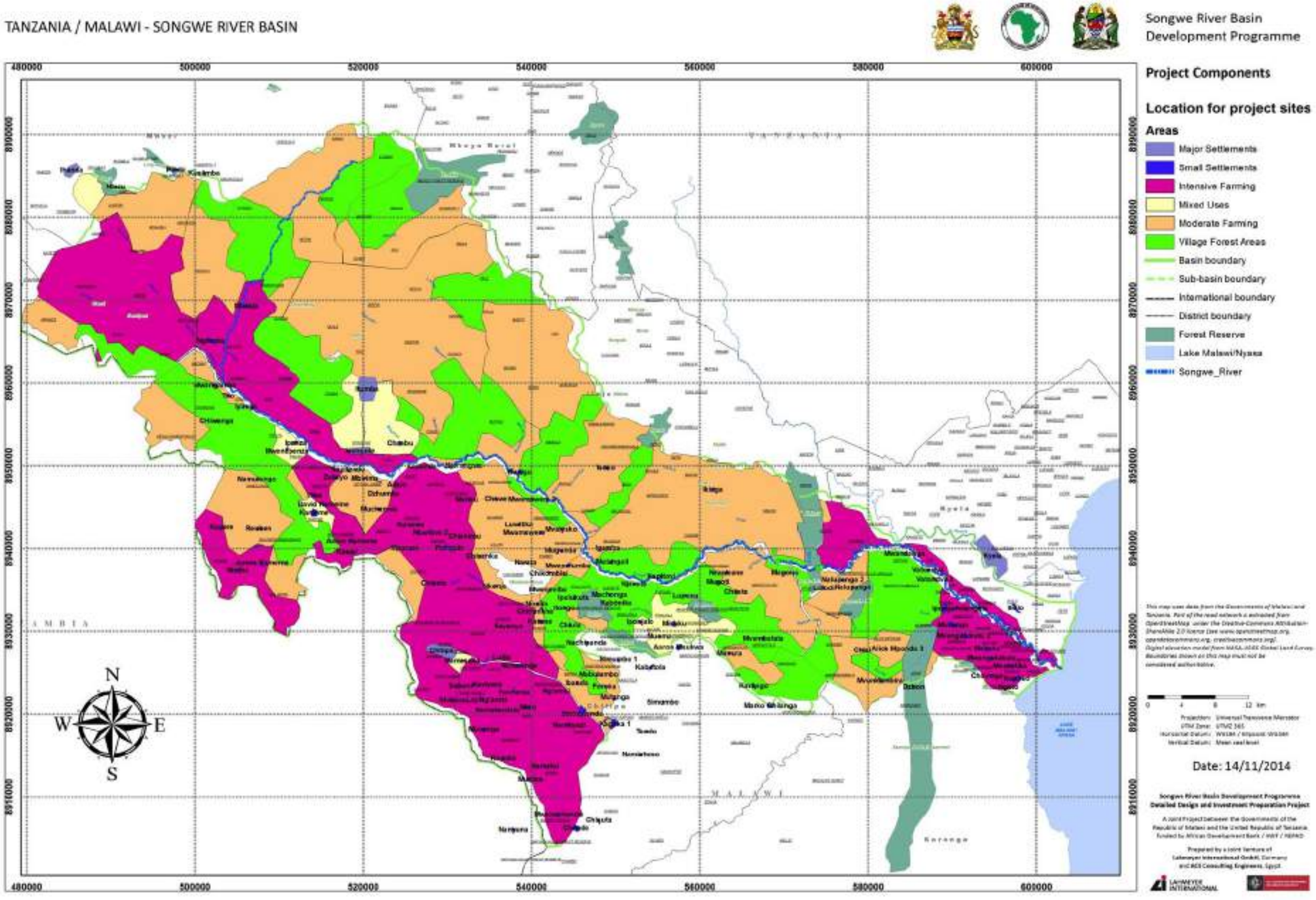


Figure 4-4: Broad land Use Zoning for the SRB

4.7 DETERMINING THE NATURAL RESOURCES MANAGEMENT PLAN

Management of natural resources should be integrated in all development endeavours within the basin and beyond. The sustainable utilization of natural resources demands that consumption levels should not exceed rates of replacement or regeneration. Another dimension of natural resources management focuses on rates of population increase which if not managed results in more people exerting pressure on available resources against rates of reproduction. Another critical element in this sector is the availability and reliability of alternative energy sources such as electricity and paraffin for lighting and cooking among the basin population.

As already noted in the Economic Development Sub-Programme, trading in forestry products contributes to the overall basin GDP. The basic area of attention therefore is exploring alternative sources of livelihoods to replace or reduce rates of the charcoal and timber businesses.

5 PROPOSED NATURAL RESOURCE AND LAND USE MANAGEMENT PLAN

The Natural Resources Management and Land Use Sub-programme, like the two other SRBDP Sub-programmes, is expected to have a 10 year planning horizon. Some interventions proposed for the basin have impacts which will not immediately be felt while others will have immediate impacts. As a basin plan, it is critical that interventions and strategies should be well integrated to ensure that they address the basin challenges in a coordinated approach.

5.1 FORESTRY OPTIONS

Areas of interventions in forestry and natural resources are diverse. As already noted, human activities are a major driver to environmental degradation. Sustainable use of natural resources demands that current needs should be reconciled with future needs. Internationally, sustainable development requires:

- That changes to the general environment should not exceed the self regulating capacity of nature
- The renewal and protection of natural resources and natural systems

It must therefore be noted that eco-systems can handle a certain degree of disturbance but that significant amounts of deforestation, overgrazing and opening of new farm land will disturb the nature's ability to regulate itself and will result in erosion with devastating effects on the system and people's lives. Interventions in forestry shall involve intensifying management, conservation of existing forests and reforestation of previously forestry areas. These proposals will require very strong commitment and sacrifice by all stakeholders to achieve the intended goal. Details are provided in the following discussion.

5.1.1 Management

In line with the legislations of the two countries, management of natural resources is slowly being transferred to local communities through the Community Based Natural Resource Management (CBNRM) approach. As seen in Appendix 4, forests and protected areas are owned and managed by central government, district councils and communities in the two countries. Specifically, all protected forest reserves in Malawi are restricted areas (no go zones) and Central Government through District Forestry Offices is responsible for management. There are however many other forests that are being co-managed by the communities and government through district offices.

Management of forest reserves in Tanzania is done through Joint Forestry Management or Participatory Community Forestry Management. Participatory Forestry Management has been adopted as an official strategy that allows for wide participation of stakeholders in forest resource management and it has three main policy objectives:

- Improved forest quality, through sustainable management practices;
- Improved livelihoods through increased forest revenue and secure supply of subsistence forest products;
- Improved forest governance at district and village levels through effective and accountable resource management institutions (Ref. Participatory Forest Management in Tanzania: 1993 – 2009)

A brief overview of the forestry sector in both countries shows that management of forestry resources is facing serious challenges as listed below:

- Encroachments through opening of gardens
- Bush fires which result in destruction of most vegetation
- Low funding for carrying out patrols and inadequate equipment to fight bushfires
- Low staffing levels and most of the available staff lack necessary skills
- Charcoal burning and timber theft

A report on Community Based Natural Resource Monitoring in Tanzania shows that implementation of PFM is faced with many challenges, some of which are:

- Delayed signing of the Joint Management Agreements
- Cost-benefit sharing mechanisms under JFM not operational
- Insufficient and unsustainable funding of PFM activities
- Inadequate staff/human resources
- Realizing real and substantial economic benefits from PFM
- Poverty among participating community
-

Challenges identified in both assessments show that there is a need for concerted effort at all levels to ensure that the forests are protected for the benefit of the current and future generations. Protected areas need to be considered as national, district even community assets and require participation of all people in their management. It is therefore strongly recommended that joint management or participatory community forestry management should be adopted for all forests in Malawi and Tanzania except where the concerned forest is privately owned.

In response to the above challenges and the desire to contribute to effective management of natural resources in the Songwe River Basin, the SRBC, in conjunction with respective district councils and sector departments is obliged to facilitate the following forestry management activities:

(a) Facilitate the formation of new and strengthen the existing forestry management committees in the basin
(b) Facilitate capacity development initiatives at local, district, regional and/or national levels for staff directly involved in managing forest reserves
(c) Facilitate the formulation and review of existing forestry management bye laws to be more effective and relevant to current situation
(d) Identify resources for procurement of equipment for conducting joint patrols of forest reserves
(e) Assist in the formulation of guidelines for the sharing of benefits from forestry reserves

5.1.2 Conservation

(a) Proposed Interventions in TA Kameme in Chitipa District

It is recommended that areas that were identified as priority conservation areas in 2004 should be considered for significant interventions under the broad Songwe River Basin environmental conservation. Area marked on Figure 3-3, which is named after TA Kameme in Chitipa District has the following environmental issues and challenges:

- High rates of deforestation: Figure 3-3 shows that an area of about 5,623 ha around Kameme in Chitipa was facing serious cutting down of trees.
- Moderate to critical rates of erosion: It is also estimated that about 4,545 ha in this area was exposed to erosion (Figure 3-3).
- The area is characterized by small sized crop fields under rain-fed and monoculture farming system.
- Open woodland in the surrounding hilly areas

Integrated natural resource conservation strategies and interventions are proposed to be implemented in the targeted area under TA Kameme as shown in Figure 6-2 which is the locations of the proposed projects under NR&LUM. The main activities are described below:

- Tree planting along the stream: It is recommended that trees be planted along Henga River within a 30m buffer through community participation. In addition, the hilly area covered by open woodland should also be planted with trees to improve tree cover and reduce soil erosion. This activity should also involve community participation.
- Improvement in agricultural practices: The farming communities in and around this area should be encouraged to adopt modern farming technologies such as the following:
    - Establishing vetivar hedge rows
    - Contours and box ridges
    - Agro-forestry and multiple cropping

- On water conservation, it is recommended that farmers should be trained in low cost rain harvesting technologies such as construction of small earth dams and in-situ technology (where water is collected right in the crop fields).

(b) Proposed Interventions Around Ilomba and Haraka in Mbozi District

The main purpose of undertaking this forestry conservation intervention is to address deforestation that is taking place around the major water sources in this area. According to the assessment done under SRCTMP, this was identified as a conservation priority area because it was experiencing deforestation and, being a source of the Songwe River, this is a major concern. Mbozi District Council is already implementing some conservation activities through participatory forestry management with funding from the parent ministry and DANIDA. The SRBC will complement these interventions by supporting the following activities within Iyula and Nyimbili Wards (about 19,610ha):

- Management and protection of water sources through the following activities:
  - Strengthening of natural resources management committees and establishing new ones where they do not exist
  - Training of management committees at local, ward and district levels so that they are able to carry out their duties
  - Equipping enforcement structures so that they are able to discharge their functions effectively
  - Strengthening of by-laws for the management and protection of the environment. Lessons from the SRCTMP should be drawn for use in these areas.
  - Discouraging river bank cultivation and promoting the planting of trees in those places that are experiencing environmental degradation. This should be done through involvement of communities
  - Promotion of bee keeping as a source of income for communities around the catchment area
- Sharing of benefits from forestry and related products such as timber, firewood, mushrooms, water and herbal medicines
  - Drawing up strategies for sharing benefits of forestry products among community members
  - Introducing and promoting bee keeping in the forest reserves as an income generating activity for the communities

(c) Proposed Conservation and Afforestation around the Lower Songwe Reservoir and Dam

The Lower Songwe reservoir is recommended to have a buffer zone of about 200m. This will be a protected area and no human activities such as settlements and farming will be permitted. However, the area needs to have a proper and effective management structure that will ensure that the strategies recommended are implemented accordingly. Observations show that there are no settlements in the proposed buffer zone, which presents an opportunity because conservation measures will not result in direct negative

impacts on human habitat. The investments in this area will be owned and managed by the SRBC in collaboration with the responsible district councils in the two countries. Specifically, the following management arrangements are proposed:

- It is highly recommended that the 200m buffer zone around the reservoir should be controlled and managed by the SRBC.
- The forestry area beyond the 200m buffer should be co-managed by surrounding communities and the SRBC through two committees (one from each side of the dam). This will promote ownership and instil a sense of responsibility in the way its resources should be utilized.
- Undertake phased reforesting activities around the dam as follows:
    - Areas that are not affected by excavation of soil should be reforested beginning 2016
    - Areas that will be excavated but have trees should be brought to its original state by end of the dam construction. This requires intensive tree planting efforts to be led by the SRBC and concerned district councils
    - Management of the planted trees should be undertaken throughout the dam construction period and the communities should be engaged on these activities.
- The dam site and its surrounding areas should be spatially planned in order to regulate what types of land uses should be permitted on each parcel of land. This spatial planning should also involve the communities so as to ensure that their needs are well understood and accommodated (See Appendix 3 for guidelines).

All the environmental conservation interventions proposed in this document will require detailed assessment and analysis to establish the following:

a) The actual size of the targeted land to be affected by the proposed afforestation and management of trees
b) The type and number of trees to be planted in each environmental conservation area
c) The estimated cost of undertaking the intervention and identifying sources of funding
d) Identification of already existing interventions in the target areas and propose how they can be reconciled with the suggested strategies in order to achieve complementarity and integration
e) Implementation framework of the proposed interventions and defining the role of each stakeholder (forestry, agriculture, water, district councils, communities and SRBC).

It is in this regard therefore that the SRBC should have within its structure key persons who will directly coordinate all environmental and natural resources management issues for the basin because this is a central pillar of the SRBDP.

5.1.3 Use of Forestry Products

One of the critical factors that contribute to the unsustainable use of natural resources including forestry products is the inequitable distribution of benefits accruing from the concerned natural resources. Ostrom (1999) asserts that forests are an example of common pool resources that are characterized by difficulty of exclusion and generate finite quantities of resource units so that one person's use subtracts from the quantity of the resource available to others. This therefore brings the need that beneficiaries should take responsibility and ownership of forests surrounding their communities. However, governments often strive to convince other stakeholders to take full responsibility and participate in conservation efforts of forestry resources because communities, among others, tend not to appreciate the benefits of their contributions. The sharing of benefits is often skewed in favour of governments. Studies have shown that, where communities are disillusioned by unfair sharing of natural resource benefits, they tend to become complicit in the destruction of the subject resources. Both the Tanzanian Forest Act of 2002 and the Malawi Forestry Policy recognize that forestry benefits should be ploughed back into the communities where these forests are located, but the challenge comes into the spotlight when other players such as beneficiaries of timber harvesting concessions take centre stage. Enforcement of agreements becomes problematic and communities do not get realistic benefits as expected.

Principles of Successful CBNRM

After analysis of cases in Botswana, Namibia, Zambia and Zimbabwe, a general consensus has been built that the following principles are key to successful performance of CBNRM programmes:

- The resources should have measurable value to the community: This will assist in determining whether benefits of managing the resources exceed costs.
-
- Those communities living in close proximity with the resources should receive higher benefits than those who do not.

- The community or group that lives with the resources should also be the same as the group that makes the decisions over the resource and the same as the group that benefits.

The analysis also concluded that smaller groups are more likely to effectively manage their resources than bigger groups (Source: Community–Based Natural Resource Management Manual).

In light of the above guiding principles, it is recommended that the SRBC should assist in the formulation of a transparent, equitable and cost based sharing of forestry and forestry products among all participating stakeholders in the planning, management and control of natural resources and forest reserves in particular within the Songwe River Basin.

Benefits from forestry are both for immediate and long term. The existing forests have immediate benefits whose access should be reconciled with long term ones. Therefore, while communities may immediately start reaping benefits, it is advisable that attention should be drawn towards the long term benefits of their efforts. The guidelines are proposed to be prepared with full involvement of communities and shall first apply in the forest reserve around the source of Songwe River and thereafter will be adapted and rolled out to other forests. It must be stated that formulation, approval and implementation shall be done in consonant with the countries' policies and legislations.

5.2 RAIN-FED FARMING

5.2.1 Overview of Rain-fed Agriculture

Farming activities in the basin are largely rain-fed and on a subsistence level. As a largely agricultural basin, it is imperative that specific measures be developed and or enhanced to support farming activities. An assessment of the Malawi side of the basin shows that farming is fragmented with land parcels of mostly less than 2ha. The situation on the Tanzanian side is the same. The baseline sample survey shows that sizes of farming parcels ranged from as low as 0.1ha for Kyela District to as high as 10ha for some households in Chitipa District. With the increase in the basin population, land fragmentation will continue and farming parcels will continue getting smaller and smaller.

The reality of rain-fed farming on people's livelihoods is that it is very unreliable. Any disruptions in the pattern and amount of rainfall negatively affect overall agricultural productivity. Subsistence farming is closely associated with unsustainable use of land and general environmental degradation. Practical and effective strategies need to be formulated and promoted whose ultimate goals are to increase production and achieve sustainable use of land and land based resources. Interventions focusing on rain-fed farming shall be carried out in the context of soil and water conservation strategies because they are complementary as shown in Table 6-3. Interventions aimed at improving agricultural production in general are proposed for all districts in the basin. However, interventions for specific areas in the basin shall be agreed upon by the SRBC (once it is established) and the respective district councils. Table 5-1 is an overview of recommended actions in the agriculture sector.

Table 5-1: Proposed Projects and Programmes in Agriculture

Item No.	Main Activity	Strategies	Responsible Authority	Implementation Period
1	Improvement in agricultural extension services	Facilitate training of extension workers and promote their retention in farming communities through incentives.	District Agricultural Offices and SRBC	2016 – 2025
		Facilitate training of lead farmers		
		Training farmers in farm management skills		
2	Improvement in agricultural marketing services	Establishing farmer groups	District Agricultural Offices and SRBC	2016 – 2025
		Facilitate farmer /buyer linkages		
		Establish markets		
3	Improving access to credit	Facilitate establishing farmer groups	District Agricultural Offices and SRBC	2017 – 2025
		Strengthen farmer groups		
		Facilitate farmer/financial institutions linkage		
4	Improvement in soil fertility and reduce soil erosion	Promote agro-forestry activities	District Agricultural Offices and SRBC	2016 – 2025
		Promote better land husbandry		
		Encourage farmers' use of composite manure		
		Facilitate supply of farm inputs		
5	Climate change adaptation in agricultural practices	Planting fast maturing crop varieties Planting water resistant crops Practice conservation farming	District Agricultural Offices and SRBC	2016 - 2025

5.2.2 Implementation of Interventions in Agriculture Sector

The implementation of the above interventions together with those proposed in the other sub-sectors is aimed at achieving efficiency so as to increase production on the same piece of land. Implementation of the recommended strategies will be done mainly by district agriculture staff in all districts. However, the SRBC will take a lead role in the identification of sources of funding and also facilitating the actual implementation. This will indirectly prevent the opening of new farmland but directly contribute to increased incomes for the farmers in the basin.

Therefore, it is recommended that the SRBC should have an agricultural unit that will coordinate implementation of these interventions. Specifically, the unit will perform the following functions among others:

- Identify sources of funding for the proposed interventions
- Linking with districts that want to undertake specific interventions in border areas
- Facilitate training of agricultural extension staff
- Assist in identifying markets for agricultural products
- Facilitate the supply of agricultural inputs
- Monitor the impact of these interventions

5.3 IRRIGATED AGRICULTURE

Irrigated agriculture is concentrated in the lower parts of the basin. However, some parts of the middle and upper basins do practice irrigation farming on a relatively low scale. Notable irrigation schemes in the basin are shown in Table 5-2 below.

It is not easy to propose strategies for promoting irrigated farming in these districts because water is very limited and the Lower Songwe Dam can only irrigate land downstream of the dam. There may be some potential if other water resources projects, such as the Middle Songwe Dam, were to go ahead, but further studies would be required to establish if there is any potential to increase the amount of land irrigated. It is now established that the previously proposed Kaseye Irrigation Scheme in Chitipa is not a feasible development and therefore the major irrigation developments will be those of the LSRT and LSRM schemes in Karonga and Kyela Districts. The SRBC, in conjunction with the respective district councils, is therefore tasked with the responsibility of selecting already existing small scale irrigation schemes and identifying ways of supporting activities in those schemes within the 10 year SRBDP period.

In addition, the two irrigation schemes of Sasenga and Ikumbilo/Chitete which span two districts of Mbozi and Ileje have been included in the proposed project to consolidate and formalize land tenure. More details on land consolidation and formalization are contained in Section 3.11.4.

Table 5-2: Existing Irrigation Schemes in the Basin

District	Name of Scheme	Type of Irrigation	Hectares Irrigated	Crops grown
Chitipa	Chiwula	Gravity	8	Maize, tomatoes, vegetables, shallots
	Namwafi	Gravity	10	Maize, tomatoes, vegetables, shallots
	Mwakasole	Gravity	10	Maize, tomatoes, vegetables, shallots
	Chipakama	Gravity	10	Maize, tomatoes, vegetables, shallots
	Luwawa	Gravity	10	Maize, tomatoes, vegetables, shallots
	Mwafongo	Gravity	8	Maize, tomatoes, vegetables, shallots
Mbozi	Ikumbilo/Chitete[#]	Gravity	270	Maize and Paddy
	Sasenga[#]	Gravity	540	Paddy
Kyela	Ngana	Gravity	209	Paddy
	Mwaigoga	Pumping and gravity	58	Paddy and vegetables
Ileje	Ikombe	Gravity	600	Maize, vegetables, beans, and some paddy
	Nguvukazi	Gravity	50	Maize, vegetables, beans, and some paddy
	Mkombozi	Gravity	20	Maize, vegetables, beans, and some paddy
	Jikomboe	Gravity	420	Maize, vegetables, beans, and some paddy
	Azimio	Gravity	50	Maize, vegetables, beans, and some paddy
	Muungano	Gravity	50	Maize, vegetables, beans, and some paddy
	Jitegemee	Gravity	45	Maize, vegetables, beans, and some paddy
	Sasenga	Gravity	540	Maize, vegetables, beans, and some paddy

5.4 SOIL AND WATER CONSERVATION

District Councils, through their Agriculture Offices, are already implementing various soil and water conservation measures to control excessive run-off that results in erosion. Implementation of any soil and water conservation strategies cannot be undertaken in isolation. Conservation of trees, practicing sustainable agricultural technologies and regulating use of water from water bodies constitute methods of water conservation and these have to be integrated and done concurrently to achieve desired results.

In this regard, the activities summarized below, most of which are already being done by farmers are intended to achieve broad objective of sustainable utilization of natural resources with the ultimate purpose of increasing agricultural production:

- Pegging and construction of marker ridges
- Marker ridge reinforcement with vetivar grass to reduce soil erosion
- Construction of brush wood check dams in order to reclaim gullies
- Soil fertility improvement practices like agro forestry technology
- Terracing and trenching, especially in marginal areas such as most parts of Mwenemisuku in Chitipa, where most of the land is marginal
- Contour ridging along the contour marker ridges
- Construction of water tanks
- Promotion of stream-bank afforestation
- Making and applying both compost and animal manure to the gardens

5.5 WATER RESOURCES MANAGEMENT

5.5.1 Integrated Water Resources Management (IWRM)

Basic principles of water resources management demand that water should be managed in an integrated manner. As a finite resource, water needs to be managed through consideration of the following:

- It is vulnerable and yet essential resource
- Multi-sectoral management
- Recognition of central role of stakeholders, especially women
- Social and economic resource (Source: Donkor, S.M.K. and Y. E. Wolde).

Debate is inconclusive on whether to treat water as a common good or an economic good. It is for this reason that national governments, especially in developing countries, have maintained subsidies on water supply. However, the notion of water being a vulnerable asset raises strong appeal to treat it as a tradable commodity whose access should attract a fee. Water in the Songwe River and the entire catchment needs to be used sustainably and this brings into the limelight procedures of sharing its use between and among communities in the basin.

As a social good, water in the basin is accessible to all communities for domestic uses without any limits but the need to balance between commercial and domestic users and upstream and downstream consumers needs proper strategies. The balance in water use between the projects proposed under DDIP-SRBDP has been analysed. The impact of the Lower Songwe Dam is that, in addition to the production of hydropower, water is available for the development of over 6,000 ha of irrigation in the lower part of the Songwe River Basin (LSRT and LSRM schemes) and for the two proposed Water Supply Schemes of Kasumulu and Songwe Towns.

In order to balance and maintain harmony among the listed water related investments and balance the river morphology and ecosystem, the SRBC will have a huge responsibility in the water management and will be in constant contact with communities. The SRBC will develop an effective communication strategy for use by all water users and the general public on the following aspects:

(a) Maximum daily discharge for irrigation water for both schemes
(b) Maximum daily intake of water fed into the supply network for Kasumulu Centre
(c) Daily maximum discharge into the river system for both dry and rainy season to maintain its normal flow
(d) Daily maximum volume of water supplied towards electric power generation

Currently, the implementation of the major water based investments will not bring conflicts in water use between hydro production and the irrigation and water supply because the water for irrigation and water supply shall be delivered after the hydro power station has released.

All these water uses call for harmonization of systems and procedures to ensure that equilibrium is maintained. In addition, communities downstream of the dam will be keen to take advantage of the more stable and regulated flow of the Songwe River by engaging in water related ventures such as construction of fish ponds, irrigation and other water related industrial activities. Such needs will require proper consultations to be undertaken and the SRBC and the concerned district councils should be pro-active in devising strategies of managing such water needs. As an organization that will manage the Songwe water resources, effective collaboration with the Lake Nyasa River Basin Board on the Tanzanian side and the Northern Region Water Board on the Malawi will be paramount.

The economic aspect of water brings into the limelight the expected returns of investments in water related ventures. It is therefore recommended that strategies should be put in place so that beneficiaries of irrigation scheme infrastructures should contribute a fee towards the supply and maintenance of facilities through the water users associations and/or irrigators associations.

5.5.2 Rain Water Harvesting

Rainfall in the upper basin ranges from less than 1000 mm in most parts of Kameme to about 1400 mm a year in the hilly parts of southern Mbozi and Rural Mbeya Districts. In the absence of rainfall recording stations in these parts, rainfall figures, approximated to be higher than those of Kameme, are based on topography and vegetation cover. The assessment of runoff from all tributaries of the Songwe River completed during the Update of the 2003 Feasibility Study shows that it is generally moderate as evidenced by moderate rates of soil erosion. Rainwater harvesting is common in arid or semi arid areas where annual rainfall rarely go up to 600mm. Therefore rainfall amounts in upper basin are generally adequate for rain-fed cropping.

The basic use of harvested water in this context is for irrigation farming; therefore, it is prudent to consider only those areas whose soils are appropriate for irrigation agriculture. Based on the above situation, it is suitable that rainfall harvesting activities should be initiated in some parts of Kameme and Mwaulambya in Chitipa District and southern parts of Ileje District.

There are various methods of rainwater harvesting which may be considered in the basin. Rainwater harvesting for crop production is composed of a run-off producing area (catchment area) and a utilization area (cropping area) (Hatibu and Mahoo 1999). Specific physical characteristics of the area such as slope, soil type and depth and the proposed use of the harvested water determine the type of water harvesting method to be used for each location.

A thorough assessment needs to be undertaken to recommend the appropriate water harvesting technologies suitable for each area. The sites proposed in Table 5-3 are recommended for rain water harvesting purely for irrigation purposes.

Table 5-3: Proposed Water Harvesting Sites in the Basin

No	District	Ta/Ward	Stream/River	Area (ha)
1	Ileje	Mbebe	Hanteseya	8,506
2	Ileje	Mbebe	Mtima	
3	Chitipa	Mwabulambya	Kakoma	3,622
4	Chitipa	Kameme	Henga	

The SRBC should facilitate studies in the above areas to determine the type of small scale reservoirs/dams that may be constructed to support irrigation farming. This task will heavily rely on full involvement and input from respective agriculture offices in the two districts and local knowledge.

5.5.3 Supply of Potable Water

The status of water supply in the basin has already been explained in the Community Development Sub-Programme. It is however, worth emphasizing that access to potable water is at core of the SRBDP. The SRBC should facilitate further studies on the access to potable water by undertaking the following specific tasks in conjunction with respective water supply institutions in the basin:

- Carrying out studies on rural centres that are proposed to be supplied with piped water in terms of population, estimated length of water supply network, size of water tanks and estimated costs
- Identifying reliable water sources which can be used for each centre; a major assessment of groundwater potential has been proposed as part of the SRBC Business Plan and is important in sourcing water supply schemes across the SRB.
- Assisting in the design of water supply schemes
- Facilitating identification of funding sources in conjunction with beneficiary district councils
- Facilitating rehabilitation of non-functional boreholes in conjunction with respective district councils

5.6 WILDLIFE AND TOURISM

Wildlife in Mbozi District is concentrated in the natural forest habitat. The black and white colobus monkeys are mainly found at Ilomba forest which is within the Songwe River Basin. Other abundant wild animals include velvet monkeys, greater kudu and a significant number and variety of bird life.

Kyela District has a high potential for wildlife. Hippos, crocodiles, monkeys, bush pigs and others are found in forests and along the lake. Also, birds of different species, such as flamingo are found in the district. The abundance of hippos and crocodiles along the shores of Lake Malawi/Nyasa can highly impress and attract tourists and woo potential investors to establish game sanctuaries within the area.

As part of the DDIP-SRBDP project, a report on Water Related Social Infrastructure has been prepared, which includes a section on Tourism Development. The assessment identifies the potential within the SRB itself, but also extends to the immediate surrounding areas to take advantage of interesting tourist attractions in the vicinity and thereby extend the SRB tourist potential. The tourism potential in the Songwe River Basin lies not just within the basin boundary but the existing linkage of the basin and the surrounding areas including travellers who cross the border from Malawi/Zambia to Tanzania through the Songwe/Kasumulu border. Potential areas of interest are mainly related to eco-tourism, though the Lower Songwe reservoir has some potential for day use as a man-made attraction. A strategy has been prepared for SRBC intervention in tourism development.

5.7 SETTLEMENTS

5.7.1 Proposed Settlement Pattern

The classification of settlements in Tanzania is different from that of Malawi. It will therefore be unrealistic to prescribe any settlement pattern in the Songwe River Basin. Settlement planning is also beyond the mandate of the SRBC, as it is primarily an integrated water resources management organisation. The existing towns and small urban centres will continue to operate as designated in each country, overseen by the existing administration. However, with investments being earmarked for the basin, new development nuclei will form around the dam and hydropower scheme and this potential new settlement needs to be planned in advance to be able to accommodate future growth demands.

For purposes of ease of identification, however district headquarters will operate as District Towns while other urban settlements are called secondary towns. Others are merely trading centres, with or without public services or facilities and having no specified minimum population. Examples of these settlement types are given in Figure 5-1.

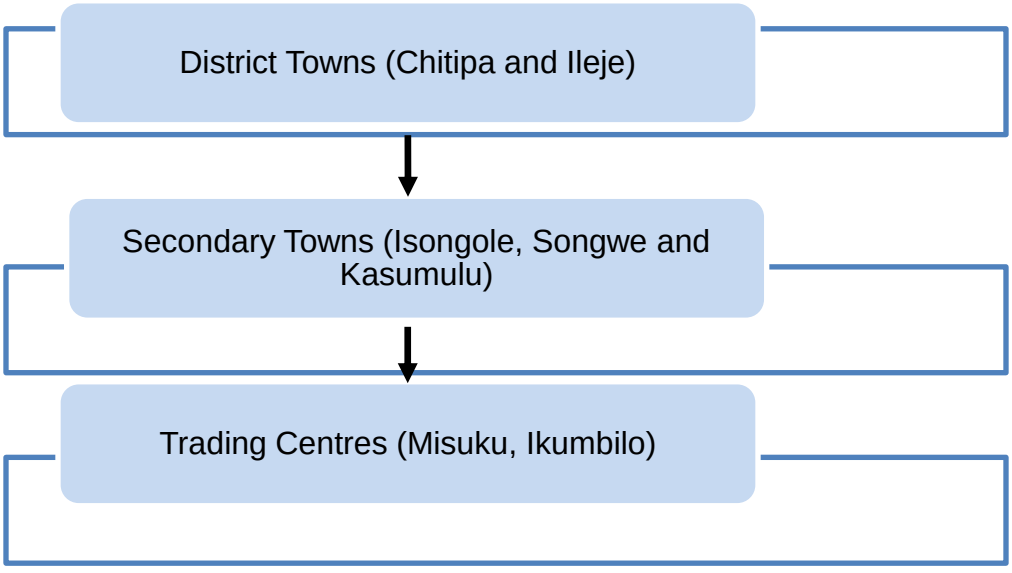


Figure 5-1: Hierarchy of Settlements in the Basin

5.7.2 Allocation of Land for Settlements

As already observed in Section 3.9, almost all rural settlements in Tanzania and Malawi are not spatially planned. This contributes to challenges faced when allocating land for settlements. As such, community leaders do practice an ad hoc kind of planning which assists them to allocate land for various uses in rural settlements. Therefore, in the absence of formal land use planning at the local level, it is unreasonable to recommend procedures for accessing land for settlements in the basin. However, challenges in the land use and management sector do exist on both sides of the basin as new settlements are being established on marginal land and often encroach into protected areas. This situation calls for the need to prepare some guidelines to control such practices. Generally, it is recommended that land for settlements should be made available based on the following consideration:

- Existing settlements should be consolidated and nucleated to achieve efficient use of land
- Allocation of land for any new settlements should be justified by a thorough assessment of the need to do so and whether or not such a need cannot be accommodated within existing settlements
- Community leaders should discourage scattered settlements as it has been observed that provision of services becomes a challenge to such scattered communities
- Villages should be encouraged to prepare simple land use plans for their villages to guide allocation of land uses
- Village leaders should promote participatory decision making on allocation of land for settlements and other uses.

5.7.3 Conclusion on Settlement Patterns

Settlements pattern in the SRB needs to be developed but this is a task beyond this assignment. Therefore, it is recommended that the SRBC should facilitate the preparation of a hierarchical settlement pattern for the basin in collaboration with the respective district councils. The ordered settlement pattern will define the type and level of services and facilities that can be provided not only with direct funding of SRBC but will also act as a guide for general investments with funding from other agencies. In this way, the overall purpose of balanced and equitable growth of the entire basin shall be achieved.

In this regard, it is recommended that the SRBC should have a land development and management specialist within its structure whose responsibility among others will be to coordinate the preparation of the overall land use plan as recommended in Section 4.6.2.

5.8 LAND MANAGEMENT INFORMATION SYSTEM

5.8.1 Introduction to Land MIS

In simple terms, a land information management system is a means to acquire, manage, retrieve, analyse and display land records for a particular area. It is a complex process that requires linking together spatial data such as maps and non-spatial information such as land ownership records. This linkage facilitates and simplifies access of land information such as land use zoning, land ownership, land rents and land prices among others using a common platform and this promotes decision making by major stakeholders.

The SRB has GIS based maps while other land based information is mainly in form of tables. These can easily be converted and applied spatially throughout the basin. Specifically, the NRLUM Sub-Programme has spatial data on land uses, land cover and maps showing proposed project sites which need to be put in the overall geo-data base for the SRBDP. The same principle can also be applied to projects in other components.

5.8.2 Recommendation on SRB Land MIS

Preparation of a comprehensive land information management system for the basin is being developed as part of the overall MIS for the SRB. This is associated with the SRBC Business Plan and is presented in that document. A GIS based management of land and other information is an essential tool for decision making and it is for the benefit of the two governments that all the maps for the SRB are GIS based.

The DDIPP-SRBDP has generated large volumes of spatial data which need to be properly managed for future use. This together with existing land information from previous projects and studies are being harmonized and put together by the GIS and Auto Cad experts to form a SRB MIS, of which land management is a part. All maps in the GIS data base have already been standardized and are using UTM Coordinate System such that manipulating them will be easy.

Once the SRBC is in place, it should have GIS experts to maintain the MIS. The MIS should take in data that is generated by the District Offices as well as those data generated by the SRBC itself. Therefore, it is highly recommended that the District Offices should ensure that all data sets be maintained in formats that will be easy to use such as shape files and geographical database files. Data in these formats can easily be accessed using open source geo-data processing software. It is also proposed that the first task of the SRBC GIS specialists be to carry out an assessment of methods being used by the districts to manage land based information in order to link and standardize it within the SRB system.

At an institutional level, it is strongly recommended that the SRBC should have an expert in geographical data base management whose main responsibilities will be to manage all the data, collect information and update data base and support district councils in the

usage of the available information. These activities will complement the land formalization project as recommended in Table 6-2 and procurement of up to date spatial data for production of maps as recommended in Section 3.2.4. Therefore, it is strongly recommended that land use planning, cadastral surveying and land titling proposed in the above project should act as a starting point for developing a comprehensive land management information system for the SRB.

The GIS experts of the DDIP-SRBDP have developed all geographical data in GIS format and developed an MIS that is user friendly to ordinary computer users. There will need to be a managed transition to the SRBC which will eventually be responsible for coordinating the SRB developments.

6 CONCLUSION

6.1 SUMMARY OF THE NR&LUM FRAMEWORK

6.1.1 Introduction

One of the tasks under the Natural Resources and Land Use Management Programme is to design a framework for the management of natural resources within the basin. The critical natural resources for the basin which form the core of the SRBDP are land, forests, water and fisheries. The framework for Natural Resources and Land Use Management is shown in Figure 6-1.

The main aim of the framework is to ensure that there is a balance between natural resources consumption rates and production/regeneration levels so as to balance the ecosystem. Strategies of sustainable use of natural resources cannot be designed under one programme. There is therefore a need for concerted and integrated efforts involving all stakeholders such as local communities, district councils NGOs and all non-state actors such as entrepreneurs to come to full understanding of the human and natural activities that lead to natural resources depletion.

Figure 6-1: Natural Resource and Land Use Management Framework

6.1.2 Major Natural Resources

6.1.2.1Land

This is the foundation for all human activities and its use needs to be properly managed. As a basic resource, all land uses need to be planned based on current and future needs, socio-economic characteristics of the population, carrying capacity, soil types and general landscape including the physical terrain.

6.1.2.2Forests and Forestry Products

The contribution of forests in balancing the ecosystem is very critical. Wanton cutting down of trees that leaves land bare contributes to soil erosion and this has a negative effect on agricultural production. Deforestation unfortunately is happening in areas that are water sources and this is affecting water supply. Serious measures need to be undertaken to reforest critical areas of the basin such as steep slopes and water sources.

6.1.2.3Water

This is a natural resource that is also central to human survival. Drying of rivers is happening due to various reasons such as excessive siltation caused by erosion, low rainfall and general disturbance in the entire catchment from human activities such as poor agricultural practices including river bank cultivation.

6.1.2.4Fisheries

Low water levels, disturbance of fish breeding grounds and use of inappropriate fishing methods are some of the causes of depletion of the fish resources in the lake and other water bodies. Sustainable fishery practices need to be developed and implemented in order to control the current high levels of depletion. Fishery management in the SRB covers both wild fish, found in the Songwe River and its tributaries, as well as in Lake Nyasa / Malawi, and farmed fish. Fish farming can aid in reducing the overfishing problem that is evident in both the lake and the river and tributaries. Fisheries development is a component of the DDIP-SRBDP project, under the Water Related Social Infrastructure, which is reported separately.

6.1.3 Impact of Population Pressure on Natural Resources

A critical element worth considering in the Songwe River Basin and its entire ecosystem is population growth. Rates of population increase need to be lower than rates of natural resources regeneration and also lower than the rate of economic growth for any area or region to witness sustainable development. This helps to maintain a socio-economic, ecological and environmental balance. Therefore, population growth for the SRB needs to be manageable and sustainable in the medium and long term so that efforts being proposed now should have a positive impact for the future generations.

The realization of the aspirations of the Songwe River Basin population as outlined in the Shared Vision 2050 will need full participation of all players, especially women who make up a larger percentage of the population through various interventions proposed in all three sub-programmes. Interventions addressing high population growth as contained in the Community Sub-Programme will contribute significantly to managing the entire environment. The framework shown in Figure 6-1and Table 6-1 stresses participatory management and balanced use of natural resources and land use planning principles that focus on local needs and contribution.

Table 6-1: Natural Resource and Land Use Management Framework

Main Natural Resources	Sub-category of Uses	Strategies	Responsible Authority	Key Stakeholders
Land Use	Agriculture	• Agro-forestry practices • Soil and water conservation farming • Promoting use of compost manure • Participatory land use planning	District Councils	▪ Agriculture Dept ▪ NGOs in agriculture sector ▪ Farmers ▪ Agro-inputs suppliers ▪ SRBC
	Settlements	• Promoting nucleated settlements • Participatory land use planning • Discouraging establishment of new villages	District Councils	▪ Lands and Housing ▪ Agriculture Dept ▪ Local Communities ▪ NGOs in the sector ▪ SRBC
Forests	Management	• Review of bye-laws on sharing of forestry products • Review and strengthen FMC • Capacity building for key forestry stakeholders • Enforcement of bye-laws through PFM	District Councils	▪ Forestry & Natural Resources ▪ Local Communities ▪ NGOs ▪ SRBC
	Harvesting (Timber, Charcoal and firewood)	• Regulate use of charcoal • Promote use of alternative energy sources	District Councils	▪ Forestry & Natural Resources ▪ Local Communities

Main Natural Resources	Sub-category of Uses	Strategies	Responsible Authority	Key Stakeholders
		• Subsidize electricity installation for the basin population		• NGOs in the sector • SRBC
	Conservation	• Planting trees in steep slopes • Forests conservation (preventing bush fires and encroachments)	District Councils	▪ Forestry & Natural Resources ▪ Local Communities ▪ NGOs in the sector ▪ SRBC
Water	Domestic use	• Declaring water sources as protected areas • Capacity building for water committees • Discouraging river bank cultivation • Planting trees in river banks	District Councils	• Water Boards/Depts • Water Committees • NGOs • SRBC • Local Communities • Forestry & Natural Resources
	Irrigation	• Water harvesting • Capacity building of water users committees • Training in water conservation methods • Reforesting water sources	District Councils	▪ Irrigation Dept ▪ Agriculture Dept ▪ Forestry Dept ▪ WUA's ▪ Local Communities ▪ NGOs in the sector ▪ SRBC
Fisheries	Breeding and production	• Introduce fish breeding technologies among communities • Promote integrated fish farming • Promote fish feeds production	District Councils	▪ Fisheries Dept ▪ Fisheries Research Institute ▪ Local Communities ▪ SRBC
	Management and harvesting	• Enforce use of legal fishing methods only • Strengthen beach management committees	District Councils	▪ Beach Management Committees ▪ Fisheries Communities

Main Natural Resources	Sub-category of Uses	Strategies	Responsible Authority	Key Stakeholders
		• Capacity building for key fisheries stakeholders • Enforce fishing activities in natural water bodies		▪ Fisheries Dept ▪ SRBC

6.2 SUMMARY OF SPECIFIC PROJECTS

Several interventions have been proposed focusing on natural resource management in general and specific projects and programmes are recommended in forestry management, afforestation, soil and water conservation and improvements in agricultural productivity with the overall goal of achieving sustainable development. The lower basin has a specific project falling under the Lower Songwe River Stabilization Project which will focus on reforesting the 60m buffer on both sides of the river from the Kasumulu Bridge to the lake.

6.2.1 Projects Justification and Linkages to Environmental Issues

Table 6-2 is an outline of specific projects and their justification in the context of existing natural resources and environmental management challenges reported in the Songwe River Basin.

Table 6-2 Project Justification & Linkage to Environmental Issues

Proposed Project	Justification	Linkage to Specific Environmental Issues
Catchment Area Protection	• Address deforestation • Prevent encroachments into water sources and other protected areas • Mbozi District Council already implementing similar interventions and need to be replicated and expanded	• Songwe River has its source around this area. As a protected area, it is necessary to enforce conservation measures • This was also an area identified for environmental conservation prior to 2004
Integrated Soil and Water Conservation Project	• Area already identified in 2004 as a conservation priority area • High levels of soil erosion and deforestation reported • Projects to also cover banks of Henga River (one of major tributaries of Songwe)	• Most of the environmental problems identified prior to 2004 are still prevalent as shown in Table 2-6 • The SRCTMP produced positive results but had limited spatial coverage. Need to cover other areas experiencing environmental degradation
Land Tenure Formalization in Irrigation Schemes	• Main target is to enable small scale farmers have secure ownership of land • This will motivate them to invest on the land • These small scale farmers will have strong and reliable bargaining tools when accessing credit	• The community prioritizes participatory land management plans • Land in irrigation schemes will undergo land readjustment which needs to be properly managed through formalization (See Table 4-1)
Improved Forestry Management	• Both countries have already adopted participatory approach to forestry management • Community priorities include reduction of deforestation and wildfires • Weak enforcement of forestry regulations need involvement of stakeholders at all levels	• The Joint Forestry Management practices need to be enhanced as reflected in Appendix 4 • The community aspires to have strict adherence to legislations and regulations as seen in Section 4.3
Studies on Rain Water Harvesting and Assessment of Irrigation Schemes	• Communities in the upper basin will not benefit from initial irrigation projects funded through SRBC. It is necessary to explore ways of improving agricultural production through existing schemes	• Sustainable utilization of natural resources requires an integrated approach to farming activities • Rain-fed farming is unreliable and irrigation farming is the alternative to increasing agricultural production (See Section 5.2.1 for more details)

	• Need to identify any potential to increase irrigable land in the 3 districts (Mbozi, Ileje and Chitipa)	

Table 6-3 below is a list of the types of projects earmarked for the Songwe River Basin under the Natural Resource and Land Use Management Sub-programme covering a period of 10 years.

The map in Figure 6-2 locates the proposed projects in cases where they are spatially oriented. Table 6-4 is the proposed implementation arrangement for the specific projects.

Appendix 5 is a summary of proposed project costs estimates. These are likely to change depending on local conditions. The costs estimates are based on specific project activities whose details will be worked out at detailed project design stage.

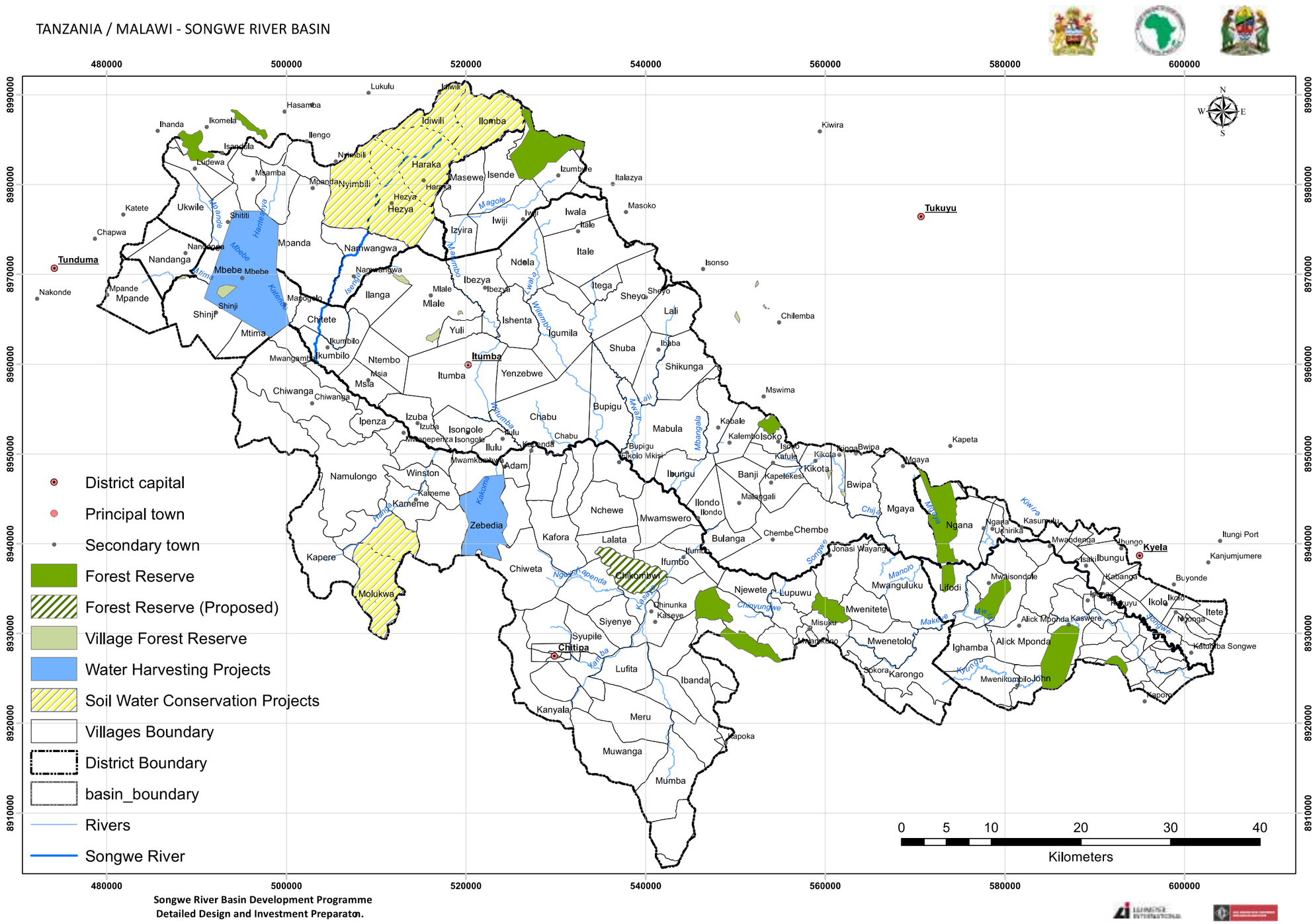


Figure 6-2: Location of Proposed Projects under NR&LUMSP

Table 6-3: Type of Projects and Locations

Project	Target Sector/Area	Ward/TA	District
Improvement of Forestry Management including formulation and review of by laws	Umalila Forest Reserve	Iwiji and Ilembo	Mbeya
	Ntanzu Forest Reserve	Isandula and Ihanda	Mbozi
	Mughese Forest Reserve	Mwenemisuku	Chitipa
	Nambatata Forest Reserve	Mwakaboko	Karonga
Land Tenure Formalization in Irrigation Schemes	Lands Sector: LSRM, LSRT, Sasenga and Ikumbilo/Chitete	Various	Kyela, Karonga, Mbozi and Ileje
Integrated Soil and Water Conservation	James Kameme and Nimbo villages	Kameme	Chitipa
Catchment Area Protection	Ilomba, Haraka and Hezya Villages	Iyula and Nyimbili	Mbozi
Conservation and Afforestation	Around Lower Dam	Ikinga, Mwenemisuku and Mwakaboko	Ileje, Chitipa and Karonga
Support to Irrigation farming	4 existing schemes (2 in Chitipa District, 2 in Ileje/Mbozi Districts)	To be identified later	Chitipa, Mbozi and Ileje
Support to rain water harvesting	Hanteseya and Mtima Rivers; Henga and Kakoma Rivers	Mbebe, Mwaulambya and Kameme	Ileje and Chitipa

Note: Project activities under improvement of agricultural production, including implementation schedule are appearing in Table 6-3.

Table 6-4: Specific Projects Implementation Arrangement

Project Description	Specific Activities	Source of Funding and Cost Estimate	Responsible Authority	Implementation Period
Land tenure formalization in Irrigation Schemes	• Registering existing land parcels • Planning irrigation schemes • Cadastral Surveying of land parcels • Land titling (registration)	Development partners, SRBC and District Councils **($513,200)**	SRBC, Regional Governments and District Councils	2018 - 2021
Improvement of forestry management	• Formation of new FMC and strengthen the existing ones • Capacity building at all levels • Formulating and reviewing existing forestry management bye laws and community sensitization • Procurement of equipment for conducting joint patrols • Review and formulate guidelines for sharing of forestry products	Development partners, SRBC and District Councils **($670,000)**	SRBC and District Councils	2016 - 2019
Integrated soil and water conservation Combined with Fertility Management for Rainfed Maize Production (Target population: 3,634)	• Tree planting along Henga river (30m buffer) • Reforesting the hilly areas • Agro-forestry and multiple cropping • Train farmers in in-situ water conservation	Development partners, SRBC and District Councils **($4,600,000)**	SRBC and District Councils	2019 - 2021
Catchment Area protection	• Sensitization meetings • Tree planting along Songwe River	Development partners, SRBC and	SRBC and District Councils	2018 - 2020

Project Description	Specific Activities	Source of Funding and Cost Estimate	Responsible Authority	Implementation Period
(Target population is 23,865)	• Bee keeping • Review or formulation of bye laws	District Councils **($632,200)**		
Conservation and reforestation around the lower dam site	• Tree planting around the buffer • Tree management	Development partners and SRBC	SRBC with assistance from District Councils	2018-2025
Support to irrigation farming activities	• Assess 5 existing irrigation schemes and identify ways of supporting them	Development partners and SRBC **($73,100)**	SRBC with assistance from District Councils	2020-2021
Support to water harvesting activities (Target population is 2,657 (Malawi) and 8,100 (Tanzania)	• Facilitate studies to determine the type of small scale reservoirs/dams to be built	Development partners and SRBC **($73,100)**	SRBC with assistance from District Councils	2020-2021

NOTE: (a) Cost estimates for tree planting and associated activities around the dam shall be done under the Environmental Management Plan which will address negative environmental impact of dam construction
(b) Costs for Integrated Soil and Water Conservation excludes costs for agricultural inputs as proposed in the SRBC Business Plan

Although all proposed interventions fall under specific sectors at district councils, it is recommended that the following projects and activities should be undertaken directly by the SRBC while sector departments will only provide logistical and other administrative support:

- Human resource and institutional capacity building for the following sectors: Forestry and Natural Resources; Land Use and Management; Water; Agriculture and Irrigation. This should be done in all districts in the basin. Further details shall be worked out by the SRBC in conjunction with beneficiary councils.
- Land Tenure Formalization including institutional support towards this project at regional level (Mbeya Regional Office and Regional Lands and Housing Office in Malawi) in the following areas:
    - Procurement of 2 sets of modern survey equipment with necessary software including hand held GPS's
    - Procurement of 2 A0 plotters and 2 high performance laptops
    - Procurement of utility vehicles

    - Carrying out aerial photography for the whole basin to assist in future planning
- Studies to assess 5 small scale existing irrigation schemes and identify ways of supporting them.
- Study to assess possibility of water harvesting along Hanteseya and Mtima Rivers in Ileje; Henga and Kakoma Rivers in Chitipa
- Tree planting and management in the buffer around the lower dam

More details on the specific projects are contained in the SRBDP Business Plan.

The projects and programmes listed below will directly be undertaken by respective sectors at district councils and the SRBC will only provide technical and financial support as appropriate:

- Improvement of forestry management
- Integrated soil and water conservation
- All agricultural projects and programmes listed in Table 5-1.

6.3 RISKS AND SUSTAINABILITY

Any project or programme intervention is faced with risks that may affect the impact of the intervention and potentially derail the overall rate of implementation. Implementation of projects in a basin spanning two countries is likely to be challenging and sources of risks are many. The risks outlined below are considered to have high negative impacts on the projects:

- Financial inflows for the SRBC will start coming in about six years from the decision to go ahead and implement it. This implies that most of the proposed projects will rely on other sources of funding. Inadequate funding is a significant risk that may affect the success of projects.
- Capacity, both human and institutional, is another area that could also retard project implementation.
- Lack of high level political will: As trans-boundary projects, certain decisions will be made by high level political bodies such as national parliaments. For this to be achieved, high level commitment is required.
- Cooperation of local and district stakeholders needs to be high in order to register success in such spatial projects
- Conflict of laws and policies may also contribute to low success rates of projects and programmes.

Some mitigation measures were already considered at inception of the whole project design and these are:

- Involvement of major stakeholders at all stages of project design. This will help integration of some projects into sector plans
- Prior consultation and sharing of proposed projects with prospective donors and development partners
- Each government needs to publicize the projects under the SRBDP within concerned sectors and prioritize them in national development strategies and public sector investment plans
- Political will needs to be attained at highest level and this could be achieved at the time cooperation agreement (Convention) will be discussed by the highest decision making bodies of the two countries

The underlying assumption, however, remains that these projects will be implemented successfully because they are central to the overall goal of the SRBDP. One of the cardinal pillars of successful project implementation is capacity building. It is therefore recommended that human and institutional capacity building should form an integral part of project activities.

Projects and programmes contained in this document aim at addressing the challenges identified under the sub-sector of land and natural resources during the preparation of the SRBDP Vision 2050. The proposed projects will also complement the two governments' efforts of conserving and preserving the natural environment. In this regard, involvement of all stakeholders at all levels will ensure sustainability of the interventions. Additionally, all project activities need to be incorporated into the routine activities of the major sectors at district councils. The successes of the projects will easily create a momentum for successor projects in the second phase of the SRBDP estimated to run from 2026 to 2035.

6.4 IMPLEMENTATION ARRANGEMENT

6.4.1 Role of Stakeholders

It is highly recommended that various stakeholders should channel their efforts towards supporting these projects. Most of the proposed projects already fit into the mandate of the sectors that are listed below:

(a) Songwe River Basin Commission: As an overseer body, its role will be critical in ensuring that it brings together all stakeholders to participate and contribute fully to the integrated natural resources and land use management in the basin. Basically, the SRBC is expected to lobby for funding from development partners jointly with respective district councils in order to implement the proposed projects
(b) Lake Nyasa Basin Water Board: The Lake Nyasa Basin Water Board is responsible for water resources management and other aspects of water related work, in the watershed flowing into Lake Nyasa from Tanzania, including the Tanzanian half of the Songwe River Basin. This is similar in scope to that of the

SRBC. This offers an opportunity for collaboration and sharing of tasks, but also has the potential to result in conflict and redundancy of tasks. Good cooperation and collaboration between these organisations is essential.

(c) Northern Region Water Board: The Northern Region Water Board has a mandate to provide potable water to the people of its region and also some responsibility for managing the water resources of its region. There is need for collaboration between them and the SRBC for mutual support in projects and in overall management.

(d) District Councils will in general be expected to liaise with the SRBC whenever they want to implement any projects and programmes in the basin with the principal aim of preventing duplications and conflicts. High level collaboration during district plan preparation and implementation will be essential.

(e) Water Department: Focus of this department should be to provide support in identifying water harvesting sites and providing technical knowledge to communities that will be targeted under this intervention.

(f) Agriculture Department: In collaboration with Water Department, Agriculture Department is very crucial in ensuring that farming communities are practicing soil and water conservation techniques while undertaking their farming activities. It is highly recommended that farmers should adopt modern farming techniques in order to improve production on same land parcels.

(g) Forestry and Natural Resources Department: All reforestation and conservation activities will be guided by this department and it is significant that capacity challenges prevailing in this department across the districts should be addressed

(h) Lands Department: Sustainable land use practices, complemented by modern farming technologies will greatly contribute towards sustainable natural resources management. Issues of access to land for all uses, land use planning and surveying therefore need to be undertaken in close collaboration with all major stakeholders including owners/users of the land. It is therefore recommended that land management and administration functions should effectively be decentralized to district level in order to easily reach out to local communities who are likely to be affected by various interventions in the basin.

Non-Governmental Organizations: These should be encouraged to become involved in undertaking various capacity building initiatives at the local level. Most projects will adopt a community based approach and NGOs are known to have a high level ability to mobilize communities. This is an attribute which the SRBC and the District Councils should build on to ensure success in project implementation.

6.4.2 Funding Arrangements

As seen in Table 6-3, funding is expected to come from a number of sources. The SRBC will take a leading role in identifying funding for the proposed projects and to act as manager for those projects. District councils also have their own budget lines but these are rarely adequate and it is appropriate that development partners should be brought in to assist in closing these funding gaps in the respective sectors. As for the specific

projects in this document, it is recommended that the SRBC and district councils should come up with specific projects sites and beneficiary target groups. Costs shown in Table 6-3 for individual projects are estimates. Detailed costing will be done at later stage upon getting more details about the status of proposed project sites and other variables from the concerned districts.

6.4.3 Monitoring and Review of the Programme

Each project will have specific targets and monitoring indicators. These will be designed after carrying out a thorough assessment as indicated. However, being a 10 year programme, it is recommended that three evaluations and reviews be done after 3 years, 6 years and at the end of the programme to assess challenges and suggest ways of overcoming them and also to provide input for future programmes. Table 6-4 below is a monitoring and review framework guide for the proposed projects. It is recommended that detailed baseline surveys for each proposed project be carried out to provide the basis for reference. At that point, therefore specific verifiable indicators shall be quantified for easy monitoring. In addition, a detailed assessment of the proposed projects' impacts on the environment in general and socio-economic well being of beneficiary communities in particular shall be carried out by the SRBC as an implementing agency. Each project will be subjected to annual monitoring to assess performance.

Table 6-5: Monitoring Guide for Projects

Name of Project	Overall Objective	Activities	Results	Time Frame	Verifiable Indicators
Land Tenure Formalization in Irrigation Schemes	Formalize land tenure	Capacity building	Competent staff	2018/2019	No. of staff trained
		Procurement of office equipment	Efficient and effective delivery of services	2019/2020	No. of equipment bought
		Assessing existing land ownership	High value property	2020	Register of land owners
		Planning the farming parcels		2020	6 Land use Plans
		Surveying the farming parcels	Secure land tenure	2020	Survey drawings
		Registering farming parcels		2020-2021	No. of land titles
		Project management	Efficient use of resources	2018-2021	Progress reports
	Improve the management	Formation of new and strengthen existing FMC's	Effective FMC's	2016	No. of FMC reviewed and formed

Name of Project	Overall Objective	Activities	Results	Time Frame	Verifiable Indicators
Improvement of Forestry Management	of forest reserves	Capacity building for forestry stakeholders	Competent and result oriented staff and stakeholders	2017	No. of people trained
		Review of forestry bye laws	Reduction of deforestation and bushfires	2018	New bye laws
		Procurement of forestry equipment		2018	No. of equipment bought and frequency of patrols
		Project management	Efficient use of resources	2016-2019	Progress reports
Integrated Soil and Water Conservation	Conserve water and reduce soil erosion	Tree planting and management	Reduced soil erosion and tree covered river buffer	2020-2021	No. of trees planted and those survived
		Train farmers in modern farming technologies	High agricultural productivity	2020	No. of farmers trained
		Train farmers in low cost rain water harvesting		2020	No. of farmers trained
		Establish FMC	Vegetation around hills	2019	No. of FMC's established
		Project management	Effective use of project resources	2019-2021	Progress reports

Name of Project	Overall Objective	Activities	Results	Time Frame	Verifiable Indicators
Catchment Area Protection	Reforest and protect the Songwe River Source and its catchment	Carry out sensitization meetings	Reduced encroachment of protected areas	2018	No. of sensitization meetings
		Planting of trees and management	Tree cover in the catchment	2019-2020	No. of trees planted and those survived
		Introduce and promote bee keeping	Increased incomes	2018	No. of bee hives
		Review or formulation of bye laws		2018	New bye laws
		Carry out patrols	No incidents of bushfires	2018-2020	Frequency of patrols
		Project management	Effective use of project resources	2018-2020	Progress reports
Studies on Rainwater Harvesting and Assessment of Irrigation Schemes	Assess potential for water harvesting and status of irrigation schemes	Carry out stakeholder consultations	Stakeholders' recommendations	2020	No. of meetings and stakeholders
		Prepare study report on rain water harvesting	Project proposals	2021	Study reports
		Prepare assessment report on 5 irrigation schemes	Recommendations on effective irrigation scheme management	2021	Assessment reports

Name of Project	Overall Objective	Activities	Results	Time Frame	Verifiable Indicators
			Potential projects in irrigation farming		
		Project management		2020-2021	Progress reports

7 REFERENCES

1. CERED (2012). Agroforestry Technologies Manual: Trainer's Guide. CERED Services Ltd, ISBN 978-9982-9942-2-6
2. Chafota,J. 2012. Integrated Natural Resources Management in a dynamic Trans-boundary Watershed Context: The Songwe River Catchment Experience, WWF
3. Chiuta M. T. and Johnson S.2010. Songwe River Trans-boundary Catchment Management Project (Tanzania-Malawi) Final Evaluation Report
4. DDIP-SRBDP, 2014, Strategic Environmental and Social Assessment Final Report
5. DDIP-SRBDP, 2014, Update of the 2003 Feasibility Study, Final Report
6. Donkor, S.M.K. and Y. E. Wolde, (No date). Integrated Water Resources Management in Africa: Issues and Options, United Nations Economic Commission for Africa
7. FAO (2013). Atlas of Malawi Land Cover and Land Cover Change 1990-2010
8. FAO, Water Harvesting Techniques: Accessed on www.fao.org dated 27/09/2014
9. Forest Act 2002. Government of the United Republic of Tanzania
10. Hatibu, N. and H. Mahoo (1999). Rainwater harvesting technologies for agricultural production: Acase for Dodoma, Tanzania
11. Konguka, G. O. (2013). Land Consolidation and Settlement Reorganization, the Rwanda Context, Conference Paper, Presented at Annual World Bank Conference on Land and Poverty, The World Bank, Washington DC, 8-11April 2013
12. Malawi National Land Policy (2002), Malawi Government
13. Ostrom, E. (1999) Self-Governance and Forest Resources, Occasional Paper No. 20: ISSN 0854-9818
14. Nyongesa, L.N. (2012) GIS Based National Land Information Management System, FIG Working Group, Rome, Italy 6-10 May 2012
15. Participatory Forest Management in Tanzania:1993 – 2009
16. Payne, G. (2000) 'Urban Land Tenure Policy Options: Titles or Rights? ', World Bank Urban Forum, 3-5 April 2000.
17. Peters, P.E. and D. Kambewa (2006) 'Whose Security? Deepening social conflict over 'customary' land in the shadow of land tenure reform in Malawi', IRD, Montpellier, May 2006.
18. Ventura, S.J. (1997) Land Information Systems and Cadastral Applications, *NCGIA Core Curriculum in GIScience*, Accessed on:http://www.ncgia.ucsb.edu/, Date: 26/11/2014
19. WWF Project Document (2004). Songwe River Trans-boundary Catchment Management Project
20. WWF (2006). Community–Based Natural Resource Management Manual, Wildlife Management Series, NORAD
21. WWF (2013). Tanzania Natural Resource Forum, Community Based Natural Resource Management: Stocktaking Exercise in Tanzania

22. WWF (2010). Community Based Natural Resource Management: Stocktaking Assessment in Malawi
23. WWF (2006). Community Based Natural Resource Management Manual

NATURAL RESOURCES AND LAND USE MANAGEMENT SUB-PROGRAMME

APPENDICES 1 THROUGH 5

APPENDIX 1

Table A1-1: Land Cover Changes in Malawi

Classification	Chitipa Boma	Kameme	Kilupula	Mwabulambya	Mwakaboko	Mwenemisuku	Grand Total
Bushland	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%
Grassland	0.0%	0.0%	0.0%	2.7%	0.0%	0.9%	1.3%
Inland Water	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.1%
Inundated Grassland	3.0%	5.5%	0.0%	5.1%	0.0%	0.0%	3.3%
Natural Forest	0.0%	0.0%	0.0%	0.3%	0.0%	8.6%	1.6%
Plantation	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.2%
Rainfed Cultivation	97.0%	64.4%	28.9%	73.3%	26.0%	81.3%	64.4%
Swamp	0.0%	0.0%	4.2%	0.0%	1.4%	0.0%	0.4%
Vegetation of Sands	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%
Woodland	0.0%	30.1%	64.6%	18.1%	72.6%	9.2%	28.7%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Norplan 2003 Land Uses and Land Cover
Songwe Atlas 2004 (Summarized Land Use Classes)

Table A1-2: Summarised Land Use in Malawi

Land Use	Chitipa Boma	Kameme	Kilupula	Mwabulambya	Mwakaboko	Mwenemisuku	Grand Total
Agriculture (planted)	27.2%	9.9%	27.9%	11.0%	16.0%	4.7%	11.1%
Bare	18.9%	3.3%	5.7%	1.7%	0.5%	0.3%	1.9%
Built-up	6.3%	0.1%	0.6%	0.3%	0.1%	0.3%	0.3%
Bushland (with grass)	5.6%	22.8%	16.3%	22.9%	15.6%	22.7%	21.6%
Forest/Myombo (green)	0.1%	12.9%	2.9%	4.8%	11.5%	21.1%	18.1%
Grass (dry& green)	27.0%	4.7%	3.4%	16.4%	4.4%	3.3%	9.4%
Myombo (dry)	14.8%	45.0%	43.0%	42.6%	51.4%	46.3%	44.8%
Water body (river)	0.0%	0.0%	0.2%	0.1%	0.5%	0.3%	0.2%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: The Songwe Atlas, 2004

Note: The inclusion of fallow land was considered to be problematic in this analysis and it is therefore added under category of agriculture. The main reason is that fallow land is mostly agriculture and it is left uncultivated to regenerate. The period may be just for one year and if it coincides with period of aerial data capture, it could be misleading to have it as a separate category.

APPENDIX 2

Table A2-1: Major Land Uses and Land Cover on Malawi Side of the Basin 2010

Major Land Cover	Chitipa	Kameme	Kilipula	Mwaulambya	Mwakaboko	Mwenemisuku	Total (%)
Rain fed herbaceous crops	32.1	35.9	16.6	41.6	2.8	20.4	30.4
Urban and rural settlements (with cultivation)	50.8	0.1	0	0.2	0	0	2.1
Rice fields	0	0	14.5	0	7.2	0	1.6
Water bodies, dambo and wetlands	0	0	2.5	0	0.9	0.1	0.2
Cultivated dambo	13.3	1.1	5.6	1.2	4.8	0	1.7
Tree and shrub savanna	0	2.5	0	1	0	6.8	2.1
Open woodland with herbaceous layer	0.9	35	21.3	33.2	37.6	14.5	30.3
Open woodland with cultivation	2.8	20.9	37.4	12.5	46.1	50.4	26.3
Broad leaved deciduous trees closed (60-70%)	0	0	0	0.1	0	6.8	1.2

Source: Atlas of Malawi Land Cover and Land Cover Change 1990-2010, FAO (2012)

APPENDIX 3

Guidelines for Preparation of Participatory Land Use Plans

A3.1 INTRODUCTION

A Land Use Plan is basically a spatial framework showing what land use activities are acceptable in a particular segment of a clearly defined area such as a ward, district or region. A land use plan therefore consists of a map indicating various land uses recommended for each area in spatial terms and statements of policies supporting or describing the land uses and procedures of undertaking any development within each land use area. A Participatory Land Use Plan (PLUP) is one which follows the approach of full community participation in the development of the Plan.

The two impact sites of Mabula in Tanzania and Ifumbo in Malawi under the SRTCMP have participatory land use plans which were prepared as one of the sets of tools for the management of natural resources in the basin. As a plan prepared through participatory approach, consultations were done at all levels and greater input was obtained from the communities themselves. A number of lessons are worthy emulating and replicating to other sites where projects impacts under the current SRBDP are anticipated to be high.

The guidelines contained in this document have given due consideration to the existing policies and laws regulating land use planning in both countries and have also consolidated the approaches adopted during the preparation of the land use plans for Mabula and Ifumbo villages in the Songwe River Basin.

A3.2 LAND USE LEGISLATION AND POLICIES IN MALAWI

Preparation of land use plans in Malawi is guided by various legislations and policies. The Town and Country Planning Act 1991 is one of the pieces of legislation in the field of land use planning. The Malawi Land Policy stipulates that the whole country is a planning area, implying that whole breadth and length of the country needs to be planned at all levels. Major provision of the Town and Country Planning Act that has direct implication on these guidelines include Section 26 (3) which outlines the structure and contents of a physical development plan for a district, part of it or parts of more than one district. The primary purpose of land use planning is to achieve optimum use of land and land based resources.

Major provisions in the Malawi Land Policy (2002) that have direct implication on participatory land use plans include the following:

- Land use planning will be extended to all rural and urban land, including freehold, leasehold and customary estates

- Guidelines for rural land use planning, conservation and environment management will be developed by Local Planning Authorities and Community Development agencies to guide rural and urban land use and development decisions.

The Forestry Act of 1997 calls for the involvement of every member of the community in protecting, managing and conserving trees on customary forests and forest reserves to maintain environmental stability. It also advocates for the Community Forestry Management and the transfer of forestry management to district/local councils. This again, is in tandem with the provision of the Local Government Act (1998) which mandates the local councils to perform the function of managing forests and wetlands among other functions.

The National Environmental Policy of Malawi (1996) seeks to promote the efficient utilization and management of natural resources; facilitate the rehabilitation and management of essential ecosystems and ecological processes; enhance public awareness of the importance of sound environmental management and promote cooperation between government, local communities and women groups including NGO's and the private sector in the management and sustainable utilization of the natural resources and the environment. The policy also advocates for the establishment of Village Natural Resource Management Committees.

The National Land Resources Management Policy and Strategy of 2000 provides guidelines on the management of land based resources and the Ministry of Agriculture through the Department of Land Resources Conservation is the implementing agency. The principal objective of the policy is to promote efficient, diversified and sustainable use of land based resources for both agriculture and other uses in order to prevent sectoral land use conflicts and ensure sustainable socio-economic development. This policy though good, has no supporting legislation and this constrain its implementation.

Preparation of a Participatory Land Use Plan for Ifumbo therefore was in line with and fulfilled the requirements and provisions of various policies and legislations in Malawi.

A3.3 LAND USE LEGISLATION AND POLICIES IN TANZANIA

Most of the land in the Songwe River Basin falls under the management and administration of the village councils. According to the Village land Act 1999, in the management of village land, the village council gives due regard to the principle of sustainable development and the relationship between land use, other natural resources and the environment in and contiguous to the village land. Under Section 13 (1) of this act, the village council has the mandate to recommend what types of land use activities are permissible on a particular parcel of land within the village and this becomes a Land Use Plan which essentially is supposed to be approved by the village assembly. Other relevant policies/laws related to land use planning are the Forestry Policy (1998) and the

Forestry Act (2001) both of which encourage and support community involvement in forestry management.

One of the tasks under the Natural Resources Management and Land Use Plan is to prepare detailed land use plans for all villages which will be directly impacted by the programme interventions. The SRBDP is a huge effort that will be implemented over a long period of time. As a programme, its immediate impact is supposed to be at basin level, but it will have district, regional and countrywide impacts. Implementation of this programme will only be achieved through project specific interventions. In this regard, various projects will be formulated whose impact shall be felt beyond the borders of the basin.

It is against this background that it is necessary to look at projects which are already being designed and are expected to anchor the whole SRBDP. Three projects namely; construction of the Lower Songwe Dam and Hydropower Plant, the LSRT (Tanzania) and LSRM (Malawi) irrigation schemes in Kyela and Karonga Districts shall have immediate impacts to the surrounding villages. In addition, the two water supply projects at Kasumulu and Songwe Towns, the small border urban centres in Kyela and Karonga Districts, respectively, will also have some impact on its overall development as an urban centres. Except for Kasumulu and Songwe Towns, the project sites are rural in nature and land use plans need to be highly integrated to reflect this aspect.

A3.4 STEPS TOWARDS LAND USE PLANNING

Steps to be followed when preparing a detailed land use plan include the following:

- Identify the affected villages and draw a sample of 6 villages
- Use the findings from the land use inventory study to establish the land use planning needs for the villages
- Draft a participatory land use plan using resource mapping, transect walks and local knowledge
- Present the land use plan to the District Councils for implementation
- Formulate land use plan monitoring tools for the communities and District Councils

Both countries have legislations supporting preparation of land use plans and it is important to examine in detail specific provisions that outline the steps to be followed.

Based on provisions of the countries' laws and policies and approaches adopted and used during the preparation of Mabula Village (Ileje) and Ifumbo Village (Chitipa) Land Use Plans, the following guidelines are recommended to be used for the areas identified to experience high impacts from the proposed projects.

A3.5 PROCESS OF PREPARING A PLUP

A bottom up approach of planning and managing land and land based resources assumes that the outcome will be acceptable to all stakeholders. However, building consensus is always challenging because of differences in socio-economic and cultural background of stakeholders. Therefore stakeholders need to understand long term benefits of planning in order to fully participate in the processes and ensure implementation of the plans. Figure 3-1 presents a diagram of a typical PLUP process.

A3.6 PROPOSED STEPS IN PREPARING A PLUP

The process of preparing a Participatory Land Use Plan is based on the following basic assumptions:

- Requisite resources (financial, human and equipment) are available
- Consensus is already built at all levels on the need to prepare a land use plan

Conditions differ from one area to the other and the proposed steps given below are meant to be just a guide:

a) Establishing a Planning Team comprising local community members and technical personnel at district level. The technical personnel may be from both structures such as ward/zone and district levels depending on the situation
b) Identification of boundaries of an area to be planned (village or a combination of villages to be planned jointly)
c) Preparation of background documents comprising a brief explanation of existing situation including maps showing existing land uses and socio-economic situation
d) Identification of key issues and challenges that would form the basis for planning
e) Drafting the Land Use Plan and presenting it to the community and sectors at district council for comments
f) Incorporating comments and preparing the Final Draft Land Use Plan
g) Submission of Final Draft Land Use Plan to Village Assembly or Village Development Committee as the case may be for approval
h) Submission of Land Use Plan to District Council for final approval
i) Implementation and monitoring adherence of the Land Use Plan

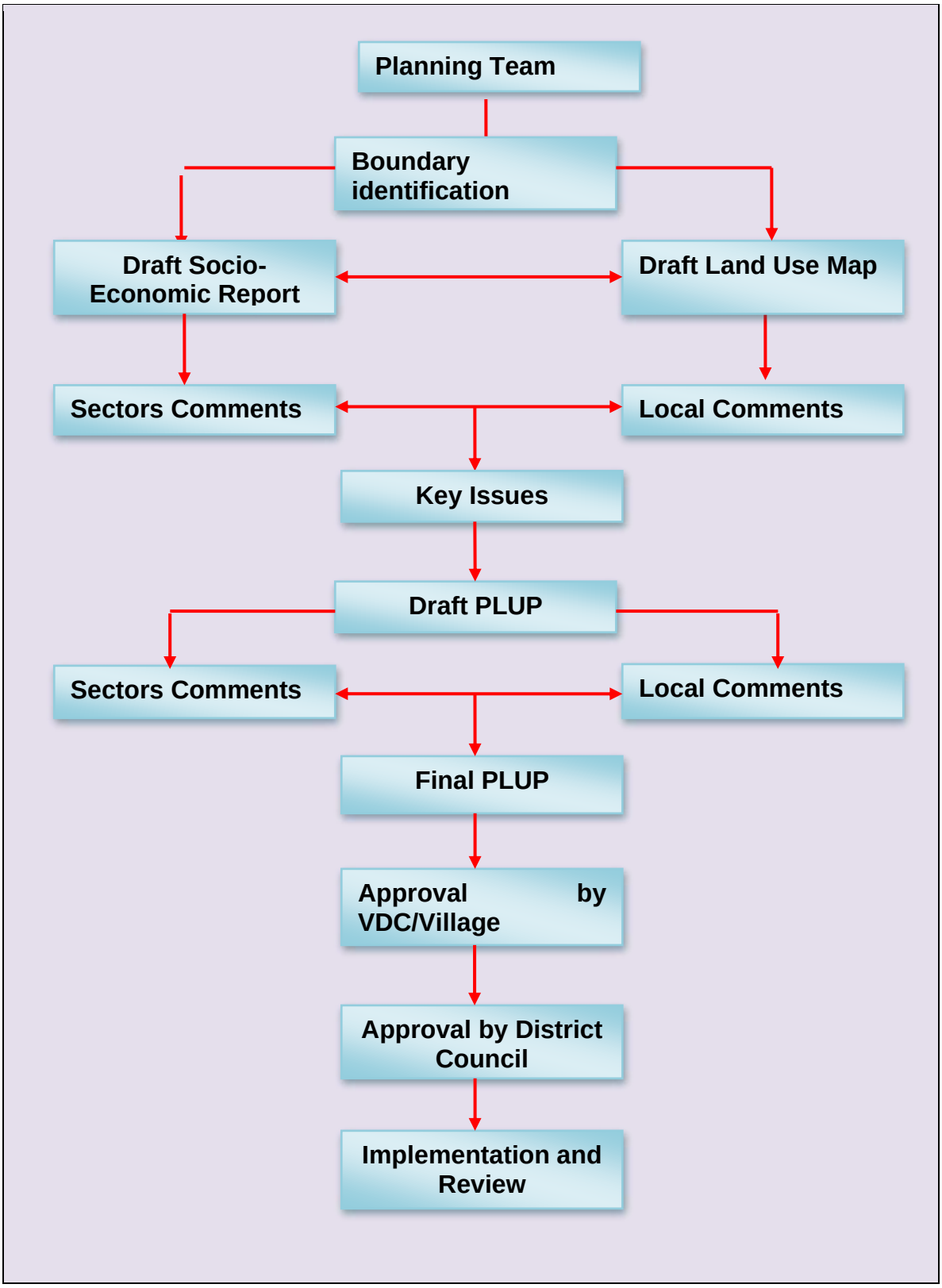


Figure A3-1: Diagram of a Participatory Planning Process

A3.7 STATUS OF PARTICIPATORY LAND USE PLANS

The critical issue of consideration in the whole process of preparing and implementing a Participatory Land Use Plan focuses on the status of such a plan. All legislations that guide the preparation of land use plans in Tanzania clearly stipulate that such plans shall be statutory. Specifically, Sections 45 and 6 of the National Land Use Planning Act (2007) provide for penalties for non compliance of such plans. Every agency and members of the community are therefore legally bound by land use provisions stipulated in the plans.

On the other hand, the current legislation in Malawi on land use planning has a provision for preparation of advisory plans whose implementation is not legally binding in rural areas. However, enforcement of such non-statutory plans rests with the communities themselves. This is an area where compliance may easily be achieved because these plans will be prepared by the communities themselves with technical assistance from the district councils. Enforcement will be guided by necessary bye laws that each village will develop to facilitate implementation of PLUPs.

Integration of all aspects of development and involvement of all stakeholders in the process of preparing a Participatory Land Use Plan in the basin will provide a mechanism and a process in which local communities form an integral part of making decisions concerning uses that could be made of land they occupy or use. In this way, all decisions on optimum use of land and land based resources will be made based on negotiations and reaching consensus on different interests, equity, viability, conservation and sustainability of the basin natural resources (Rangelands Village Land Use Planning in Tanzania, 2013).

From the above scenario, it is not feasible to give a rigid and time specific schedule of each activity in the above process. However, building on the strength of the underlying assumptions, it is estimated that the whole process should last not more than 6 months.

A3.8 INSTITUTIONAL STRUCTURES REQUIRED FOR PLUP

Tanzania already has an institutionalized set up of managing village land. There is therefore a need to replicate some of the functions of the village councils in Tanzania on the Malawian communities. This can be implemented through the existing structures such as VDC and traditional leaders. The VDC shall act as a land management committee with the village head as an advisor. This will be for the purpose of ensuring that provisions of the PLUP are complied with and also to facilitate regularizing land tenure where appropriate. However, the overall procedure and institutional set up is shown Figure 3-1 above.

A3.9 FEATURES OF A PARTICIPATORY LAND USE PLAN

A3.9.1 MAIN CHARACTERISTICS OF A PLUP

Although there are differences in the geo-physical environment and the social and economic status of impact areas, the PLUPs will have similar structure as proposed below:

(a) Purpose and Objectives of the plan
(b) Description of the Planning Area: Statements and maps showing the spatial location in the local, district and regional context
(c) Analysis of the existing situation according to sectors, including prevailing land uses
(d) Analysis of Issues and Challenges for the area and how they are linked to the entire basin
(e) Description of Permitted Land Uses for the Area
(f) Strategies for solving other challenges taking into account community aspirations, and within the context of existing district plans and funding arrangements and or commitments.
(g) Implementation schedule of proposed strategies and monitoring framework
(h) Clearly defined roles and responsibilities of all stakeholders in the implementation structures.
(i) Monitoring, Evaluation and Review of the plan

A3.9.2 MAJOR LAND USES UNDER PLUP

The following categories of land uses are provided as a basis for determining zoning for larger areas. For detailed PLUP's covering small areas, a more elaborate categorization of land uses may be recommended. For purposes of this task, the following land uses are considered to be important in the Songwe River Basin:

- Forest Reserves/Protected Areas
- Village Forests
- Moderate Farming
- Intensive Farming
- Settlements: For land use planning at each nucleated settlement, more land use categories shall be identified and planned such as residential, commercial, mixed use and public/institutional.
- River/Stream/Water body
- Grazing Land

A3.9.3 CONCLUSION

Although the concept of decentralization places strong emphasis on bottom up approach and assigns each local authority to decide how their areas should be planned and developed, the Songwe River Basin as regional area of development is considered as a planning unit. It is highly recommended that there should be close collaboration between adjacent districts in order to achieve socio-economic equilibrium in terms of physical development and natural resources management. Similarly, each planning unit at local level, be it a ward or village needs to consult and get inputs from neighbouring planning units in order to improve integration. These guidelines therefore provide a framework for achieving integrated and participatory land use planning at all levels. An example of a typical land use plan is shown in Figure 3-2.

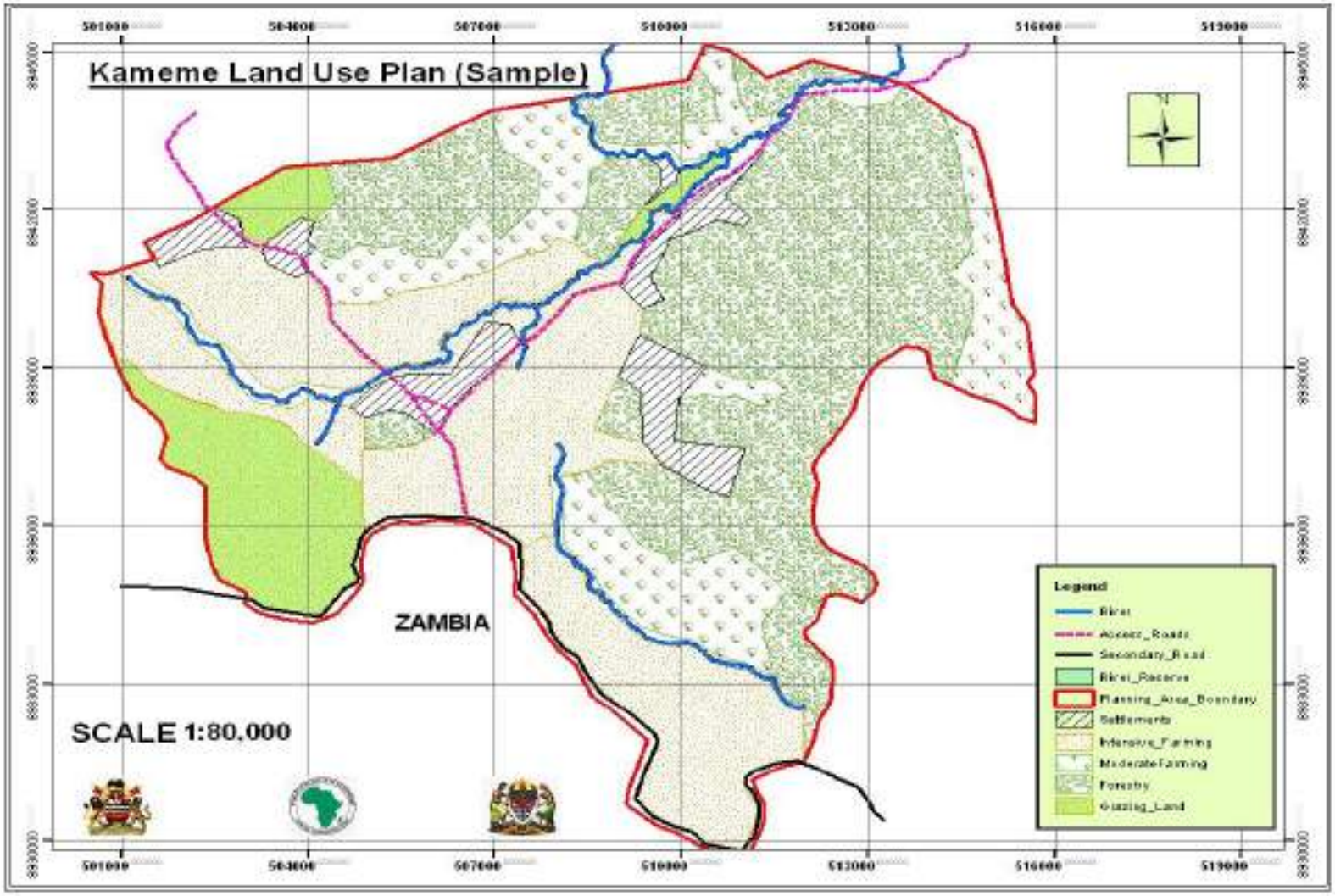


Figure A3-2: Example of a Typical Land Use Plan

A3.10 REFERENCES

1. Village Land Use Planning in Rangelands in Tanzania: good practice and lessons learned, This Issue Paper No.3 is part of the series Making Rangelands Secure, *ISBN: 978-92-95093-83-6* International Land Coalition October 2013
2. The Village Land Act 1999, United Republic of Tanzania
3. The Land Use Planning Act 2007, United Republic of Tanzania
4. Draft Local Physical Planning Operation Manual 2014, Dept of Physical Planning, Malawi
5. The Town and Country Planning Act 1991, Malawi Government
6. Guidelines for Participatory Village Land Use Management in Tanzania,1998, National Land Use Planning Commission, United Republic of Tanzania
7. Draft Land Use Plan for Mabula Village in Ileje District, Tanzania, Price Water House Coopers (2008)
8. Draft Land Use Plan for Ifumbo Village in Chitipa District, Malawi, Price Water house Coopers (2008)

APPENDIX 4

Table 4-1 Forest Reserves Within Songwe River Basin

COUNTRY	DISTRICT	Name of forest	Area		Ward/TA	Management Practices	Challenges	Proposed strategies
			GIS based (KM^2)	Reported (Ha)				
Malawi	Chitipa	Matipa	10.7734		Mwenemisuku	No go zone area, Total protection, Drying wood is the only one to be fetched, encroachment is illegal.	Low staffing levels, Low funding for carrying out patrols, Charcoal burning, Timber theft.	Intensify patrols, Lobby for participatory formation of by-laws
Malawi	Chitipa	Mughese	7.4546		Mwenemisuku			
Malawi	Chitipa	Wilindi	9.4578		Mwenemisuku			
Malawi	Chitipa	Mwabulambiya	21.9974		Mwabulambiya			
Malawi	Karonga	Ighembe	4.8128		Kilipula			
Malawi	Karonga	Karonga north escarpment	83.3432	7,208	Kilipula and Mwakaboko			
Malawi	Karonga	Nambatata	3.6762	344	Mwakaboko			
Malawi	Karonga	Kapembe Hill	9.3042	7,208	Mwakaboko			
Tanzania	Mbozi	Longisonti	3.0492		Isandula&Vwawa	Joint Forestry Management or Participatory Community Forestry Management	Encroachment, Bush fires.	Intensify participatory forestry management
Tanzania	Mbozi	Ntanzu	6.6756	628	Isandula&Ihanda			
Tanzania	Mbozi	Fonera	0.9551		Mlangali			
Tanzania	Ileje	Kajala	1.1468		Ikinga	Joint Forestry Management or Participatory Community Forestry Management	Encroachment, Bush fires, lack of funds, lack of trained staff, Lack of working skills	Intensify participatory forestry management
Tanzania	Ileje	Kasungilo	0.2356		Ikinga			
Tanzania	Ileje	Lusa	0.2744		Ikinga			
Tanzania	Ileje	Ndululu	0.1146		Ikinga			
Tanzania	Ileje	Nachipasi	1.8543		Mbebe			

Tanzania	Ileje	Visenti	0.2032		Mbebe			
Tanzania	Ileje	Njeha	1.0981		Mlale			
Tanzania	Ileje	Shigombola	0.9394		Mlale			
Tanzania	Ileje	Nalupembe		126	Itumba			
Tanzania	Ileje	Kalembo			Itumba			
Tanzania	Ileje	Itale		2,577	Itale			
Tanzania	Ileje	Izuba		1,116	Mbebe			
Tanzania	Ileje	Pimbi		785	Itumba			
Tanzania	Ileje	Mabisi	0.1472		Mlale			
Tanzania	Ileje	Iyondo	8.7173	4,402	Kafule&Sange			
Tanzania	Ileje	Kabulo	30.6376	3,218	Ikinga&Ngana			
Tanzania	Ileje	Kyosa	9.9738		Ngulilo			
Tanzania	Mbeya	Mporoto		9,332	Ijombe&Swaya			
Tanzania	Mbeya	Umalira	41.2845	3,796	Iwiji&Ilembo			
Tanzania	Kyela	Livingstone Ranges		16,054	North of Kyela	Participatory Community Forestry Management	Encroachment, Illegal timber harvesting	To re-demarcate forest reserves, to introduce community participatory forestry in some reserves
Tanzania	Kyela	Kabulo		3,218	West of Kyela			
Tanzania	Kyela	Kigali		2,752	North of Kyela			
Tanzania	Kyela	Kasumulu		2,330	North of Kyela			
Tanzania	Kyela	Ikomelo		2,100	North of Kyela			
Tanzania	Kyela	Busale		1,000	North of Kyela			
Tanzania	Kyela	Masoko		750	North of Kyela			
Tanzania	Kyela	Nakaba		683	North of Kyela			
Tanzania	Kyela	Lugela		550	North of Kyela			
Tanzania	Kyela	Katago		22	North of Kyela			
Tanzania	Kyela	Kilambo		12	North of Kyela			

APPENDIX 5

PROJECT COSTS SUMMARY

PROJECT NAME: **LAND TENURE FORMALIZATION IN IRRIGATION SCHEMES**
PROJECT SITES: (KARONGA, KYELA, MBOZI AND ILEJE)

PROJECT COMPONENT	PROJECT ACTIVITIES	UNIT COST (US$)	TOTAL COSTS
Human Resource and Institutional Capacity Building	Training surveyors in short courses	3,000	12,000
	Training land use planners in short courses	3,000	12,000
	Training land administrators in short courses	3,000	12,000
	Procure modern survey GPSs	2,600	5,200
	Procure ordinary hand held GPSs	1,200	4,800
	Procure high performance laptop computers	1,000	4,000
	Procure high performance desktop computers	800	3,200
	Procure sets of survey licences and data processing dongles	700	1,400
	Procure A0 plotters	6,000	12,000
	Procure utility vehicles	60,000	120,000
	Procure up to date sets of spatial data for the basin	50,000	50,000
Cadastral Survey	Cadastral survey of Lower Songwe River Irrigation Scheme (Mw)	10,500	10,500
	Cadastral survey of Lower Songwe River Irrigation Scheme (Tz)	10,500	10,500
	Boundary verification of Ikumbilo/Chitete Irrigation Scheme in Mbozi/Ileje	2,350.00	2,350.00
	Boundary verification of Sasenga Irrigation Scheme in Mbozi/Ileje	2,350.00	2,350.00

	Cadastral survey of existing land parcels in LSRM	19,600.00	19,600.00
	Cadastral survey of existing land parcels in LSRT	19,600.00	19,600.00
	Survey fees for both LSRM and LSRT	82,600.00	82,600.00
Land Formalization	Register existing land owners in the LSRM	14,100.00	14,100.00
	Register existing land owners in the LSRT	14,100.00	14,100.00
	Prepare land use plans	14,100.00	14,100.00
	Carry out cadstral survey of planned land parcels	39,200.00	39,200.00
	Land registration	27,600.00	27,600.00
	Project support activities from SRBC and District Councils	20,000.00	20,000.00
TOTAL ESTIMATED PROJECT COST IN US DOLLARS (US$)			**513,200**

IMPROVED FORESTRY MANAGEMENT (FOUR FOREST RESERVES)				TWO YEARS
(UMALILA, MUGHESE, NTANZU, MWABULAMBYA)				
ACTIVITIES		**NUMBER**	**RATE**	**TOTAL (MWK)**
DISTRICT STAKEHOLDER MEETINGS		20	600,000.00	12,000,000.00
AREA/WARD MEETINGS		40	500,000.00	20,000,000.00
COMMUNITY MEETINGS		100	300,000.00	30,000,000.00
BY LAWS FORMULATION AND SENSITIZATION		4	10,000,000.00	40,000,000.00
CBNRMC		40	543,000.00	21,720,000.00
ENFORCEMENT	M/BIKES	16	1,000,000.00	16,000,000.00
	BICYCLES	40	60,000.00	2,400,000.00
EQUIPMENT (SETS)		40	250,000.00	10,000,000.00
EXCHANGE VISITS (2 for Tz and 2 for Mw)		4	5,000,000.00	20,000,000.00
MANAGEMENT AND SUPERVISION		40	500,000.00	20,000,000.00
FUEL FOR PATROLS		16	7,680,000.00	122,880,000.00
STATIONERY		VARIOUS	20,000,000.00	20,000,000.00
TOTAL				**335,000,000.00**
				US$ 670,000.00

CATCHMENT AREA PROTECTION (HARAKA AREA IN MBOZI DISTRICT) 2018-2020				
Ilomba, Haraka and Hezya Villages (19,610 ha)				
ACTIVITY		**NUMBER**	**RATE**	**TOTAL (MWK)**
DISTRICT STAKEHOLDER MEETINGS		20	600,000.00	12,000,000.00
AREA/WARD MEETINGS		40	300,000.00	12,000,000.00
COMMUNITY MEETINGS		100	300,000.00	30,000,000.00
TREE PLANTING		1000000	200.00	200,000,000.00
BY LAWS		1	6,000,000.00	6,000,000.00
CBNRMC		30	500,000.00	15,000,000.00
	M/BIKES	3	1,000,000.00	3,000,000.00
ENFORCEMENT	BICYCLES	15	60,000.00	900,000.00
EQUIPMENT (SETS)		20	250,000.00	5,000,000.00
BEE HIVES		200	5,000.00	1,000,000.00
SUPERVISION		20	500,000.00	10,000,000.00
FUEL FOR PATROLS		1080	15,000.00	16,200,000.00
STATIONERY		VARIOUS	5,000,000.00	5,000,000.00
TOTAL				**316,100,000.00**
				$ 632,200.00

INTEGRATED SOIL AND WATER CONSERVATION (KAMEME AREA) 2019-2021				
5623 HA (TO BE DIVIDED INTO 5 PLANNING UNITS)				
ACTIVITIES		**NUMBER**	**RATE**	**TOTAL (MWK)**
DISTRICT STAKEHOLDER MEETINGS		20	600,000.00	12,000,000.00
AREA/WARD MEETINGS		40	300,000.00	12,000,000.00
COMMUNITY MEETINGS		100	300,000.00	30,000,000.00
SEEDLINGS		1000000	200.00	200,000,000.00
CBNRMC/BYE LAWS		30	500,000.00	15,000,000.00
ENFORCEMENT	M/BIKES FOR Agric. Ext officers	2	500,000.00	1,000,000.00
	BICYCLES for Lead farmers	5	50,000.00	250,000.00
FUEL		1080	15,000.00	16,200,000.00
EQUIPMENT (line levels, shovels, wheelburrows, etc)		VARIOUS	2,000,000.00	2,000,000.00
SUPERVISION (SRBC)		20	500,000.00	10,000,000.00
STATIONERY		VARIOUS	5,000,000.00	5,000,000.00
TOTAL				**303,450,000.00**
				$ 606,900.00

STUDY ON RAINWATER HARVESTING ALONG HANTESEYA AND MTIMA RIVERS IN ILEJE AND HENGA AND KAKOMA RIVERS IN CHITIPA			
WORK TO BE DONE BY CONSULTANTS			
TEAM	**No. of days**	**Rate**	**Total Cost (MWK)**
Water specialists	90	65,000.00	5,850,000.00
Agriculturalist	90	65,000.00	5,850,000.00
Community Development Expert	90	65,000.00	5,850,000.00
Stakeholder meetings	20	600,000.00	12,000,000.00
Operational costs			5,000,000.00
Coordination			2,000,000.00
			36,550,000.00
TOTAL			**$ 73,100.00**

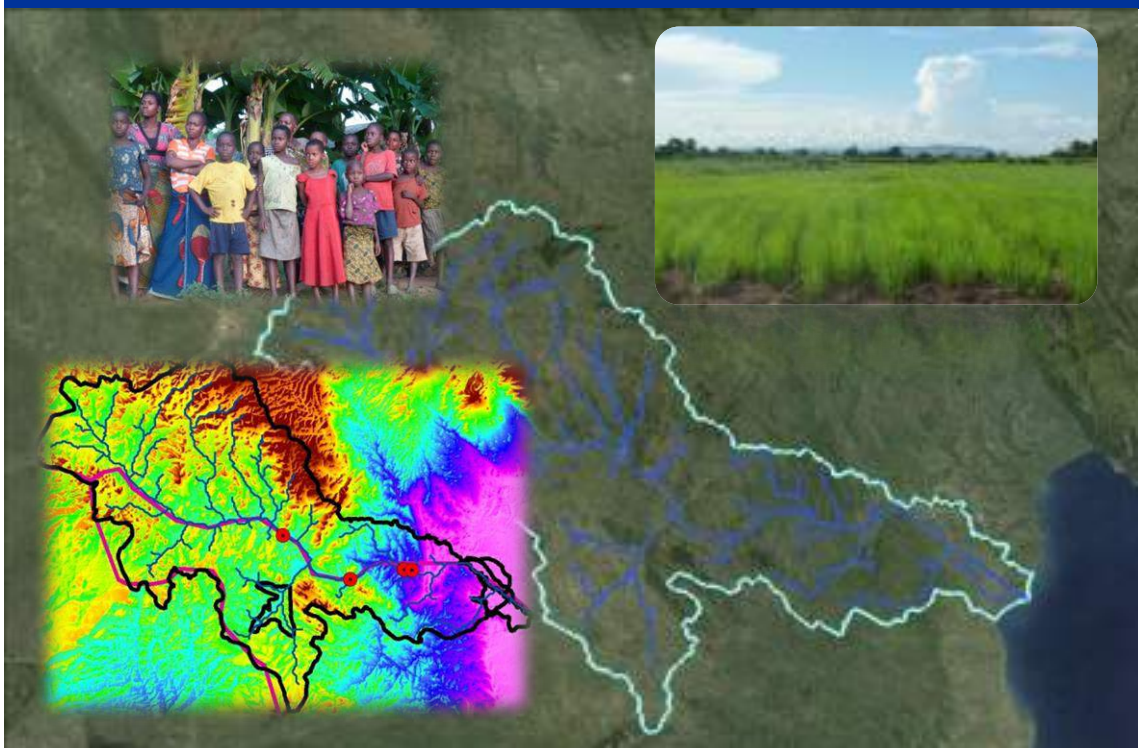
STUDY ON SUPPORT TO IRRIGATION FARMING IN EXISTING IRRIGATION SCHEMES			
WORK TO BE DONE BY CONSULTANTS			
TEAM	No. of days	Rate	Total Cost (MWK)
Water specialists	90	65,000.00	5,850,000.00
Agriculturalist	90	65,000.00	5,850,000.00
Community Development Expert	90	65,000.00	5,850,000.00
Stakeholder meetings	20	600,000.00	12,000,000.00
Operational costs			5,000,000.00
Coordination			2,000,000.00
			36,550,000.00
TOTAL			**$ 73,100.00**

A Joint Project between the Governments of the
Republic of Malawi and the United Republic of Tanzania
funded by African Development Bank / AWF / NEPAD

DETAILED DESIGN AND INVESTMENT PREPARATION PROJECT FOR THE SONGWE RIVER BASIN DEVELOPMENT PROGRAMME

SRBDP VOLUME 4

ECONOMIC DEVELOPMENT SUB-PROGRAMME



Prepared by a Joint Venture of
Lahmeyer International GmbH, Germany
and **ACE Consulting Engineers**, Egypt

April 2015

FINAL

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Appendix A: Statistical Appendix: SRB RGDP

Appendix B: Data Collection from District Offices

Acronyms and Abbreviations

AfDB	African Development Bank
ADF	African Development Fund
CBA	Cost Benefit Analysis
DAP	Di-ammonium Phosphate
DC	District Council
DDIP	Detailed Design and Investment Preparation
EDSP	Economic Development Sub-Programme
ESCOM	Electricity Supply Company (Malawi)
FAO	Food and Agricultural Organisation
GDP	Gross Domestic product
GIS	Geographical Information System
GVP	Gross Value of Production
GWh	Giga watt hour
IFDC	International Fertiliser Development Centre
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
kcals	kilocalories
kWh	kilo watt hour
LCU	Local Currency Unit
MDG	Millennium Development Goals
MOM	Management Operation and Maintenance
MWh	Mega watt hour
MWK	Malawian Kwacha
NGO	Non Government Organisation
NPK	Nitrogen Phosphate Potassium
NPV	Net Present Value
NRLUM	Natural Resources and Land Use Management
OER	Official Exchange Rate
PPP	Purchasing Power Parity
R&M	Repair and Maintenance
RGDP	Regional Gross Domestic Product
SAM	Social Accounting Matrix
SMI	Small and Medium Industry
SRB	Songwe River Basin
SRBC	Songwe River Basin Commission
SRBDP	Songwe River Basin Development Programme
SWC	Soil and Water Conservation
T/A	Traditional Authority
TANESCO	Tanzania Electricity Supply Company
TLU	Tropical Livestock Unit
ToR	Terms of Reference
TZS	Tanzanian Shilling

1 INTRODUCTION

1.1 REPORTING

This document is Volume 4, Economic Development Sub-Programme (EDSP) of the four volume Songwe River Basin Development Programme Final Report. It is prepared as part of the Detailed Design and Investment Preparation (DDIP) – Songwe River Basin Development Programme (SRBDP) project.

Volume 1 is the summary of the three Sub-Programmes with an Introduction to the SRBDP as a whole; Volume 2 is the Community Development Sub-Programme; and Volume 3 is the Natural Resources and Land Use Management Sub-Programme. This, Volume 3, is intended to be read in conjunction with the other three volumes.

Additionally, the DDIP-SRBDP project has produced several reports over the two years of the project. The documents with the closest links to this report are:

- Update of the 2003 Feasibility Study: April 2014
- Shared Vision 2050: April 2014
- Water Related Social Infrastructure: April 2015
- Business Plan for the SRBC: April 2014

The other documents prepared under this project are:

- Inception Report: May 2013
- Strategic Environmental Assessment for the SRBDP: April 2014
- ESIA Scoping Report: June 2014
- Convention for the Songwe River Basin Commission (SRBC): September 2014
- Songwe River Basin Development Programme: April 2015
- Detailed Design for the Stabilisation of the Lower Songwe River: April 2014
- Detailed Design for Water Supply for Kasumulu Town and Lower Songwe Communities: June 2015
- Detailed Design for Water Supply for Songwe Town and Lower Songwe Communities: June 2015
- Detailed Design and Tender Documents for the Lower Songwe Dam and HPP: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Tanzania Irrigation and Drainage Scheme: June 2015
- Detailed Design and Tender Documents for the Lower Songwe River Malawi Irrigation and Drainage Scheme: June 2015
- Environmental and Social Impact Assessment: April 2015
- Resettlement Action Plan for the Lower Songwe Dam and HPP: April 2015
- Resettlement Action Plan for the Lower Songwe River Irrigation and Drainage Schemes: April 2015

1.1 GOALS AND OBJECTIVES

The Economic Development Sub-Programme (EDSP) is part of the overall Songwe River Basin Development Programme (SRBDP), which started with the preparation of the Shared Vision 2050 under Component I of the DDIP-SRBDP project. Component I as a whole has the following scope:

- Facilitate the preparation of a Shared Vision 2050 by project stakeholders
- Preparation of the Songwe River Basin Development Programme which will include:
  - Natural Resource and Land Use Management Sub-Programme
  - Community Development Sub-Programme
  - Economic Development Sub-Programme.

Essentially, the Shared Vision 2050 identifies Songwe River Basin (SRB) stakeholders and their development aspirations in connection with the proposed investment in the Basin. The SRBDP builds on the unity identified and provides a plan to respond to the wide range of challenges and opportunities that face the Basin population.

The stated objective of the EDSP itself is to develop viable economic and business development opportunities not present in the basin today as well as opportunities for improving existing economic activities.

The EDSP examines the effects of the planning measures proposed for the basin economy and environment (Chapter 8) and presents the expected impact of the economy of these measures, together with the investment required (Chapter 9). A final Chapter 10 describes a SRBDP Financing Plan. Earlier sections address key preliminary stages in the EDSP:

- Develops an analysis tool for economic planning (Chapters 2 to 4)
- Presents a basin-wide multi-sectoral economic assessment (Chapter 5)
- Derives key economic indicators at basin level (Chapter 6)
- Presents a regional social accounting matrix (Chapter 7).

The general approach followed is the preparation of a Regional Gross Domestic Product (RGDP) for SRB which assists the preparation of the EDSP by estimating the present wealth and distribution of economic activity in the project area, the relative importance of different economic sectors in generating wealth and an objective measurement of the productivity of labour in those sectors. The RGDP is an economic baseline of the SRB in the period 2010-2012: the most recent assessment that the national and local statistics will allow. Then, the EDSP uses these tools and indicators to examine the effects of the planning measures proposed for the basin economy and environment.

2 METHODOLGY

2.1 ECONOMIC ACCOUNTING

Economic accounting is the basis of the Economic Development Sub-Programme (EDSP) and assists future planning of SRB development in the following ways:

- An estimate of the RGDP is essential to estimate the value and change over time of RGDP per capita, which is an important indicator for economic planning
- The relative past, present and expected future shares of Tanzania and Malawi in economic activity in the SRB can be determined, which is important information to assist in making international and regional policy decisions
- Differences in RGDP over the area of the SRB suggest which areas and groups of population are relatively disadvantaged, enabling a more focussed approach to planning. In addition, the productivity of the basin population can be compared with national and regional per capita productivity
- A high level of economic activity in a higher part of the basin, for example in the agriculture, may lead to environmental deterioration which has an adverse impact on economic activity in the lower (for example siltation, reduced or erratic stream flow, smaller fish stocks, reduced land suitability and damage to communications): economic accounting provides an indication of the relative benefits and dis-benefits
- Economic accounts assist in measuring the impact of proposed planning interventions in the context of economic growth in the basin as a whole: for example an initiative to increase the productivity of the fisheries sub-sector may have little impact on the overall economic growth rate (fisheries accounted for only 1% of SRB RGDP in 2010) but may have a substantial impact on food security and raising the share of RGDP of a comparatively disadvantaged section of the population
- Labour occupation and productivity can be assessed objectively by sector and administrative area
- Year on year economic data indicate the overall rate of growth of economic activity and enable projections to be made of future growth rates. As economic activity expands, the use of scarce natural resources will also increase. Natural resource management will plan to improve sustainability of resource use and environmental quality in the context of the expected economic growth
- The relative importance of different types of economic activity is estimated, together with how these shares change over time, which in turn indicates those sectors of the economy that are more or less dynamic and can provide leverage for economic growth.

2.2 ENVIRONMENTAL ACCOUNTING

Economic accounts can be criticised as an incomplete measure of the costs of economic activity, since they exclude the cost of unsustainable use (i.e. depreciation

of value) of finite natural resources such as minerals, petroleum, fish stocks, soil and forests. Sustainable natural resource use requires that:

- The rate of consumption of renewable natural resources (soils, forest, fish stocks) should not exceed the rate of regeneration
- The rate of consumption of non-renewable resources (minerals, petroleum) does not exceed the rate of generation of renewable substitutes
- The rate of pollution (heavy metals, sedimentation) does not exceed the environment's capacity to assimilate it.

There is evidence for unsustainable natural resource use in SRB. For example, in 2010 92% of RGDP was derived from the value of primary goods which is evidence of more resources being extracted than can be replaced. Many "service" activities (for example the replacement of housing stock, the provision of water supply and domestic energy) depend on natural resources. Formal economic accounts take into account changes in capital stocks of factors of production through investment and depreciation. To estimate economic growth correctly it is important that the stock of natural resources is treated in the same way. However, because many natural resources are neither traded commodities nor have a formal market, the difficulty is to quantify depreciation costs in economic terms, and incorporate them in national accounts. The subtraction of the cost of depreciation of natural resources from RGDP will reduce the growth rates normally observed in the economy, especially if these are driven predominantly by the growth of population (e.g. increased cultivation for home consumption). The implication then is that the economy is not growing as fast as the official economic data suggest, and that some members of the population, particularly those dependent on primary production may be becoming absolutely disadvantaged in terms of RGDP per capita.

While acknowledging the importance of valuing environmental accounting, the EDSP does not carry out environmental accounting or systematically and completely calculate or report the costs of depreciation of natural resources in SRB because:

- Deducting environmental depreciation from the SRB accounts would mean that the RGDP would no longer be directly comparable to the standard GDP estimates for Malawi and Tanzania because neither country systematically reports environmental depreciation (in fact, because of the obvious complexities in calculation, few countries make such reports as part of their national accounts);
- Systematic year on year data would be required to estimate the reduction in quantity and quality of soil available for agricultural use (e.g. net soil nutrient depletion and net loss of soil from erosion), wood for fuel and timber (e.g. net loss of woody biomass and net reduction in value of the standing stock of wood taking into account selective removal of economic tree species), grazing (e.g. net loss of dry matter and net reduction in value of the standing stock of grass and browse species taking into account selective removal of economic species), water resources (e.g. net reduction in available surface and ground water due to extraction and reduction in quality of the water resource due to pollution and erosion) and natural fish (and possibly, game) stocks as a result of economic activity in the basin;

- Having established declines in quantity and quality of soil, woody biomass, dry matter, water and natural fisheries it would then be necessary to attach an appropriate unit value to those declines: this is challenging because values change both spatially (depending on access to and demand for natural resources as well as supply) and year-on-year.

Nevertheless, this report does include some estimates of the magnitude of environmental depreciation; specifically the cost of replacing the annual loss of soil nutrients as a result of extraction by crops and incomplete substitution by fertilisers (both organic and inorganic) (see sections 5.2 and 8.8.8.2). However, this cost is not deducted from the estimates of RGDP reported in the EDSP. The indicative calculations show that environmental depreciation of the value of the soil nutrient resource (but excluding costs of any net losses from erosion) is in the order of 4.7% of crop RGDP and this cost is incurred year on year. The impact on long-term economic growth is therefore considerable. In spite of the impracticality of a systematic approach to environmental accounting in SRB, its importance should not be ignored.

2.3 DEFINITIONS

The GDP is the total financial value of all final goods and services produced within a country for consumption during one year. Its rise or fall measures domestic economic activity based on labour and production output. In this study, financial value is the sum of:

- the value of production of agricultural products (crop, forestry, fish and livestock products)
- the value of other commodities produced (petroleum products, other solid fuels and metallic and non-metallic minerals)
- the value of processed industrial goods (processed food, drink, textiles, wood and metal products)
- the value of utilities (electricity, gas and water)
- the value of construction (buildings and other infrastructure)
- the value of commercial and financial services (banking, insurance)
- the value of transport and communications
- the value of social services (housing, government, education and health care).

The value of intermediate goods and services used in production is not included in GDP since it is already reflected in the final price of goods or services offered for sale. The concept of value added avoids the possibility of double counting. For example, the value added of milk produced on the farm can and should be added to the value added of milk products obtained from the factory, where milk purchased from the farm is treated as an intermediate input. The GDP includes allowances for depreciation and indirect business taxes such as those on sales and property.

The **Gross Value of Production** (GVP) is the market value of the production of an establishment, whether a family farm for production for own use or a large industry oriented to sales. The **Value Added** is the GVP minus the bought-in costs of production and is equal to the sum of wages and profits. Value added is therefore computed inclusive of labour costs of production. The **Return to Labour** is value

added divided by the units of labour required to produce it. Return to labour is an objective measurement of the comparative productivity of labour between sectors or zones.

The **Regional Gross Domestic Product** (RGDP) is the GDP for a defined geographical area (an administrative unit, or a river basin). After adjustments for any double counting (especially in inter-regional transactions in transport, financial services etc.), the sum of the RGDP for all administrative units of a country should equal the national GDP.

Current prices are monetary prices and values (value is price multiplied by quantity) of goods and services during the period for which they are reported. **Constant prices** are monetary prices and values of goods and services relative to a defined base time period. Constant prices allow prices and values to be directly compared between time periods by removing the effect of inflation. Current prices can be converted to constant prices using an appropriate **Price Index**. In this study the country-specific GDP deflator is generally used.

Purchasing Power Parity (PPP) is an estimate of the exchange rate required to equalise the purchasing power of different currencies, or the same currency in different time periods, in order to compare the value of production and cost of living between countries and time. This is necessary because the cost of goods and services offered for sale varies between countries depending on the price of labour and intermediate products. Also, currency exchange rates vary widely, depending on monetary policy, perceived international financial risk and other factors. PPP estimates are made by the United Nations' International Comparisons Project and are reported annually by country in the World Bank's World Development Indicators.

This RGDP estimate excludes a **valuation of capital assets**: this is gross capital value minus a value to take account of depreciation. National accounting applies a depreciation coefficient to the present value of capital assets (rather than the standard accounting procedure, which applies depreciation to the original (or book) value of capital assets). The value of capital assets (farm equipment, social infrastructure, water infrastructure, industrial equipment etc.) is relatively small compared with the gross value of production because the present economy is largely agrarian and artisanal, rather than industrial. Many capital assets are already heavily depreciated. It is very difficult to accumulate a dataset of capital assets in the SRB from scratch. For these reasons capital accounting was neglected in this study, but as the economy diversifies and capitalises a valuation of capital assets will become important.

2.4 REVIEW OF PREVIOUS ACCOUNTING STUDIES

A constraint to accurate economic accounting is that SRB is essentially small (4,254 km^2) both by river basin and administrative unit standards, and as a consequence the Basin is fragmented between the lowest strata of administrative areas in both countries. Within Tanzania SRB falls entirely within Mbeya Region and comprises parts of five Districts. Of these, only Ileje is mostly inside (78%). The Malawian sector falls entirely within Northern Province but comprises only two Districts most of which

are outside the basin, Chitipa (37% inside the SRB) and Karonga (only 10% inside SRB). Each district is composed of sub-administration units (Wards in Tanzania and Traditional Authorities (T/A) in Malawi). In SRB T/A are larger administrative units than Wards. The EDSP refers to both as “administrative areas”. Within each there are settlement areas (about 212 in SRB as a whole). Some use is made of settlement areas for detailed planning (see for example sections 8.2.2 and 8.8.2), but generally the area sub-unit used in the EDSP is administrative area. Table 2-1 shows the constituent Districts and estimated population within SRB.

Table 2-1: Area and Population of High Level Administrative Units

District	ha	Projected Population			
		2010	2011	2012	2013
Mbeya Rural	15,728	14,431	14,785	15,148	15,512
Kyela	18,274	56,449	57,831	59,253	60,675
Ileje	143,523	88,295	90,457	92,682	94,906
Mbozi	47,896	46,645	47,787	48,962	50,137
Momba	4,051	2,626	2,690	2,757	2,823
Tunduma	3,760	2,046	2,096	2,148	2,200
Chitipa	159,045	115,115	118,258	121,427	124,681
Karonga	33,143	37,395	38,415	39,445	40,502
Total	425,420	363,002	372,320	381,821	391,436

Source: SRBDP GIS, Population and Housing Census Tanzania (2012) and Malawi Population Census (2008)

Neither country has prepared recent regional economic accounts: due to a lack of funds and trained staff the respective Ministries of Finance arrange for periodic national level sector sample surveys (usually with the cooperation of regional planning offices) just sufficient to allow the annual GDP estimates to be prepared at national level with reasonable levels of confidence. So when attempting to estimate a lower-order RGDP, the region must be disaggregated from the national, the district must be disaggregated from the (estimated) regional and a further disaggregation must be made to estimate the RGDP of the lower order administrative areas of interest. This is a tenuous process and has to be supported by not only working downwards from the national statistics but also (as has been done in this study) working upwards by accumulating prices and quantities at local level.

Administrative regions are gradually appreciating the importance of regional economic accounts as a planning tool for devolved government; hence regional planning departments are gaining experience in preparing them. However, preparing economic accounts by river basins falls far outside their responsibility, and this is in fact a more complex task than preparing regional accounts because river basins do not respect the administrative boundaries within which statistical data is collected. Furthermore, the statistics themselves are often unreliable and incomplete. Politicians seldom appreciate the statistical implications of introducing a new District in the national administration. National sample surveys are accurate within defined confidence limits (but these confidence limits are set to be valid at national not local level) and to some extent fill the gap, but nevertheless they are surveys (not censuses) and because of

shortage of skilled staff they are not carried out every year. For all these reasons it was necessary to start almost from scratch to prepare economic accounts for the SRB.

It is also difficult to prepare a time series of economic accounts. Because most (about 75%) of SRB RGDP is from agriculture it is safest to prepare accounts initially with reference to the year of a published agricultural census. For Tanzania the most recent was The National Sample Census of Agriculture 2007/08. The data gathered during this relatively reliable study could be compared with agricultural statistics reported in published socio-economic profiles prepared for similar years at District level in Malawi. The problem of selecting a year of good data is aggravated because sample surveys of different sectors span a number of years. Subsequently economic data gathered by SRB project staff from the District authorities at ward and T/A level enabled this preliminary estimate to be extended to 2010, and projected annually to 2012. Nevertheless, economic accounts that claim to be for a specific year actually relate to data gathered during a number of years around the year of interest. Although prices can be adjusted between years by using the appropriate price index, this is no substitute for regularly updated statistics. It is strongly recommended that the Songwe River Basin Commission (SRBC) encourages and promotes systematic economic data collection to refine and up-date the preliminary Songwe RGDP estimates reported here.

2.5 STRUCTURE OF THE SRB ACCOUNTS

The approach adopted was to use the low level administrative units to tabulate socio-economic data by sector on:

1 population
2 annual and permanent crops
3 livestock, apiculture and fisheries
4 medium and large scale industries
5 small scale industries
6 handicraft and cottage industries
7 electricity supply
8 water supply
9 construction (regional and municipality, industrial, NGO and private)
10 trade, hotels and restaurants
11 real estate and ownership of dwellings
12 public administration
13 health (private and public)
14 education (private and public)
15 community, social and personal services
16 private households with employed persons.

Population estimates (item 1) had already been prepared by the Project's socio-economists and later reviewed by the GIS unit (March 2014). Items 2 and 3 have received detailed attention using published statistics, supported by ward and T/A data for 2010-2012 collected directly from the Districts: since these statistics represent a substantial proportion of the SRB economy the accuracy of the RGDP estimate (in terms of total size and specificity by lower administrative areas) has been substantially

improved. Items 4-7 and 10 remain a problem. National statistics are prepared for these sectors using sample surveys that are of no use for making District level estimates. Luckily only items 5, 6 and 10 will be significant in SRB but these have had to be collected piecemeal from District subject matter specialists. Items 8, 9 and 11 have been studied both from District-level expenditure and estimates of requirements based on population data. Items 12-15 have similarly been estimated using District budget data. Item 16 is unlikely to be very important.

A range of publications was consulted to prepare the data, only some of which are cited in the text. The most important data are the price, area and production data collected by ward and T/A from District offices. Technical coefficients of production for the crops and livestock sector were obtained either from local publications or FAO PriceStat. Food security estimates drew on the FAO Food Balances for Malawi and Tanzania.

Quantities, prices and values of production were used to prepare GVP by sector. Prices have been a problem – they vary annually depending on many factors and must therefore be accurate and year specific. Unfortunately neither the Tanzanian nor the Malawian statistical offices post regular reports on prices on the web, so a variety of sources had to be used which may not be exactly comparable. However, local price estimates of the main commodities are available from District offices and have been compiled for this report.

The quantities, prices and costs of intermediate products were identified as far as possible and subtracted from GVP to obtain an estimate of value added. The employment in each sector was also estimated, and divided into value added to give an indication of returns to labour by sector.

District level data (e.g. crop areas, production, livestock numbers etc. taken from published sources) was then processed in order to represent the economic accounts for the SRB by the Project's latest and definitive population and area calculations by administrative unit (as revised in February 2014: ward and T/A; 33 in number).

The administrative areas can be used for modelling. They are transparently identified and have been mapped accurately. However, they are not necessarily good as planning units. For example, one part of an administrative area may have different climate and land resources than another part and as a result have a different land use (e.g. Ileje wards have very wide climatic and altitudinal variability). Planning units that take into account communications, population density and farming systems are more appropriate.

The economic accounts were then collated to estimate the total RGDP of the basin and the RGDP per capita by administrative unit for each year of the period 2010-2012. This enabled an annual estimate of the distribution of the RGDP within the basin, an assessment of food security and the returns to labour by sector.

The following sections discuss the compilations of estimates. For convenience the discussion distinguishes between the primary and secondary production sectors and the administrative and services sectors.

2.6 DATA RELIABILITY

An initial RGDP estimate was developed based on District level data in November 2013. While this was useful, there was very little difference in the RGDP between Wards and T/A within any District. By collecting more data at sub-District level in March-April 2014 the model was improved substantially. Time series data for the period 2010-2012 was collected to establish trends and rates of change.

The District counterpart staffs were very helpful, able and willing to collate this data – they have access to the District archives and they know what is available and where it is. The amount of extra data needed to develop the model to sub-District level was relatively small – after preparing the initial District-level model it was clear what parameters would have a strong influence on the model out-turn and what parameters were less important.

The pro forma for collecting this data are reproduced in Appendix B. In summary, these forms collect the following information:

- Crop area, production and price statistics by Ward/T/A for the period 2010-2012 substantially improved the estimate of about 65% of the basin economy. The top ten crops which contribute 90% to crop value added in the basin were identified and the collection of detailed statistics was confined to these crops.
- Tonnage of inputs (fertiliser and improved seed) supplied to Ward/T/A for the same period, and the system under which they were supplied (subsidised or open market)
- The net irrigated area by Ward or T/A from 2010 to 2012
- An estimate of the price of daily labour (an agricultural rate or a daily wage rate) from 2010 to 2012
- Number of Cattle (cattle comprise about 90% of the value added of livestock so collecting statistics on other types would provide rather limited additional information)
- Number of beehives
- Local prices of difficult commodities like fuel wood, charcoal, timber, honey and selected construction materials
- The number of Small and Medium Sized industries by type
- Collation of the statistics on physical social assets (health services, water supply, schools, roads, electricity supply, agro-processing, forestry, mining and administration).

While it is not possible to put confidence limits on the accuracy of the RGDP estimates, it will be apparent that data provided by the District offices enables the value added of the rainfed-cropping sector of the economy to be reasonably well estimated. The largest sector of the economy is therefore the best estimated.

3 PRIMARY AND SECONDARY PRODUCTION

3.1 RAINFED AND IRRIGATED CROPPING

This study first concentrated on making an outline estimate of the RGDP of the natural resources sector, relying on data from published sources and the internet. It was found that only District level statistics were available and these were dated. The main sources used were the Mbeya Region Report of the National Sample Census of Agriculture, the Socio-economic Profiles of Chitipa and Karonga and statistics collected as part of the SRDP Social Survey Baselines. Crop area and production statistical sources cover the years from 2008 to 2010. This data was subsequently substantially improved by selected data (covering the most important crops) collected for the period 2010-2012 by each lower level administrative unit directly from District offices.

The main data collated by crop and administrative unit were:

- Area cultivated and tonnage of main crop produced distinguishing between rainfed and irrigated production
- Farm gate (producer) price of main crop in current local currency units
- Estimate of crop losses
- Tonnage of by-product produced
- Price of by-product in current local currency units
- Area under improved seed and market price of improved seed in current local currency units
- Area fertilised and market price of fertiliser in current local currency units
- Use of herbicide, pesticide and fungicide and market price in current local currency units
- Use of oxen labour days
- Use of labour days.

Some generalisation and estimates were required to collate this information in a systematic way. Additional data had to be sought on perennial crops including oil palm, tea, cocoa and coffee that had not always been presented well in the statistics. This information then enabled the following financial estimates in local currency units to be carried out by crop:

- Gross value of output calculated as gross value of production less crop losses and use of held-over seed and plus the value of the by-product
- Subtracting cost of intermediate inputs (fertiliser, chemicals, irrigation charges, ox power) from gross value of output gives the value added
- Including labour in the costs of inputs gives the crop gross margin.

The result of this work was a set of sheets in an Excel spreadsheet each of which represented an estimate of the value of crop production for one low-level administrative unit. The estimate of 2010 is the most accurate year: estimates for 2011 and 2012 use some official statistics for the period 2008-2010 (e.g. for minor crops) which could not be up-dated locally. However the projections made for 2011 and 2012 indicate the rate of economic growth in crop production for the SRB as a whole (see Section 6.3.2). Findings for rainfed and irrigated cropping are given in Table 3-1 and Table 3-2.

Table 3-1: Summary of Estimate of SRB RGDP Rainfed Cropping, 2010

District	Basin Area ha	Basin Population 2010	density people/ha	Gross cropped ha	Cropped % of basin by District	density people/gross cropped ha	RGDP Crops, US$ '000	RGDP Crops US$ pc	RGDP Crops US$ per gross cultivated ha	Return to labour, US$/labour day	Labour days in field operations	kcals produced as % of kcal requirement
Mbeya Rural	15,728	14,431	0.9	6,359	40%	2.3	4,631	321	728	11	425,262	400%
Kyela	18,274	56,449	3.1	9,590	52%	5.7	15,547	275	1,621	21	723,854	236%
Ileje	143,523	88,295	0.6	32,271	22%	2.7	27,353	310	848	14	1,978,455	432%
Mbozi	47,896	46,645	1.0	15,427	32%	3.0	4,919	105	319	4	1,205,286	155%
Momba [1/]	7,811	4,672	0.6	1,303	17%	3.0	760	163	583	10	76,842	213%
Chitipa	159,045	115,115	0.7	23,675	15%	4.8	27,022	235	1,141	15	1,755,339	155%
Karonga	33,143	37,395	1.1	12,924	39%	2.9	14,751	394	1,141	15	1,011,554	344%
Total	**425,420**	**363,002**	0.9	**101,548**	24%	**3.57**	**94,983**	262	935	13	**7,176,591**	

[1/] The area and population of Tunduma District within the basin is included in Momba District

Table 3-2: Summary of Estimate of SRB RGDP Irrigated Cropping, 2010

District	Basin Area ha	Basin Population 2009	density people/ha	Gross irrigated ha	Cropped % of basin by District	RGDP Crops, US$ '000	RGDP Crops US$ pc	RGDP Crops US$ per net irrigated ha	Return to labour, US$/labour day	Labour days	kcals produced as % of kcal requirement
Mbeya Rural	15,728	14,431	0.9	69	0.4%	379	26	5,485	68	5,560	3%
Kyela	18,274	56,449	3.1	49	0.3%	109	2	2,218	28	3,957	1%
Ileje	143,523	88,295	0.6	924	0.6%	2,060	23	2,229	28	74,368	6%
Mbozi	47,896	46,645	1.0	717	1.5%	788	17	1,100	14	57,708	10%
Momba [1/]	7,811	4,672	0.6	193	2.5%	212	45	1,100	14	15,512	26%
Chitipa	159,045	115,115	0.7	154	0.1%	750	7	4,883	61	12,371	1%
Karonga	33,143	37,395	1.1	119	0.4%	280	7	2,349	29	9,601	2%
Total	**425,420**	**363,002**	0.9	**2,225**	0.5%	**4,578**	13	**2,058**	26	**179,076**	

[1/] The area and population of Tunduma District within the basin is included in Momba District

The value added of rainfed cropping in SRB is estimated at US$ 94 million in 2010, distributed between crops as shown in Table 3-3.

Table 3-3: Value Added by Rainfed Crop by District, US$ '000 2010

	Cereals			Roots		Legumes						
	Maize	Paddy	Other cereals	Cassava	Other roots	Beans	Other legumes	Oilseeds	Vegetables	Industrial crops	Perennial trees	Total
Mbeya Rura	2,911	0	77	4	478	386	21	57	45	652	0	4,631
Kyela	1,034	4,483	2	7,800	1,343	9	42	133	0	0	868	15,716
Ileje	18,315	1,206	55	2,762	1,291	2,908	54	340	441	87	0	27,460
Mbozi	1,705	0	300	1	50	1,187	23	231	2	1,467	0	4,965
Momba	223	22	11	5	14	359	0	90	0	0	0	722
Chitipa	2,129	68	519	11,160	4,009	3,235	406	2,495	2,258	2,566	264	29,109
Karonga	2,673	3,019	9	3,092	196	283	31	239	471	47	969	11,031
Total	28,990	8,798	972	24,823	7,382	8,367	578	3,583	3,217	4,820	2,101	93,633

The cropped area is estimated to be about 102,500 ha implying 24% of the basin was under rainfed crops and the number of people per cropped ha was 3.57. The distribution of the rainfed cropped area is shown in Table 3-4. Section 6.3.2.1 reviews the distribution of cropped area by administrative area and identifies medium and long-term trends.

Table 3-4: Rainfed Cropped Area by District, ha 2010

	Cereals			Roots		Legumes						
	Maize	Paddy	Other cereals	Cassava	Other roots	Beans	Other legumes	Oilseeds	Vegetables	Industrial crops	Perennial trees	Total
Mbeya Rura	4,061	0	289	1	242	806	68	229	28	634	0	6,359
Kyela	1,746	5,664	10	662	236	29	49	229	9	0	1,217	9,852
Ileje	20,977	1,252	288	572	2,397	5,037	271	932	200	345	0	32,271
Mbozi	6,215	0	781	9	244	1,972	85	1,611	44	4,653	0	15,616
Momba	552	31	170	17	65	380	13	169	10	0	0	1,408
Chitipa	9,013	336	798	1,290	1,522	5,443	1,097	2,374	341	1,185	640	24,039
Karonga	5,512	3,530	30	1,005	42	537	56	1,063	80	641	430	12,924
Total	48,076	10,813	2,367	3,556	4,748	14,205	1,638	6,607	712	7,459	2,287	102,468

The value of cropping per ha was highest in Kyela (due to the high proportion of rice and fruit) and lowest in Mbozi (due to a combination of low yields, low prices and high input use). The return to farm labour was satisfactory at around US$13 per labour day. Over 7 million labour days were used in rainfed crop field operations. Food energy produced from rainfed crops compared with food energy requirements varied quite markedly in the Basin. Chitipa and Mbozi appear have a lower level of food security than other districts. Mbeya Rural and Ileje Districts on the other hand produce over four times their food energy requirement.

Irrigated crop production would seem a good strategy in terms of value added. Both value of production per ha and return per family labour day doubles. However, the area, yield and production statistics on these small areas are unreliable and no further comments can be made.

Fertiliser use in SRB is estimated to be about 19,000 tons (about 50% of basal fertiliser and 50% of urea) in 2010 and the cultivated area of the basin (including the irrigated gross cropped area) is estimated as 106,000 ha. This represents an overall application rate of about 85 kg of NPK per cultivated ha per annum. See Table 3-5.

Table 3-5: Fertiliser Application by District, 2010

District	Cropped ha	Fertiliser, tons	Nutrient application rates, kg/ha			Proportion subsidised
			N	P	K	
Mbeya Rural	6,359	277	16	3	3	96%
Kyela	9,809	569	21	4	4	75%
Ileje	32,271	14,091	155	27	27	14%
Mbozi	15,427	2,025	47	8	8	37%
Momba	631	6	3	1	1	100%
Tunduma	553	21	14	2	2	100%
Chitipa	23,675	1,368	21	4	4	46%
Karonga	12,924	451	12	2	2	100%
SRB	101,648	18,807	66	12	12	24%

This is a relatively high application rate for smallholder agriculture, but is heavily skewed by the large tonnage of fertiliser reportedly used by Ileje District (adjusted for the area of Ileje in the basin); fertiliser application rates in other Districts are lower and the level of subsidised fertiliser use is much higher. Fertiliser smuggling undoubtedly takes place. The extraction rate by a stand of maize yielding 4 tons per ha is about 100 kg of nitrogen alone. Only in Ileje is this level of nitrogen application from fertiliser achieved; and in fact maize yields in Ileje in 2010 were estimated to be 4 tons per ha.

IFPRI studies estimate net losses of 60-100 kg per ha of NPK per annum from rainfed crop cultivation in Tanzania and Malawi (Nutrient Depletion in the Agricultural Soils of Africa, 2020 Brief 62, IFPRI) and this observation seems relevant for most of the basin. Fertiliser use might have to double to replace mined nutrients. With the market price of fertiliser about US$ 800 per ton in the basin in 2013 this is clearly impossible for poorer smallholder farmers. Section 6.3.2.1 discusses the implication for the basin economy in more detail.

3.2 LIVESTOCK

Estimates of livestock value added are difficult to make. District livestock statistics were easily available (numbers of cattle, goats, sheep, chickens, pigs). While the number of livestock units is usually well estimated the productivity coefficients are not and can vary quite widely. Some guidance is usually available from FAOStat and web articles. Key things to estimate include:

- Herd composition, particularly the proportion of improved stock, lactating animals, oxen
- The culling ratio (the annual off-take from the herd for slaughtering) and sales statistics
- Milk yields and lactation periods
- Egg yields
- Prices expressed as live weight (for sales) and dead weight (for culled animals)
- Live weights and dead weights for sales and culls
- Number of bee hives by type and annual yield expected by type
- Fish ponds and average annual catch

- For the lake fishery, annual catch, equipment by type and number and unit values and labour employed.

It also helps to have meat, fish, egg and milk consumption statistics so that physical production estimates can be checked for gross errors. These estimates can be found in the FAO Food Balance sheets by country.

After assembling this information it was possible to compile District level estimates of the annual cull and its value for each livestock type, the number, volume and value of eggs and milk, the volume and weight of honey and bees wax and the annual catch and value of inland and lake fisheries. A calorific value could be attached to the amount of each product produced.

It was then necessary to assign production costs to each livestock enterprise. The amount of dry fodder, grain feed, supplement and calf milk could be estimated per unit. Veterinary supplies used could only be notional but expenditure is likely to be small relative to the value of the enterprise. The number of eggs used for hatching is easily estimated to maintain the flock. Costs of bee keeping and fishing equipment could be estimated.

Labour requirements are less easy to estimate. Dividing the requirement between management and processing helps. It was assumed herding was done on a communal basis and therefore required little time. Dairy processing time can be complicated if butter making is considered but no value added was assumed beyond the production of milk which requires no more than milking time.

The value added of the Lake fishery is of interest. Fishing gear costs could be estimated by attaching a depreciation value to the known stock of fishing equipment available from Lake fishery reports. Deducting depreciation from the value of the known annual catch gives the value added. Assuming crew fished for the minimum wage the number of labour days in the industry could be calculated (value added is return to labour). The labour force is also known, so the number of work days per year per crew could be calculated. This worked out to be only 60 days per fisherman per year. As is well known, the lake fishery is fully exploited and marginal returns to labour are now zero or possibly negative. The depreciation of the Lake fish resource (i.e. the cost of replacing it to a level at which it can be sustainably harvested) is not being given its full value in the market place.

The result of collating livestock statistics was a set of sheets in an Excel spread sheet each of which represented an estimate of the value of livestock production for each administrative area of the SRB Districts.

Estimates for livestock production are given in Table 3-6. There are about 120,000 TLU in SRB, suggesting that on average households own about 1.4 TLU – this is a moderate or low level of ownership. Ownership of TLU per household is higher in Malawi, with 2.1 TLU per household, than in the Tanzania sector where TLU ownership is about 1.2 TLU. However, Ileje households appear to own 1.5 TLU per household. At 0.3 TLU per basin hectare livestock density is also quite low. Cattle account for 70% of TLU and so the return per TLU is mostly the return to one TLU of livestock. Of course the financial return to one cattle TLU is not fully expressed – cattle

also provide insurance and the equivalent of money in the bank. The estimated return per labour day is very low (compared with cropping). This is a well-known characteristic of the sector and is linked to low genetic quality that limits stock productivity but promotes its survival.

Fisheries are not very important in the basin in financial terms. Aquaculture is limited both in scope and geographical area. Apiculture is an important activity locally, notably in Kyela.

The total use of dry matter by grazing stock in SRB is estimated as 237,000 tons pa. Crop residue production may be in the order of 90,000 tons so will provide a substantial proportion of dry matter for grazing stock. Perhaps only about 200,000 tons pa of dry matter from natural grazing is needed. Annual dry matter productivity of lowland grazing is about 1.5 tons per ha pa (see FAO Feed Resources in Tanzania), increasing to 4 tons per ha pa in upland areas. Land use statistics suggest the area of grazing in SRB is in the order of 250,000 ha. The mean elevation of the basin (estimated by administrative area and then weighted by area) is about 1,400 m with about 75% of land area below and 25% of land area above. Assuming 75% of grazing land is “lowland” and the balance is “highland” then annual dry matter production from grazing land is about 525,000 tons per annum. While accessibility to pasture is always an issue (good pasture is usually in the wrong place), the biological productivity of the basin to produce the dry matter requirement for the present number of grazing stock appears to be sufficient. The issue of dry matter supply to the basin herd in the medium and long term is discussed in Section 6.3.2.2.

Table 3-6: Summary of Estimate of SRB RGDP Livestock, 2010

District	Basin ha	TLU number	Gross Cultivated ha	TLU/Basin ha	TLU/gross cropped ha	RGDP Stock, US$ '000	RGDP Apiculture US$ '000	RGDP Fisheries US$ '000	RGDP Aquaculture US$ '000	Labour days required (million)	Return to Labour US$/day	Food security: kcals produced as % of kcal requirement	% of RGDP Livestock: Stock	% of RGDP Livestock: Apiculture	% of RGDP Livestock: Fisheries & Aquaculture
Mbeya Rural	15,728	4,375	6,359	0.3	0.69	179	3	31	15	0.16	1.5	6%	79%	1%	20%
Kyela	18,274	16,632	9,590	0.9	1.73	1,865	1	210	0	0.72	2.9	5%	90%	0%	10%
Ileje	143,523	36,023	32,271	0.3	1.12	1,900	533	187	41	1.32	2.0	5%	71%	20%	9%
Mbozi	47,896	13,404	15,427	0.3	0.87	620	6	99	11	0.46	1.6	3%	84%	1%	15%
Momba	7,811	3,255	1,303	0.4	2.50	143	3	10	0	0.11	1.5	7%	92%	2%	6%
Chitipa	159,045	24,056	23,675	0.2	1.02	977	69	286	7	0.84	1.6	3%	73%	5%	22%
Karonga	33,143	21,543	12,924	0.6	1.67	1,365	1	291	2	0.86	1.9	9%	82%	0%	18%
Total	**425,420**	**119,289**	**101,548**	**0.3**	**1.17**	**7,049**	**616**	**1,114**	**75**	**4.47**	**2.0**	**4.6%**	80%	7%	13%

3.3 WOOD PRODUCTS

The value added of wood products was roughly estimated on the basis of the needs of the largely rural population under the assumption that no alternative energy sources were available. The per capita requirement of wood for rural domestic use (lacking any other source of energy) is in order of 230 kg per capita per annum. Intuitively though, more fuel energy is required with altitude as temperatures fall both diurnally and seasonally and more energy is required for heating. The altitudinal range in SRB is large so an adjustment should be made for increased wood consumption at higher altitudes. Unfortunately no observed data on this exists, but a study in Ethiopia (Rift Valley Lakes Master Plan, Halcrow for Ministry of Water Resources, 2009) (where woody biomass availability is critical and agro-climatic zones similar to the Tanzanian Southern Highlands exist) suggested that rural domestic consumption increased by about 0.38 kg per capita per annum for every metre of altitude. Using this coefficient led to an estimate of annual rural domestic use in the Basin in 2010 of about 286,000 tons per annum. Not using the coefficient, the estimate is about one third less.

A part of this demand will be for charcoal and some of this may be transported to urban areas outside the basin. No data is available for this: 9% (following regional studies) of the rural domestic use is assumed to be extracted as charcoal. It is important to make this assumption because the value added of charcoal is higher than fuel wood.

In addition to rural domestic energy use, wood products are also required for construction, in Songwe River Basin primarily for local housing, though there may be extraction for urban markets including Mbeya and Karonga and further afield. Using an estimate of 26 kg per capita per annum the annual use of the basin population in 2009 approximates to about 10,000 tons of timber.

Prices of fuel wood, charcoal and timber were obtained from District sources, though the estimates given vary widely. Table 3-7 below gives the raw data for Tanzania administrative areas and Table 3-8 gives the raw data for Malawi. Note that Tanzanian firewood and charcoal are reported by weight in the administrative areas rather than by volume; firewood is mostly traded by the “head load”. Timber prices are for a bulk of building timber. Note the apparently very high quoted price of fuel wood in Kyela District. This may be reasonable, given the scarcity of “natural” vegetation in the Kyela sector of SRB and the fact that nearly all woody biomass is composed of economic trees rather than those normally used for fuel.

Table 3-7: Reported Fuelwood and Timber Prices from SRB Administrative Areas in Tanzania

District	Ward	Prices in 2014 TZS		
		Firewood	Charcoal	Timber
		TZS/30kg	TZS/30kg	TZS per 2*6*12 bulk
Kyela	Ikolo	20,000	16,000	6,000
Kyela	Katumba Songwe	20,000	15,000	6,000
Kyela	Ngana	4,000	10,000	12,000
Kyela	Ngonga	20,000	15,000	12,000
Ileje	Itumba	1,500	15,000	7,000
Ileje	Itale	900	10,000	6,000
Ileje	Ibaba	700	12,000	5,000
Ileje	Ndola	500	12,000	6,000
Ileje	Ikinga	800	12,000	6,000
Ileje	Kafule	1,000	13,000	5,000
Ileje	Malangali	1,000	12,000	6,000
Ileje	Bupigu	500	13,000	7,000
Ileje	Isongole	1,500	15,000	7,000
Ileje	Chitete	1,000	15,000	7,000
Ileje	Mbebe	1,000	15,000	7,000
Mbozi	Iyula	1,000	6,000	7,000
Mbozi	Nyimbili	500	5,000	7,000
Mbozi	Mlowo	500	5,000	7,000
Mbozi	Isandula	500	5,000	8,000
Mbozi	Ihanda	1,000	7,500	10,000

Malawi fuel and timber prices are not really commensurate; they are reported as “official” Government prices, which apparently have not changed in the period 2010-2012. No data was available for Karonga: this is unfortunate as it would be interesting to see if Karonga Lakeshore area had wood prices similar to the high prices reported from Kyela.

Table 3-8: Reported Fuelwood and Timber Prices from SRB Administrative Areas in Malawi

	Firewood		Charcoal		Timber
	Per m^3	Per head load	Per 50 kg	Over 50 kg	Per Plank
Chitipa Mwabulambya	700	150	500	600	150
Chitipa Mwenemisuku	700	150	500	600	150
Chitipa Kameme	700	150	500	600	150
Chitipa Boma	700	150	500	600	150
Chitipa Kilupula	700	150	500	600	150
Chitipa Mwakaboko	1700		1000	600	1500/m^3

Some adjustments had to be made to this data. Tanzania prices were deflated to 2010 prices by applying the GDP deflator to adjust for inflation. It was not necessary to adjust prices from administrative areas in Malawi because 2010 prices are reported. Some standardisation of weights and volumes was carried out, the conversion rate between cubic metres and metric tons was assumed to be 0.6005 m^3 per ton. Prices were then weighted by estimated consumption to arrive at a SRB level price, though this has little meaning at local level. In 2010, fuel wood market price was estimated to be US$ 32 per ton, charcoal was valued at US$ 88 per ton and timber was valued at US$ 149 per ton, see Table 3.9. Forest products (fungi, medicinal plants etc.) will also be important in the basin but without more study based on local knowledge only indicative values can be assigned.

Table 3-9: Prices and Estimated Consumption of Wood Products (2010)

	Fuelwood		Charcoal		Timber		Estimated consumption in tons		
	US$/ton	LCU/ton	US$/ton	LCU/ton	US$/ton	LCU/ton	Fuelwood	Charcoal	Timber
Mbeya Rural	9	13,326	44	62,633	151	213,220	12,321	280	378
Kyela	252	355,367	132	186,567	213	299,840	21,369	486	1,480
Ileje	15	20,999	124	174,453	148	208,980	63,184	1,437	2,314
Mbozi	9	13,326	44	62,633	151	213,220	35,855	815	1,223
Momba	9	13,326	44	62,633	151	213,220	29,813	678	1,068
Chitipa	10	1,443	78	11,667	100	15,000	75,700	1,721	3,016
Karonga	19	2,887	155	23,333	199	30,000	16,119	366	980
Overall	32		88		149		254,361	5,783	10,458

Note: LCU is Local Currency Unit (TZS in Tanzania, MWK in Malawi)

It is important to estimate if the SRB can support such levels of consumption of woody biomass. Taking the data reported in the SRBDP Inception Report and attaching standard woody biomass stock and mean annual increments to the land use types

gives an estimate of incremental growth from standing woody biomass stock of about 100,000 tons per annum[1], see Table 3-10.

Table 3-10: Provisional Land Use and Woody Biomass Estimates, SRB, 2010

	(km^2)	(%)	stock, tons per ha	Mean Annual Increment, tons per annum	stock, tons	Incremental growth, tons per annum
Natural Forest	72.0	2%	30	2.1	216,000	15,120
Woodland	723.2	17%	12	0.72	867,840	52,070
Bush land	2,086.9	50%	3.6	0.12	751,271	25,042
Grassland	89.3	2%	0	0	0	0
Inundated Grassland	192.2	5%	0	0	0	0
Cultivation	1,036.5	25%	2.4	0.12	248,769	12,438
Swamp	14.2	0%	0	0	0	0
Total	4,214.3	100%			2,083,880	104,671

Note: Unit Stock and MAI estimates from WBISPP, Ethiopia 2005

Even a cursory glance at the Basin's accessible hills in the altitudinal range 1,000-2,000 metres shows that deforestation has been severe, with most of the indigenous *Brachystegia* woodland remaining as no more than pollard stumps. Overall, the annual use of wood resources in the basin appears to be about double the annual replacement rate. See Section 6.3.2.4.

Production costs have been estimated for each category of wood product, considering harvesting, haulage and processing. Very little machinery and vehicle haulage costs are incurred in relation to wood production for domestic use. The value added of wood can be divided by the labour days required to produce and make it immediately useable to give the return to labour as estimated in Table 3-11.

Table 3-11: Summary of Estimate of RGDP SRB Wood Products, 2010

District	Basin ha	Population in the basin, 2010	RGDP Firewood US$ '000	RGDP Charcoal US$ '000	RGDP Forest products US$ '000	RGDP Timber US% '000	RGDP Forestry US% '000	Labour days	Return to labour, US$/labour day
Mbeya Rural	15,728	14,431	116.44	10.26	29.11	47.76	203.57	85,274	2.39
Kyela	18,274	56,449	5,385.16	54.09	1,346.29	264.07	7,049.61	156,126	45.15
Ileje	143,523	88,295	940.90	149.43	235.22	286.29	1,611.84	441,026	3.65
Mbozi	47,896	46,645	338.84	29.85	84.71	154.37	607.77	249,362	2.44
Momba	7,811	4,672	31.14	2.74	7.78	15.46	57.13	23,016	2.48
Chitipa	159,045	115,115	725.83	113.18	167.87	254.72	1,261.60	530,820	2.38
Karonga	33,143	37,395	309.10	48.24	35.74	165.71	558.80	116,402	4.80
Total	**425,420**	**363,002**	**7,847.41**	**407.80**	**1,906.73**	**1,188.38**	**11,350.31**	**1,602,026**	**7.08**

[1] The area of the cultivated area has been revised to 25% of the basin area (see section 3.1); the balance of the area was transferred to bushland.

Despite the unsustainable use of wood the return to labour for its production is low, suggesting that the depreciation of wood resources is not being given its proper value in the market. This is the same type of market failure (typical of common property resources) as described for Lake fisheries in Section 3.2.

3.4 HOUSING

The value of housing is an important part of any GDP valuation. Again, estimates are linked to population, see Table 3-12. The growth of housing stock depends on both the growth of population and the depreciation and replacement of existing stock. The population growth rate has been established for the period 2009-10, assuming the number of persons per house does not change about 2,050 new houses would be needed to accommodate it. The SRBDP Household Survey has established types of houses in the basin and values of properties have been estimated as part of the valuation for compensation purposes. This makes it possible to value the existing housing stock (say 83,000 units) as about US$ 84 million in present (2013) prices. 2013 prices were also used to calculate the value of new housing stock and repair and maintenance (at 5%) on existing stock. Deflating (using the GDP deflator) gives an estimate of US$ 5.1 million in current 2010 prices. To obtain the value added, the cost of materials has to be subtracted. Most of these are sun-dried bricks, thatching and timber the cost of which is mostly equivalent to the labour required to prepare them for building. Cement and corrugated sheeting are the main materials cost which amount to about 20% of the total costs of construction.

Table 3-12: Summary of Estimate of SRB RGDP Housing, 2010

	Existing stock 2009, number	Value of 2009 housing stock, US$ million, 2013	New housing stock required in 2010	New construction, US$ 2009	R&M on existing stock, US$ 2009	New construction, cost of materials, US$ 2009	New construction, cost of labour, US$ 2009	R&M on existing stock, cost of materials, US$ 2009	R&M on existing stock, cost of labour, US$ 2009	New construction, Labour days	Existing stock, Labour days	Return to Labour, New construction US$ per day	Return to Labour, R&M US$ per day
Mbeya Rural	3,237	2.09	79	42,897	87,975	7,559	35,338	13,636	74,339	5,386	11,045	6.56	6.73
Kyela	14,060	9.07	343	186,347	382,168	32,835	153,512	59,236	322,932	23,395	47,979	6.56	6.73
Ileje	22,815	14.72	556	302,383	620,138	53,281	249,101	96,121	524,017	37,963	77,855	6.56	6.73
Mbozi	11,262	7.27	275	149,259	306,107	26,300	122,959	47,447	258,660	18,739	38,430	6.56	6.73
Momba	10,403	28.68	254	137,880	282,770	24,295	113,585	43,829	238,940	17,310	35,500	6.56	6.73
Chitipa	15,178	15.27	379	621,957	1,243,914	174,620	447,337	273,661	970,253	25,898	51,795	17.27	18.73
Karonga	6,342	6.38	159	259,897	519,793	72,968	186,928	114,355	405,439	10,822	21,644	17.27	18.73
Total	83,296	83.48	2,044	1,700,620	3,442,865	391,859	1,308,761	648,285	2,794,580	139,512	284,249	9.38	9.83

Return to labour on house construction is higher than return to labour in other sectors as described above. The high value given to housing (obtained from compensation rates in 2013 and deflated to 2010 prices) and the relatively low cost of materials used gives a good return to labour allocated to housing. Of course, the need for housing in the basin is relatively fixed – there is no developed housing market – so the opportunities for increasing labour allocated to this sector is limited.

3.5 WATER SUPPLY

The statistics related to domestic water supply in SRB distinguish the type of supply systems available and the number of systems by administrative area. It is not always clear whether the systems are working or what the number of people served by each is. This made it difficult to calculate the value of water so a simple approach was taken, assuming that water is valued according to the costs incurred in accessing it, and

estimating those costs for three main types of system: rural improved, rural unimproved and semi-urban improved.

The basin population was disaggregated into rural (83%) and semi-urban (17% -the population living in agglomerations of more than 5,000 people which is likely to have a dedicated domestic supply service). Of the rural population a level of access to improved water supply was assumed by the lowest level of administrative area: overall about 50% of the rural population in the basin have access to an improved level of service. The volume of rural consumption with improved level of service was assumed to be 15 litres per capita per day. Rural water consumers without improved service level consume only 10 litres per capita per day. Semi-urban consumers mostly have access to an improved water supply service and consume 30 litres per capita per day.

The costs of supply were then estimated by assuming the labour days required to access 1m^3 of supply (1.4 days of labour from improved rural supply, 4.2 days of labour from unimproved supply and 0.4 days from semi-urban water supply). This labour use was valued by multiplying by the daily wage rate. The management, operation and maintenance (MOM) costs of supply were then estimated, distinguishing between management and equipment costs.

The gross value of domestic water is the labour and management costs plus intermediate costs (operation and maintenance), the value added is the cost of labour plus management.

Table 3-13 shows a summary of the calculations. The majority of domestic water in the basin is supplied through an improved or protected system, though this may not be elaborate. The return to labour and management for collecting water is as expected, low, but a substantial number of labour days are incurred in collecting it: in rural areas the effort may be up to 7% of the labour days available to the household (including children). In semi-urban areas the effort may be as low as 2%.

Table 3-13: RGDP Domestic Water Supply, 2010

	Rural population	Semi-urban population	Number of households	Consumption by type of system, m3			Gross value of water,US $ '000	Value added of water, US$ '000	Intermediate costs, US$ '000	Labour days	Return to labour, US$/labour day
				Rural unimproved	Rural improved	Semi-urban improved					
Mbeya Rural	14,431	0	5,147	26,337	39,506	0	223	180	43	169,659	1.3
Kyela	42,702	13,747	16,186	77,931	116,896	150,530	727	592	135	555,219	1.3
Ileje	73,851	14,444	24,498	134,779	202,168	158,162	1,204	1,000	204	921,329	1.3
Mbozi	29,185	17,460	29,747	53,262	79,894	191,187	583	335	248	428,470	1.4
Momba	4,672	0	6,376	8,527	12,791	0	84	31	53	59,553	1.4
Chitipa	99,636	15,479	19,467	181,836	272,754	169,492	2,012	1,595	417	1,197,775	1.7
Karonga	37,395	0	14,019	68,245	102,367	0	739	439	300	428,294	1.7
Total	301,873	61,130	115,440	550,918	826,376	669,370	5,572	4,170	1,401	3,760,298	1.5

3.6 SMALL AND MEDIUM INDUSTRY

It proved difficult to obtain the numbers and characteristics of SMI in the SRB. Data from the revenue authorities and Regional Trade offices suggest there are 1,087 SMIs in the basin's constituent Districts. It is estimated that only about 518 of these are within the SRB. The types of SMI enumerated include flour mills, rice mills, oil expellers, other small scale food processors, bakeries, restaurants and guest houses.

A few bus and taxi services exist in the semi-urban areas. Coal mining concessions exist within the SRB in Ileje (Tanzacoal) and Mwabulambya (Malcoal). The former is now in production, the latter is at exploration stage. Neither was producing before 2012.

Cereal production (maize and rice) amounted to about 200,000 tons in SRB in 2010 and accounts for 40% of the value added of cropping and 27% of the SRB RGDP. Food consumption estimates suggest that about 30% of cereals produced is consumed within SRB. While some of this is milled in the home a significant proportion is milled in an estimated 400 small-scale hammer mills that can be found in every ward and T/A in the basin. There are also a few small rice mills within SRB in Ileje and Kyela Districts, though the larger rice mills are outside the basin. Within the time available for this study, it was only feasible to obtain production characteristics for a "typical" mill, so the return to labour is constant for all administrative units. It is also lower than expected (maize US$ 3.34 per labour day, rice US$ 8.08 per labour day). Probably less than 20% of cereals produced in SRB are milled within the basin. See Table 3-14 for an estimate of value added, intermediate costs and labour use.

Table 3-14: RGDP Milling Industry, 2010

	Numbers of units in SRB		Value added, US$ '000		Intermediate costs, US$ '000		Labour days per annum	
	Maize mills	Rice mills	Maize mills	Rice mills	Maize mills	Rice mills	Maize mills	Rice mills
Mbeya Rural	14	0	72	0	392	0	21,647	0
Kyela	56	6	283	24	1,534	67	84,673	3,000
Ileje	88	6	442	24	2,399	67	132,443	3,000
Mbozi	47	0	233	0	1,267	0	69,967	0
Momba	5	0	23	0	127	0	7,009	0
Chitipa	191	0	957	0	5,197	0	286,874	0
Karonga	20	3	100	12	543	34	30,000	1,500
Total	422	15	2,111	61	11,460	168	632,613	7,500

Chitipa Boma (850 ha basin hectares, about 17,000 population) is the only administrative area in the SRB that can be considered urban. While agriculture is moderately important in the area (335 ha and 579 TLU) the RGDP per capita and labour occupancy is the lowest of all administrative units in the basin. This is because the SMI is incompletely enumerated in Chitipa Boma: a large proportion of the work force is working in SMI for which no data is available. Also some of the population may be working farms outside the administrative area.

4 THE ADMINISTRATION AND SERVICE SECTORS

4.1 TANZANIA ADMINISTRATION AND SERVICES

The Government Accounts (i.e. reported expenditure available for the accounts year 2009/2010 which appears to be the most recent year available) are available from the Tanzania Ministry of Finance website at http://www.tanzania.go.tz/financef.html. It is not easy to navigate the site but the detailed accounts are available on a page entitled 2011-12 MDAs and RAS. The Development and Recurrent expenditure is given by Ministry and Region. Vote 78 is the vote number for Mbeya Region. The files are in .pdf but very luckily can be downloaded in Excel as the file *Tz Gvt budget 09-10_TOTAL.xlsx* though the location of the link is not obvious. Mbeya Regional and District data can be isolated from the spreadsheet. It is unfortunate that a later set of accounts was not available in softcopy: in addition the .pdf files report approved estimates for 2010/11 and unapproved estimates for 2011/12.

The main groups of accounts of interest are:

(i) The Recurrent Expenditure for Ileje, Kyela, Mbeya Rural and Momba District HQs (salaries, consumables etc.) (TZS 0.92 billion)
(ii) The Recurrent Expenditure for the Mbeya Region HQ (salaries, consumables etc.) (TZS 3.93 billion)
(iii) Transfers made from Mbeya Region to all the Mbeya Districts to meet recurrent sectoral costs (agriculture, water, roads, health etc.) (TZS 103.8 billion)
(iv) The share of the Development Budget (projects being implemented at national level and partly funded by donors) disbursed by Mbeya Region to the Mbeya Districts (TZS 26.7 billion).

Nearly all public expenditure in Mbeya Region appears to pass through the Regional Budget and Accounts (but see below for some exceptions). However, there is an item in the summary accounts named “Less Appropriation in AID” (about 18% of the total budget in 2011/12). This may be a deduction for recurrent costs funded by donors, but if so it is clear that this expenditure is already itemised in the budget.

It is unfortunate that the best reported items are (i) and (ii) which are financially the least important. Summarising the data and reporting recurrent expenditure by Regional HQ and each Tanzanian District which partly falls within the Songwe River Basin gives the result shown in Table 4-1. It is straightforward to allocate District recurrent costs to the SRB by multiplying by the proportion of the total population of each District that were resident in the Basin in 2009/10. The recurrent costs of the Regional HQ are also partly incurred within SRB. To estimate this requires firstly multiplying the recurrent expenditure of Mbeya HQ by the proportion of the population of each District falling within the Basin and then multiplying by the proportion of the

total population of each District that were resident in the Basin in 2009/10. This estimate represents the value of Government work done at Mbeya HQ level within the SRB.

The Gross Value Added can be assumed to be salaries and allowances which comprise 63% of recurrent expenditure overall, the balance is intermediate costs.

Table 4-1: Recurrent Expenditure by Region and District, 2009/10, current TZS

	Regional HQ	Ileje	Kyela	Mbeya Rural	Mbozi	Total
Allowances	641,718,000	39,480,000	40,900,000	54,035,000	53,631,000	829,764,000
Cleaning	7,500,000	600,000	520,000	500,000	960,000	10,080,000
Communication	54,400,000	3,600,000	4,419,600	8,273,000	4,920,000	75,612,600
Computing	125,637,200	1,580,400	4,703,200	3,200,000	4,564,000	139,684,800
Conferences	5,980,000	100,000	0	0	200,000	6,280,000
Construction	36,300,000	800,000	500,000	1,300,000	1,554,000	40,454,000
Entertainment	34,200,000	900,000	6,076,600	3,100,000	2,210,000	46,486,600
Fuel	318,200,000	29,192,000	34,690,000	31,360,000	28,894,000	442,336,000
Hospitality	78,032,000	7,991,600	923,000	1,723,500	5,658,000	94,328,100
Medicines	78,270,000	0	0	600,000	0	78,870,000
Miscelaneous	122,151,600	300,000	0	800,000	150,000	123,401,600
Office supplies	88,209,600	3,768,000	1,660,000	3,930,000	6,414,600	103,982,200
Peoples Militia	30,000,000	3,600,000	4,000,000	6,000,000	4,800,000	48,400,000
Power	58,860,000	9,900,000	10,560,000	11,898,000	10,700,400	101,918,400
Salaries	1,747,501,000	74,074,000	81,187,000	96,144,000	114,469,000	2,113,375,000
Spare Parts	17,458,000	0	0	510,000	0	17,968,000
Technical Equipment	28,691,000	0	0	0	0	28,691,000
Training	151,519,000	3,000,000	300,000	748,500	902,000	156,469,500
Transfer: agriculture	0	0	0	0	0	0
Transfers: Administration	0	0	0	0	0	0
Transfers: health	0	0	0	0	0	0
Transfers: roads	0	0	0	0	0	0
Transfers: water	0	0	0	0	0	0
Transportation	170,666,600	24,710,000	20,170,000	21,472,000	24,527,000	261,545,600
Trasfers: Education	0	0	0	0	0	0
Vehicles	125,000,000	0	0	0	0	125,000,000
Water	11,016,000	0	99,600	1,008,000	120,000	12,243,600
	3,931,310,000	203,596,000	210,709,000	246,602,000	264,674,000	4,856,891,000

NB The budget items are District totals, therefore unadjusted for SRB expenditure and not distinguishing between value added and intermediate costs.

The next item of interest is the allocation of recurrent costs by sector. This is divided as shown in Table 4-2. It is not easy to deduce from the spreadsheet *Tz Gvt budget 09-10_TOTAL.xlsx* which District gets what allocation, though the accounting entries are reported clearly enough. Further sub-division of the entries can be found in *Mbeya Region and District Expenditure Vote 78.pdf* which gives the detailed accounts of Mbeya City Council and each District including the expenditure justifying the transfers. It was not realistic to process this information from .pdf (which is a detailed account of the items in Table 4-1 and Table 4-2), but the expenditure heads suggest a similar proportion of salaries and allowances as reported in Table 4-1.

Table 4-2: Recurrent Expenditure by Sector, 2009/10, current TZS

	Mbeya	Chunya	Ileje	Kyela	Mbeya Rural	Mbozi	Rungwe	Mbarali	Total	%
Administration Transfers	4,503,795,000	2,044,601,000	1,255,088,000	2,027,469,000	2,664,159,000	2,153,000,000	3,528,661,000	1,871,360,000	20,048,133,000	19%
Agriculture Transfers	249,495,000	274,067,000	27,883,000	66,392,000	41,499,000	118,842,000	736,286,000	218,693,000	1,733,157,000	2%
Education transfers	11,351,247,000	4,928,998,000	4,452,411,000	6,172,765,000	7,777,019,000	11,151,545,000	14,141,039,000	7,314,488,000	67,289,512,000	65%
Health Transfers	1,905,408,000	1,604,170,000	795,057,000	1,429,266,000	1,414,756,000	1,972,098,000	2,398,827,000	1,350,384,000	12,869,966,000	12%
Road transfers	178,766,000	132,122,000	115,662,000	86,187,000	114,694,000	129,683,000	122,601,000	114,049,000	993,764,000	1%
Water transfers	17,318,000	115,342,000	90,510,000	92,215,000	111,372,000	132,656,000	221,731,000	119,133,000	900,277,000	1%
Total	18,206,029,000	9,099,300,000	6,736,611,000	9,874,294,000	12,123,499,000	15,657,824,000	21,149,145,000	10,988,107,000	103,834,809,000	100%

NB: The budget items are District totals, therefore unadjusted for SRB expenditure and not distinguishing between value added and intermediate costs.

The distribution of the allocations to the SRB can be done as described above; assuming recurrent expenditure in the Basin is proportional to the District population within it.

Table 4-2 contains some important information on Government priorities for development: education and health figure prominently with education dominant.

The final budget item is the distribution of the Development Budget. Little information is available from the Accounts, just a total sum by project for the whole of Mbeya Region, but the expenditure is itemised in *2009 Actual Development Expenditure Vote 78 Mbeya Region.pdf*. The donor is sometimes specified but unfortunately projects are not named, and recipients of expenditure at District level are also not identified. Quite a large proportion of expenditure is incurred in the construction and furnishing of buildings, though there is also a significant proportion of allowances (but no salaries). We can only assume once more that this is distributed in proportion to population to the Districts, as shown in Table 4-3, but the allocation is more likely to be at the technical discretion of the Regional government offices responsible for disbursement.

Table 4-3: Development Budget by Project and District, 2009/109, current TZS

Development Budget	Mbeya	Chunya	Ileje	Kyela	Mbeya Rural	Mbozi	Rungwe	Mbarali	Total
Rural Water Supply & Sanitation	537,002,292	404,868,554	173,459,940	308,713,005	425,553,957	896,432,931	472,717,398	418,860,924	3,637,609,000
National Rural Transport Programme.	111,849,317	84,327,892	36,129,037	64,300,170	88,636,343	186,713,190	98,459,763	87,242,287	757,658,000
Agriculture Sector Dev. Prog. Support	427,719,437	322,475,626	138,159,909	245,888,247	338,951,437	714,004,007	376,516,864	333,620,472	2,897,336,000
Agriculture Sector Dev. Prog. Support	275,927,794	208,033,539	89,128,891	158,625,949	218,662,315	460,613,977	242,896,298	215,223,236	1,869,112,000
Participatory Forest Management	62,160,932	46,865,734	20,078,930	35,735,207	49,260,182	103,766,981	54,719,606	48,485,427	421,073,000
Health Sector Prog. Support-Districts	83,166,504	62,702,716	26,864,051	47,810,934	65,906,301	138,832,168	73,210,587	64,869,739	563,363,000
Health Sector Prog. Support-Districts	533,002,243	401,852,750	172,167,863	306,413,448	422,384,069	889,755,537	469,196,197	415,740,892	3,610,513,000
Global Fund HIV/AIDS Prev. Project	124,005,061	93,492,617	40,055,528	71,288,290	98,269,309	207,005,113	109,160,334	96,723,748	840,000,000
HIV/AIDS	64,026,323	48,272,130	20,681,480	36,807,587	50,738,433	106,880,929	56,361,690	49,940,429	433,709,000
Local Govt Support Programme	750,012,576	565,465,943	242,265,514	431,168,803	594,356,530	1,252,016,949	660,228,082	585,008,602	5,080,523,000
Wetlands Mgt and Sustainable Development	26,203,450	19,755,880	8,464,115	15,063,895	20,765,241	43,742,152	23,066,618	20,438,649	177,500,000
Urban Development and Environment Management	15,934,650	12,013,801	5,147,135	9,160,545	12,627,606	26,600,157	14,027,103	12,429,002	107,940,000
District Councils	930,961,203	701,890,704	300,714,684	535,192,930	737,751,457	1,554,079,549	819,515,231	726,148,241	6,306,254,000
Total	3,941,971,782	2,972,017,887	1,273,317,078	2,266,169,010	3,123,863,181	6,580,443,641	3,470,075,773	3,074,731,647	26,702,590,000

NB: The budget items are District totals, therefore unadjusted for SRB expenditure and not distinguishing between value added and intermediate costs.

Most District expenditure is included in the budget of the District Council, though the Council may incur a deduction for expenditure that is made available locally and externally from other sources (see above). According to the District Planning Office, Ileje, a few items of Ileje District expenditure are funded from outside the District

Council budget. Recently, these include specific items funded from the Tanzania – Japan Counterpart Food Aid:

(i) Isongole-Itumba Road Project, to connect the boma with the border, about 10 km of tarred road and apparent improvement of semi-urban roads within Itumba, now complete
(ii) Ilondo Water Supply Project, a piped scheme costing about TZS 270 million, now complete.

These are relatively small projects. More important is the Agricultural Input and Fertiliser Project that provides subsidised inputs. The subsidy is paid outside the District by central government. From the data provided it would seem that the value of the fertiliser and seed subsidy to Ileje District in 2013 was in the order of US$ 550,000 million (about 50% of the market price of the inputs dispersed). The project benefitted one person in each of about 5,540 households or about 20% of households in the District. On average, each beneficiary purchased inputs (about 150 kg of fertiliser and 10 kg of improved seed) with a market value of US$ 160 at a subsidised price of US$ 76. The subsidised inputs were theoretically sufficient to plant and fertilise about 20% of the District's area cultivated to maize (about 21,000 ha) and 100% of the area cultivated to paddy rice (about 1,250 ha) in 2010. The total amount of subsidised fertiliser supplied to the District in 2013 was about 815 tons and the total amount of subsidised seed was about 60 tons. Comparing this value with the 2009/10 District Council budget it would be about 7% of the government budget for Ileje District.

4.2 MALAWI ADMINISTRATON AND SERVICES

Similar statements of the Government expenditure for the Malawi sector of SRB were unavailable from the internet. The only accessible source was from the Sustainable Development Network Programme web site that contains a statement of expenditure devolved from central government to Local Councils for the period 2010/2011 (http://www.sdnp.org.mw/budget-2011/votes-2011/Local_Councils_-_OBB.pdf). This is Section 3 of a larger document: 2011/12 Output Based Budget Document (Ministry of Finance 2012). This document does not appear on the web. The total amount devolved to Local Councils during the period was MWK 13.9 billion and the proportion by sector and fund was deducible, see Table 4-4. Also available was the total sum devolved for Chitipa and Karonga, so an estimate of sectoral allocation could be made based on the national level division.

It is worth remarking that the national allocation to Local Councils is only US$ 6.15 per capita, but the per capita allocations to Chitipa and Karonga are US$12 and US$8 respectively. Note that the allocation does not include the salaries of government ministry officers who are paid centrally (unlike ministry staff in Tanzania who are paid through the District Council budget). Table 4-4 does not include salaries of Malawi Government staff. Staff numbers by government department were obtained for the Songwe River Basin. A unit cost of MWK 0.8 million per salaried official per annum was assumed which includes social costs as well as net salary.

Table 4-4: Budgeted Local Council Expenditure, 2010/11, Current MWK, million

	Total	Chitipa	Karonga	%
Health	9,208.39	196.44	222.48	66%
Education	2,157.14	46.02	52.12	16%
Education materals	0.00	0.00	0.00	0%
Agriculture	517.10	11.03	12.49	4%
Trade	33.97	0.72	0.82	0%
Water	33.48	0.71	0.81	0%
Gender	64.00	1.37	1.55	0%
Environment	51.90	1.11	1.25	0%
Forestry	35.33	0.75	0.85	0%
Housing	35.16	0.75	0.85	0%
Fisheries	70.33	1.50	1.70	1%
Labour	30.27	0.65	0.73	0%
National Registration Bureau	38.53	0.82	0.93	0%
Immigration	30.00	0.64	0.72	0%
Irrigation	84.00	1.79	2.03	1%
General Rsource Fund	566.10	12.08	13.68	4%
Constituency Development Fund	579.00	12.35	13.99	4%
Infrastructure Fund	360.00	7.68	8.70	3%
Total	13,894.70	296.41	335.70	100%

Note: Exclusive of salaries of Government Staff
NB: The budget items are District totals, therefore unadjusted for SRB expenditure and not distinguishing between value added and intermediate costs.

Nevertheless, the Local Councils do employ some staff, the salaries and allowances of which are paid through the General Resource Fund. Devolved sector funds (education, health etc.) are conditional (that is they cannot be diverted to other activities) and mostly pay recurrent costs. The Constituency Development Fund is for allocation at the discretion of local politicians. The City Council Infrastructure Development Fund is for urgent short-term construction and repairs.

The figures give an idea of the relative priorities of local government expenditure, which (as in Tanzania) are focussed on health and education. In Malawi a much greater proportion of local spending is directed to health than is observed in Tanzania, but in the 2012/13 budget for Karonga Local Council this is less marked, with 43% of the budget going to Health and 36% to Education[2]. This is partly explained by Malawian teachers being paid direct from the Ministry of Education. Ministry of Health staff are also paid centrally, but there are fewer of them and health services have a higher requirement for intermediate costs, particularly medicines. It may also be that

[2] The SRB Quantitative Survey Report (SRDP November 2013) Table 5 suggests that educational services are harder to access in the Malawi sector of the Basin whereas the converse is true for health services.

educational materials are paid centrally: there is a Local Council budget line for them but even in the Karonga District Council budget for 2012/13 this remained as zero.

In addition to the Local Council allocations, funding is allocated to specific projects or activities by line Ministries. It has proved impossible to get estimates of such expenditure for Karonga and Chitipa, though it may be available in the illusive Section 2 of the 2011/12 Output Based Budget Document. It is likely that the most important support comes through the Farm Input Subsidy Programme and the Irrigation and Rural Livelihoods and Agricultural Development Project which both provide subsidised seed and fertiliser, though the latter requires that beneficiaries do labour on public works in return. The input subsidy is directed and paid for outside the District by central government and donors. From the data provided by Karonga District it would seem that the value of the fertiliser and seed subsidy to the Songwe River Basin area of Karonga District (about 10% of its total area and 13% of its population) in 2013 was in the order of US$ 220,000 (about 3% of the market value of the inputs dispersed). The programme benefitted one person in each of about 2,976 households or about 50% of Karonga households in the basin. On average, each beneficiary "purchased" inputs (about 80 kg of fertiliser and 5-10 kg of improved seed) with a market value of US$ 76 at a subsidised price of about US$ 4 (excluding the transaction costs of obtaining inputs though the voucher system which are apparently considerable). The subsidised inputs were theoretically sufficient to plant and fertilise an area equivalent to about 10% of the area cultivated to maize in the area of the District within the basin in 2010 (about 5,512 ha). The total amount of subsidised fertiliser supplied to the area of the District within the basin in 2013 was about 240 tons and the total amount of subsidised seed was about 10 tons. Comparing this value with the 2009/10 District Council budget it would be about 170% of the Local Council budget for Karonga District spent within the Songwe River basin area. Chitipa District practices a similar system and there are estimated to be about 7,900 beneficiary households in the SRB area (compared with about 3,000 households in the Karonga District sector).

The input subsidy system practiced in Karonga and Chitipa Districts is similar to that described for Ileje District in that the value of subsidy is about $70-80 for each beneficiary. However, on the Malawi side the number of beneficiaries seems to be a larger proportion of the farming population and a smaller quantity of inputs are supplied to each beneficiary. But the most important difference is the level of subsidy – on the Malawi side inputs are almost given away, if one ignores the difficulty of actually obtaining them (waiting time, subversion costs etc.). In Ileje District the level of subsidy on inputs provided to benefiting farmers is about 50%. The level of subsidy (95%) in Karonga and Chitipa makes the cost of the Farm Input Subsidy Programme enormous compared to the Local Council budgets. The lower level of subsidy (50%) and the smaller scope of the Agricultural Input and Fertiliser Programme in Ileje District, as well as the larger District Council budget, means the cost of the programme fits much better in context of the overall District budget (about 7% of the total)[3].

[3] The SRB Quantitative Report (SRBDP November 2013) Table 8 reports 83% of respondents claiming income support through the provision of services in the Malawi sector compared with 68% on the Tanzania side. Government Extension Service support was also reported as being stronger on the Malawi side.

The Social Cash Transfer Programme (according to its own guidelines) benefits no more than 10% of the very poorest households in Karonga and Chitipa Districts. Within the SRB there are probably no more than 620 and 1,700 benefiting households respectively. They receive minimum cash payments of MWK 1,000-2,900 per month. The Programme is centrally funded through the Ministry of Gender, Children and Social Welfare and may provide cash payments to beneficiaries in SRB totalling about US$ 214,000 per annum.

A third source of funding is direct and indirect donor funds that are the subject of a whole report entitled Malawi Aid Atlas 2010/11. An inventory of donor projects in Malawi is available from the Robert S. Strauss Centre at the University of Austin (https://www.strausscenter.org/ccaps/mapping-tool.html). Projects and activities listed as specifically related to Chitipa and Karonga Districts are shown in Table 4-5.

Table 4-5: Donor-funded Projects: Karonga and Chitipa Districts, 2010 US$

District	Donor	Project Name	Estimated 2010 disbursment
Chitipa District	European Union (EU)	Farm Income Diversification Programme -Phase 2	62,954
Misuku	Flemish International Cooperation Agency (FICA)	Mzuzu Coffee Planters Co-op Ubion	116,842
Chitipa District	International Fund for Agricultural Development (IFAD)	Irrigation Rural Livelihoods and Agriculture Development Programme (IRLAD)	1,275,986
Chitipa District	US Agency for International Development	Kulera Biodiversity Activity	777,807
Chitipa District	European Union (EU)	Farm Income Diversification Programme	212,633
Karonga	African Development Bank (AfDB)	EDUCATION V	239,238
Chitipa District	Norwegian Agency for Development Cooperation (NORAD)	Sustainable Management of Nyika Transfrontier conservation Area	0
Chitipa District	European Union (EU)	Forestry Management for Sustainable Livelihoods	111,790
Chitipa District	Norwegian Agency for Development Cooperation (NORAD)	Response to Gender Based Violance	0
Chitipa District	African Development Bank (AfDB)	Support to the health sector programme	246,656
Chitipa	UK Department for International Development (DfID)	Support to Banja La Mtsongolo	0
Chitipa	German Agency for International Cooperation (GIZ)	Promoting Democratic Decentralization (next phase II)	1,585,053
Chitipa District	European Union (EU)	Rural Feeder Roads	153,962
Chitipa	World Bank	Infrastructure Services Project	211,209
Chitipa District	Irish Aid	Malawi Social Cash Transfer Programme	393,253
Chitipa	Norwegian Agency for Development Cooperation (NORAD)	NCA-ACT Food Crisis Emergency snf recovery response program	558,513
Chitipa District	World Bank	MASAF III (Extension)	0
Chitipa District	World Food Program (WFP)	Protracted Relief and Recovery Operation (PRRO)	10,864,616
Chitipa District	African Development Bank (AfDB)	Smallholder crop production and marketing project	283,040
Chitipa District	World Bank	Irrigation, Rural Livelihoods and Agriculture Development (IRLAD)	5,435,806
Karonga	Irish Aid	Seed inputs	402,138
Karonga District	Norwegian Agency for Development Cooperation (NORAD)	NASFAM III	2,357,176
Karonga District	Norwegian Agency for Development Cooperation (NORAD)	NCA Prevention of Human trafficking"	310,704
Karonga District	UNDP	Disaster Risk Management Programme Support	1,136,570
Karonga District	German Agency for International Cooperation (GIZ)	School Feeding Program	705,480
Karonga District	Norwegian Agency for Development Cooperation (NORAD)	Sustainable Management of Nyika Transfrontier conservation Area	0
Karonga District	US Agency for International Development	COMMUNITY BASED FAMILY PLANNING (FP) AND HIV/AIDS SERVICES	3,402,382
Karonga	US Center for Disease Control and Prevention (US CDC)	Improving the delivery & management HIV/AIDS care through appropriate medical informatics	770,833
Karonga District	European Union (EU)	Microprojects Programme	124,868
Karonga District	People's Republic of China	Karonga et al. Road Building	11,650,000
Karonga	European Union (EU)	Karonga-Chiweta (Repayment of outstanding bills)	2,991,862
Karonga	European Union (EU)	Malawi Backlog Road Rehabilitation and Maintenance Programme	5,169,700
Karonga District	UK Department for International Development (DfID)	Humanitarian Assistance - Karonga Earthquake	1,412,859
Karonga District	Japan	The Project for Crisis Counselling Programme in Karonga Earthquake Disaster Area	14,467
Karonga District	UK Department for International Development (DfID)	Water and Sanitation Governance - (Old name) Water Aid - Policy, Equity and Accountability	202,706

The estimate of 2010 funding is derived from the database (not reported in it) by Consultants' estimates based on the reported start year of the project and reported cumulative disbursement to date. The database reports the total funding allocation, not the funds allocated to the District. The larger projects are generally designed for implementation in many Districts, so in many cases the disbursement had to be re-estimated with this in mind. Accuracy was difficult and over-estimation is suspected, though this does not matter much as the contribution of donor funded projects to RDSP is small. In addition, projects and programmes related to agricultural input supply should be eliminated (the subsidies have already been estimated, see above), along with projects and programmes taking place outside the SRB. The remainder should be adjusted for scope, since some take place throughout the District and others are local but outside the Basin. Only activities within SRB should be included. All these adjustments lead to the estimate given in Table 4-6. The largest budget item represents the proportion of the Karonga-Chitipa road in the Songwe River Basin which was under construction in 2010 (none of the Karonga section of the road is within the SRB).

Table 4-6: Donor-funded Activities by Sector, SRB 2010, current US$

	Chitipa		Karonga		Malawi Sector	
Sector	US$ 2010	US$/pc	US$ 2010	US$/pc	US$ 2010	US$/pc
Agriculture	211,912	2	235,718	8	447,629	4
Democratic Governance		0	0	0	0	0
Education	129,188	1	70,548	3	199,736	2
Environment & natural resources	60,367	1		0	60,367	1
Gender & Youth	0	0		0	0	0
Health	133,194	2	340,238	12	473,432	4
IRDP	0	0	12,487	0	12,487	0
Roads & Public Works	4,857,187	56	0	0	4,857,187	42
Vulnerability Disaster Risk Management	301,597	3	0	0	301,597	3
Water and Sanitation	142,041	2	0	0	142,041	1
Total	5,835,486	67	658,991	23	6,494,477	56

Source: Consultant's Estimate

NGOs also provide development funds as reported in a survey of 45 villages in the Songwe River Basin Qualitative Survey Report (SRBDP, November 2013). Only six of the 45 villages reported NGO initiatives of which five were in Karonga District. The NGOs reported were Paradin Mine, Danida, Livingstonia Synod, the Association for Rural Community Development and the Moravian Church. Expenditure is unlikely to be large.

4.3 ADMINISTRATION AND SERVICES IN SRB

The two sections above report government and donor funding by high-level administrative areas that are available from official sources and therefore attributable. The processes by which the data are actually disaggregated to Basin level are "consultants' estimates". The disaggregation used is shown in Table 4-7 and based on the distribution of population.

The total expenditure on public services in Songwe River Basin in the year of interest is estimated to be about US$ 22 million per annum and US$ 60 per capita. This is a reasonable estimate because Government national expenditure per capita in Malawi in 2010 was US$ 103 per capita and in Tanzania US$ 132 per capita (see Table 6-13).

SRB is remote and rural so government expenditure per capita is expected to be lower than the national average. The two Government public administration and service budgets are quite similar but there is a difference in the distribution of costs between sectors, with the Malawi sector having a greater proportion of the District budget allocated to health while the Tanzania sector prioritises education. The Malawi sector does not appear to have the overheads of a provincial administration whereas the Tanzania sector incurs costs at regional level. Water and roads appear to have very small government budget allocations on both sides.

Table 4-7: Estimate of Administration and Services in SRB, 2010, current US$

	Development budget	District Administration	Regional Administration	Health	Water	Roads	Education	Agriculture	Agricultural input subsidies	Other Externally funded projects	Social Cash Transfer Programme	Total	Public Administtation and Services US$ pc
Tanzania	1,492,750	150,368	1,086,952	742,137	70,814	79,351	3,969,349	31,410	587,909	0	0	8,211,039	37
Malawi Government	89,379	82,208	102,284	3,669,459	74,286	72,390	1,789,676	322,401	0	0	213,495	6,415,578	40
Malawi Donors	0	0	0	473,432	142,041	4,857,187	199,736	809,593	1,000,033	12,487	0	7,494,510	47
Total	1,582,129	232,576	1,189,235	4,885,029	287,141	5,008,929	5,958,761	1,163,404	1,587,942	12,487	213,495	22,121,127	58
% Tanzania	18.2%	1.8%	13.2%	9.0%	0.9%	1.0%	48.3%	0.4%	7.2%	0.0%	0.0%	100%	
% Malawi	0.6%	0.6%	0.7%	29.8%	1.6%	35.4%	14.3%	8.1%	7.2%	0.1%	1.5%	100%	
% total	7%	1%	5%	22%	1%	23%	27%	5%	7%	0%	1%	100%	

Notes
Tanzania estimate refers to 2009/10
Malawi estimate refrers to 2010/11
Input subsidies are estimated for 2012/13
Malawi government budget includes an estmate of salaries paid centrally
There is unreported NGO expenditure in both Malawi and Tanzania sectors

None of this is particularly surprising until the large injection of donor funding in the Malawian sector of the Songwe River Basin is taken into account. This can be only roughly estimated. Malawi has been under scrutiny by donors in recent years in respect of budgeting (though some studies equally criticise the part donors play in the process) especially in respect of allocation, delivery and reporting. Apparently only about 40% of donor funding to Malawi (which slightly exceeded US$ 1 billion in 2010/11) actually appears in the budget for 2010/11.

Adding the donor disbursements in 2010/11 (from Table 4-6) suggests that service expenditure per capita is overall greater on the Malawi side. Note though that the donor disbursements are dominated by the cost of the Karonga-Chitipa road, which was under construction in 2010.

The bottom line of the budget shows the overall allocation of service expenditure. It is not easy to compare like with like in terms of development budgets and administration costs but it might be observed that District administration costs are surprisingly low as a proportion of the total budget, though in Tanzania quite a lot of District administration seems to be carried out at Regional level. No data was available about overhead costs of basin administration by Northern Province in Malawi.

The estimates of sectoral expenditure are reasonably comparable. Education and health have the largest budget allocations, followed by agriculture. Agricultural input subsidies have to be added to the recurrent costs incurred. Recurrent expenditure on water and roads (neglecting the Karonga-Chitipa road) is very low.

4.4 ADMINISTRATION AND SERVICES IN THE RGDP

Sections 4.1 and 4.2 above present annual District budgets with total expenditure divided between sectors. The data has to be adjusted to reflect total expenditure in the Basin, see Section 4.3. Then total basin expenditure has to be divided firstly between development and recurrent costs and then each budget head must be divided between intermediate costs and value added.

There is little alternative to dividing the total District expenditure proportionate to the basin population resident within the District on the assumption that the District apportions its budget commensurate with population distribution. This is of course easily done, since the basin population is reasonably accurately known by District and administrative area for the years of interest. District total populations are also available for these years. The proportion of the district annual budgeted expenditure incurred in the Tanzania sector of SRB is therefore assumed to be: Ileje 65%, Kyela 14%, Mbozi 11% and Mbeya Rural 5%. In 2009 Momba District had not yet been created and it was assumed that it was part of Mbozi. In the Malawian sector it was assumed to be 54% of the Chitipa District budget and 10% of that of Karonga.

For the division of the District budgets between development costs and recurrent costs it was assumed that all project costs (i.e. the Development budget of Tanzania and the donor funded projects of Malawi) were allocated to development and the District and Local Council costs were all recurrent costs.

It was easy to separate value added in the Tanzanian District Council budget. Value added is exactly equivalent to staff salaries and allowances and is overall (for all four Districts) 57% of the budget. Unfortunately similar sub-divisions of costs for sectoral recurrent expenditure in Tanzanian districts was not available, neither was any subdivision available for Local Council spending in the Malawian sector. A further complication on the Malawi side was that staff salaries of ministry staff are paid centrally.

A similar sub-division of development costs was also problematic. The value added of development costs is equivalent to the value of product intended to be produced – the labour to produce it is an intermediate cost as well as the materials used for construction or the costs of project implementation. Since development costs are incurred as part of investment projects the value added will depend on the nature of the project. A new forestry plantation would be valued according to the annual incremental production of wood, the value added of a new farm or irrigation scheme would be calculated as equivalent to the value added of the crops produced. The sector in which development costs have been incurred in the years of interest has been identified (see Table 4-3 and Table 4-5). Given the project documents the intended value added could be calculated, but these are mostly unavailable. However, it is worth remarking that the value added of most development investment is very small in the year of implementation: benefit streams develop over time and are incorporated in the estimates of value added for subsequent years. We are therefore justified in assuming value added to be very small in the year of expenditure (10%) and limited to projects with immediate returns: water supply, health and transport.

The contribution of the financial sector to the RGDP currently contributes a very small amount to the SRB economy but it is likely to grow in future. The financial sector allows the transfer of money between investors and borrowers and the basic components are financial institutions (e.g. banks, brokers, insurance companies) operating through markets (both money and capital). The main financial institutions operating in SRB are the commercial banks, from which no data was collected directly. However, in 2010 the value added to the GDP by the Tanzanian banking sector as a whole was about US$ 28 million in current prices (https://www.quandl.com), therefore comprising only 0.6% of national GDP (US$ 22.9 billion n 2010). On a national basis banking contributes about US$ 3.50 per capita to value added, but most of this will be accumulated in regional and commercial sectors. It may be concluded that the financial value added accumulated in SRB will be very small, in fact not significantly measurable, though it is acknowledged that value added from financial transactions will grow in the future.

The only other item to consider is subsidy. Agricultural input subsidies clearly have no intrinsic value added – inputs are intermediate goods that contribute to the production of crops, the value added of which have already been calculated for the year of interest. It is important to add subsidies to the intermediate cost of inputs actually paid for by the farmer (i.e. use the market price). The social cash transfer enables a greater productivity of labour of the poorest; it has no value added until it is used as such. The productivity of labour is accounted for in the person days estimated for each economic activity.

5 SUMMARY OF THE 2010 RGDP ESTIMATE

5.1 THE FINANCIAL ACCOUNTS

The RGDP of the SRB in 2010 is estimated to be about US$ 134 million per annum in 2010 current prices, see Table 5-4. For an appreciation of the current state of the economy we focus on 2010, which is the year for which there is most accurate and year-specific data available. GDP estimates are often compilations of data sets for several years that are adjusted for the year of interest. Since 2010 there will have been an expansion of the basin economy: increases in crop areas are expected and probably yields have also risen slightly. Local authority budgets appear to be increasing. Population is also increasing, so RGDP per capita may have increased at a slower rate. See Section 6 for an estimate of the rate of expansion of the SRB economy and an estimate of the value of RGDP in 2013.

The basic structure of the SRB economy is shown in Figure 5-1. Rainfed and irrigated cropping accounts for the largest proportion, 71%, other sectors are much smaller, but important. The main message from the Figure is that productivity increases in the crops sector will have the biggest leverage for growth in the basin economy.

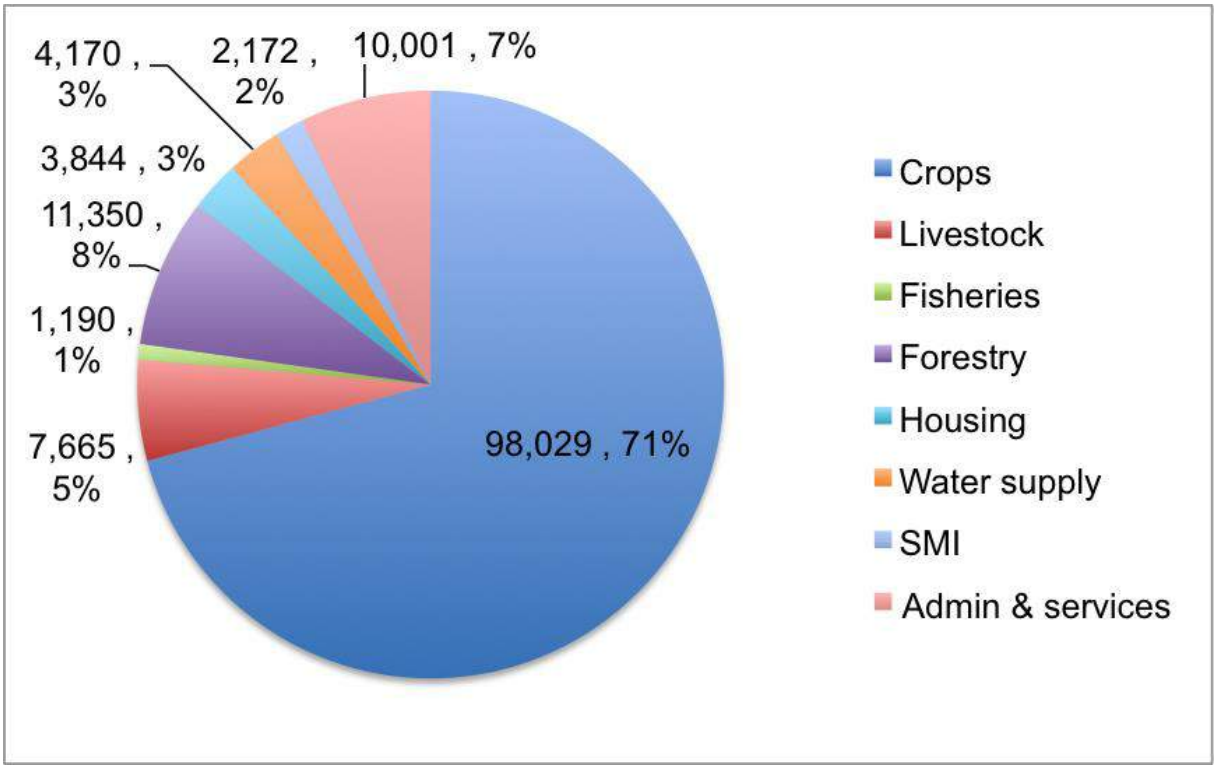


Figure 5-1: SRB Economy by Sector in 2010, current 2010 US$ '000

The distribution of RGDP by administrative area within the basin is shown in Figure 5-2. The larger administrative areas tend to have larger RGDP than smaller. The Figure

also indicates RGDP per capita by administrative area. There is no significant correlation between size of RGDP and RGDP per capita.

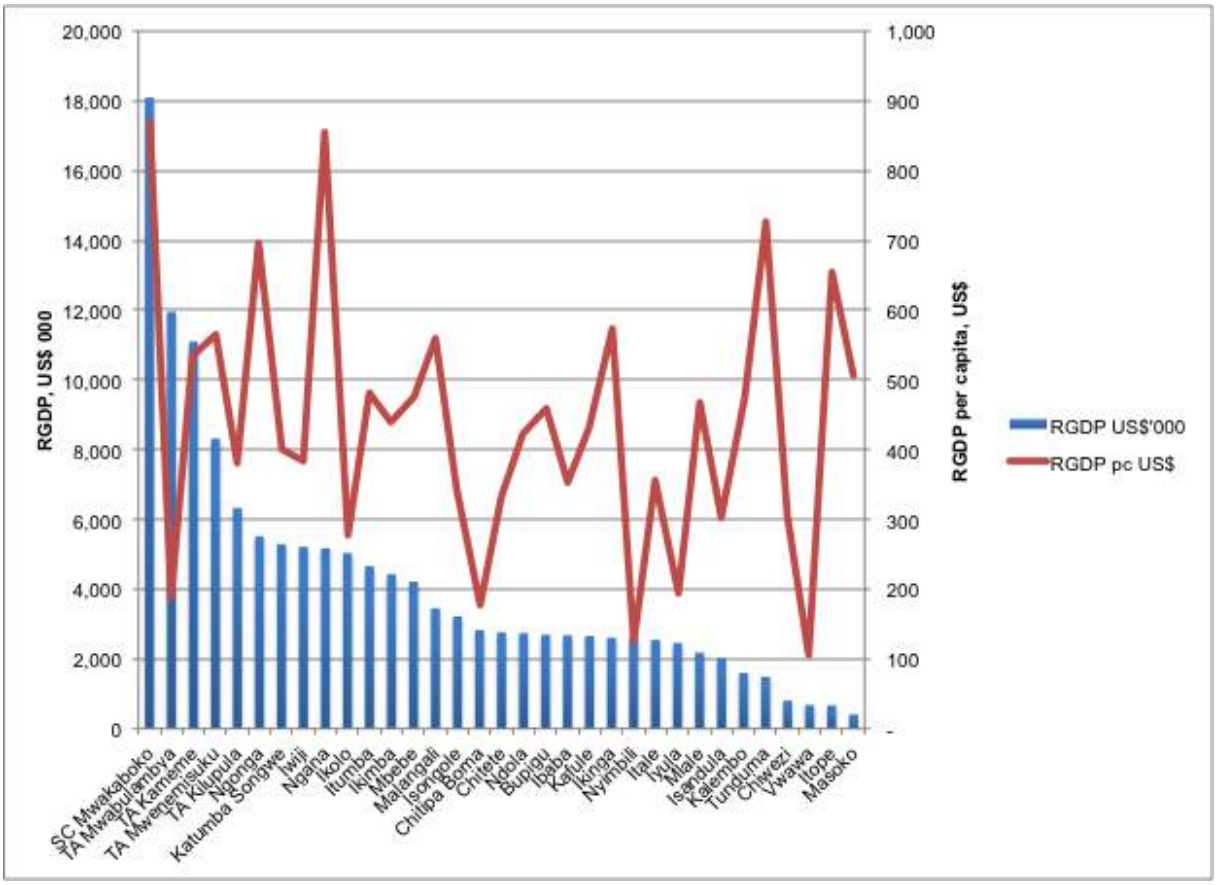


Figure 5-2: SRB Distribution of RGDP and RGDP per capita

In 2010, SRB was only about 0.50% of the combined GDP of Tanzania and Malawi. Dividing the basin economy between the two countries in that year, the share of the Tanzanian and Malawian areas of SRB is 0.36% and 1.07% of the two nations' GDP respectively. It is obvious SRB is not very significant in economic terms now to either country, but as a border area (55% in Tanzania and 45% in Malawi) it is strategically important and with investment for hydropower production it will grow.

Table 5-1 compares the share of basin RGDP, population and area between the two riparian States.

Table 5-1 SRB: Share of RGDP, Population and Area

	RGDP 2010, US$ '000	% RGDP	Population 2010	% population	Area, ha	% area	RGDP US$ pc	RGDP pc in local currency units	RGDP pc in PPP, US$
Share of Tanzania	79,539	59%	210,493	58%	233,232	55%	377.87	532,850	1,022
Share of Malawi	54,668	41%	152,509	42%	192,188	45%	358.46	53,959	850
Total	134,208	100%	363,002	100%	425,420	100%	369.72		

2010 Official Exchange rates used: US$1 = TZS 1,410 and US$1 = MZK 151, source IMF Country Factsheets

The estimate suggests that in 2010 the SRB economy was shared 59% to Tanzania and 41% to Malawi. The distribution of population in the basin between the two countries was similar, while the area is divided 55% to Tanzania and 45% to Malawi.

The difference in economic activity in the two sectors may in fact be more profound. The Malawian Kwacha was over-valued during the period, which artificially inflates the country's GDP compared to others. It should be possible to adjust this by using the Purchasing Power Parity exchange rate, but in the year of interest the adjustment between the official exchange rate and the PPP rate was almost exactly the same for both Tanzania and Malawi: most devaluation of the kwacha had not yet happened. Another adjustment that might be made is to express prices in 2013 currency units using the GDP deflator: as Malawi devalued by about 143% between 2010 and 2013 this would have the effect of reducing the value of Malawi's production in relation to Tanzania. See Section 6.3.3 for the results of this approach.

The relationship between RGDP per capita and poverty indices is difficult to make because the RGDP does not explain how value added is distributed between households. Also, poverty indices focus on consumption, while GDP estimates deal with the value of production. Theoretically, RGDP per capita says that on average the labour of one person in the Basin during 2009/10 added (in this case) US$ 370 to the basin economy. This is a little more than a dollar a day, and bearing in mind that the contribution of the administration and service sector of the economy was about 7% but made by less than 1% of the population it is clear that poverty exists in the basin. The food poverty line in Malawi in 2011 was marked by a consumption level of MWK 37,000 per person per annum: the value added by Malawian citizens in the basin a year earlier was MWK 57,000 per annum. In Tanzania the food poverty line (also expressed in consumption requirement) was established as TZS 14,000 per person per month. See the Community Development Sub-Programme Report for the details. Inflating with the CPI this is equivalent to TZS 250,000 per person per year: the value added by Tanzanian citizens in the basin was TZS 552,000 per person per year. In Malawi the cost of required consumption is about 65% of the reported value of production; in Tanzania it is only 45%. Tentatively one might say that the proportion in poverty in the basin is greater in Malawi, assuming the basin Gini coefficient is similar in each country.

About 85% of the SRB RGDP in 2009-10 is estimated to be accounted for by agriculture and allied activities but the natural resources sector accounted for only 26% of Tanzanian GDP and 30% of Malawi GDP in the same period. The obvious conclusion is that SRB is essentially rural. Nevertheless there does exist what might loosely be called "semi-urban" areas (Chitipa and Itumba bomas and five large villages) within which about 17% of the basin's population are associated. Most people in "semi-urban" areas will live rural lives, though some will have small and cottage industries and services and work in administration. The present concentrations of population will be a focus for any urban development the basin might manage, unless interventions under the proposed project radically change the economic environment.

About 270% of the notional food energy requirement of 2,100 kcals per capita per day of the rural population was met by crop, livestock, apiculture and fisheries production in the SRB (i.e. food energy production is over twice as much as required by the basin population), see Table 5-2.

Table 5-2 SRB: Food Energy Requirement and Production, 2010

	Required, mkcals			Produced, mkcals			Produced against required	animal protein produced against required
	Total	Crops	Livestock	Total	Crops	Livestock		
Mbeya Rural	11,588	10,661	927	47,103	46,396	707	406%	76%
Kyela	45,328	41,702	3,626	109,243	106,938	2,305	241%	64%
Ileje	70,901	65,229	5,672	309,600	306,123	3,477	437%	61%
Mbozi	37,456	34,459	2,996	59,303	58,180	1,123	158%	37%
Momba	3,752	3,452	300	8,217	7,977	240	219%	80%
Chitipa	92,437	85,042	7,395	145,830	143,427	2,402	158%	32%
Karonga	30,028	27,626	2,402	105,881	103,311	2,570	353%	107%
Total	291,491	268,172	23,319	785,176	772,352	12,824	269%	55%

Of course, the production figures do not allow for trade, either food exported from the basin, or food imported into the basin, nor the purchasing power of households. The most food insecure districts are apparently Mbozi and Chitipa that produced only about 158% of food energy requirements. This is a small margin that could easily be eroded in a drought year. There is also an apparent basin-level shortfall in animal protein supply against need: only about 55% of animal food energy required is available from livestock, fisheries and apiculture production within the basin. These shortages of animal protein have a negative impact on child nutrition.

Crop production accounts for the greatest proportion of labour requirements in the SRB, 54%, followed by livestock management and livestock products processing, 33%, see Table 5-3.

Table 5-3: SRB Labour Supply and Demand: Natural Resources Sector, 2010

	Population	Working days pa (million)	Required for sectors, million labour days				
			Crops	Stock	Forestry	Housing	Total
Mbeya Rural	14,431	1.59	0.43	0.15	0.09	0.02	0.69
Kyela	56,449	6.21	0.73	0.72	0.16	0.07	1.68
Ileje	88,295	9.71	2.05	1.32	0.44	0.12	3.93
Mbozi	46,645	5.13	1.26	0.46	0.25	0.06	2.02
Momba	4,672	0.51	0.09	0.11	0.02	0.05	0.27
Chitipa	115,115	12.66	1.77	0.84	0.53	0.08	3.22
Karonga	37,395	4.11	1.02	0.86	0.12	0.03	2.03
Total	363,002	39.93	7.36	4.46	1.60	0.42	13.84

The overall occupancy rate as a proportion of the time available to the economically active population is only 0.34, indicating that there is under-employment in the project area. Returns to labour are also low, particularly for the majority of the population engaged in agricultural and livestock production and water supply (for most of the population this is the return to fetching and carrying water). Nevertheless, some work opportunities are not included in the estimate, for example labour in Food for Work schemes, labour requirements for the administration and service sectors, crop processing and marketing, etc. Figure 5-3 shows relative returns from different enterprise categories. There are many sub-enterprises with different returns per labour day subsumed in each category. Overall irrigated agriculture clearly has a high return to each labour day committed to the activity. The return to each labour day obtaining water is the lowest. The low return to labour in SMI is remarkable and disappointing:

value margins of agro-processing are small because of the small scale of plant and very small margins.

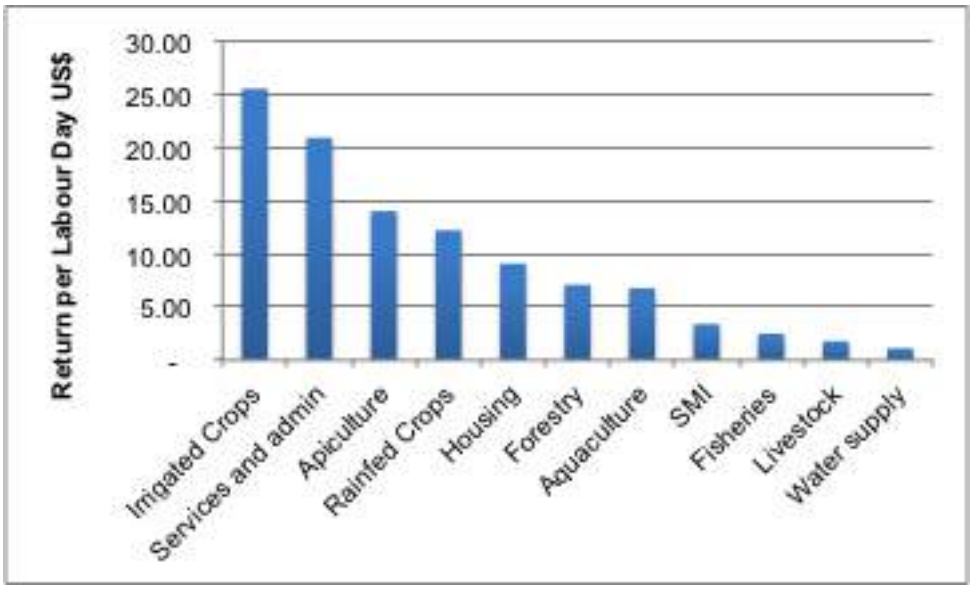


Figure 5-3: Return to Labour by Economic Activity, US$/day 2010

Figure 5-4 shows the variability of return to labour over SRB administrative areas. Ngana, with good opportunities for irrigation and forestry (wood prices in Kyela were very high in 2010) has a mix of economic activities leading to an overall high return to labour. The labour force in other administrative areas generally works in activities with a much lower return. But one has to beware of errors in calculations in small administrative areas, poor population estimates and consequent under-estimates of economic activity.

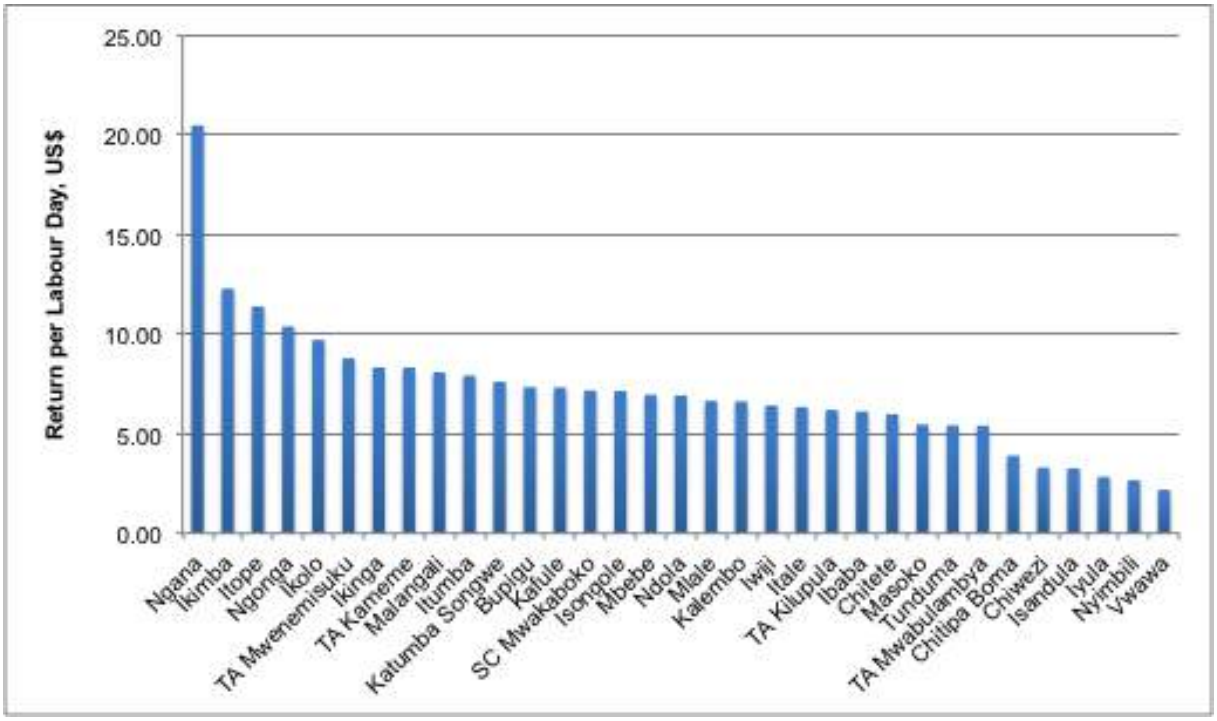


Figure 5-4: Return per Labour Day, 2010 US$/day

Table 5-4 gives the SRB RGDP in 2010. The advantages of using ward and T/A level data are apparent over the earlier drafts of this report: clear differences in RGDP per capita between geographical areas can be seen. The full set of accounts estimated for 2010 is given in the statistical Appendix to the EDSP.

Table 5-4: Indicative SRB RGDP by Administrative Area, US$ '000 2010

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from natural resources in US$ '000 current 2010									
					Rainfed	Irrigated	TLU	Rainfed Crops	Irrigated Crops	Livestock	Apiculture	Fisheries	Aquaculture	Forestry	Housing	Water supply	SMI	Total
1	Mbeya Rural	Iwiji	15,176	13,826	5,011	65	4,198	4,234.8	354.9	168.9	2.7	28.9	13.8	191.5	96.3	178.6	68.2	8,339.7
2	Mbeya Rural	Masoko	902	805	348	4	177	209.8	21.0	9.1	0.2	1.7	0.8	12.1	6.4	9.7	4.0	265.8
3	Kyela	Ikolo	2,056	18,134	894	16	3,177	1,906.6	33.1	269.8	0.2	38.5	0.0	2,222.4	143.8	236.3	90.8	4,964.5
4	Kyela	Katumba Songwe	3,545	13,237	3,144	12	5,455	2,343.3	24.2	706.0	0.2	28.1	0.0	1,629.1	102.5	114.1	78.4	5,025.7
5	Kyela	Ngana	6,731	8,054	1,434	5	1,339	3,868.2	11.0	150.0	0.1	12.8	0.0	847.8	50.5	76.1	30.3	5,046.9
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	3,530.6	14.4	506.5	0.1	107.0	0.0	970.7	61.3	103.4	51.7	5,344.8
7	Kyela	Ikimba	2,401	10,082	1,801	9	2,691	2,549.6	18.4	258.6	0.1	21.4	0.0	1,246.5	79.9	97.1	52.5	4,234.2
8	Kyela	Ibobe	738	1,024	183	1	94	258.9	1.9	5.6	0.0	2.2	0.0	130.1	8.1	5.3	5.1	417.2
9	Ileje	Itumba	10,138	9,704	4,474	102	4,536	3,596.3	225.7	165.3	58.6	20.6	9.5	174.6	76.9	40.0	48.6	4,417.0
10	Ileje	Mlale	11,221	4,664	1,667	49	2,587	1,416.3	106.5	176.2	28.2	9.9	0.0	87.5	36.1	60.9	23.3	1,948.7
11	Ileje	Itale	9,812	7,176	2,134	75	1,998	1,587.2	166.9	118.6	43.4	19.2	7.0	149.9	55.6	93.7	35.9	2,273.5
12	Ileje	Iboba	14,971	7,600	2,220	80	2,630	1,647.8	176.8	169.3	46.9	16.1	7.5	160.7	61.8	98.6	38.0	2,422.5
13	Ileje	Ndola	13,576	6,497	2,242	68	2,695	1,676.1	151.1	166.2	39.3	13.8	6.5	122.9	51.5	84.7	32.5	2,543.6
14	Ileje	Ilunga	11,471	4,547	2,243	48	1,747	1,973.6	106.8	96.1	27.5	9.6	4.5	68.5	40.0	53.7	22.8	2,401.8
15	Ileje	Kafule	5,302	6,175	1,923	65	2,447	1,792.4	143.6	160.7	37.3	13.1	6.0	112.3	52.8	78.2	30.9	2,427.3
16	Ileje	Malangali	15,071	8,178	2,861	65	3,103	2,629.7	143.7	195.1	37.3	13.1	0.0	101.3	54.3	79.5	30.9	3,285.1
17	Ileje	Kalembo	4,167	3,570	1,204	35	1,857	1,023.1	78.4	127.7	20.4	7.2	0.0	69.2	27.4	43.7	16.9	1,413.9
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,295	1,869.2	136.2	82.3	35.4	12.4	0.0	103.9	47.6	76.1	29.3	2,392.2
19	Ileje	Isongole	5,856	9,425	2,902	99	2,956	2,295.7	219.2	135.8	56.9	20.0	0.0	159.9	80.6	67.9	47.2	3,083.2
20	Ileje	Chitete	8,811	8,263	2,350	88	3,577	1,834.8	192.2	136.6	49.9	17.5	0.0	143.1	68.9	107.0	33.5	2,603.3
21	Ileje	Mbebe	12,878	8,643	3,920	93	3,695	3,227.7	205.7	168.5	53.4	18.8	0.0	158.1	68.5	115.6	36.4	4,072.6
22	Mbozi	Iyula	6,044	12,611	5,318	194	4,103	1,413.6	196.0	232.7	1.5	28.8	3.4	177.6	97.8	23.0	63.1	2,234.3
23	Mbozi	Nyimbili	32,971	20,990	5,367	322	5,810	1,304.8	323.9	237.1	2.5	44.5	5.7	266.8	158.4	220.1	104.9	2,668.6
24	Mbozi	Vwawa	1,068	6,431	430	99	346	113.5	99.4	17.6	0.8	13.6	0.0	82.2	49.8	15.2	32.2	424.3
25	Mbozi	Isendula	7,788	6,663	4,513	102	3,145	1,282.4	102.9	132.6	0.8	14.1	1.8	61.2	51.5	76.4	33.3	1,767.0
26	Momba	Chiwezi	4,051	2,626	763	106	1,612	274.3	109.0	74.3	0.9	5.6	0.0	31.3	20.3	3.3	13.1	532.1
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	409.7	106.5	80.4	2.6	4.3	0.0	25.8	309.7	27.3	10.2	966.6
28	Chitipa	TA Mwabulambya	82,079	63,732	10,203	85	8,647	7,958.5	615.1	345.4	36.1	158.4	4.5	694.4	725.8	1,503.7	319.0	11,862.4
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,458	20	5,099	6,802.5	63.8	171.5	8.8	39.6	0.9	156.1	205.8	186.1	73.8	7,709.9
30	Chitipa	TA Kameme	43,316	20,770	7,680	28	9,730	9,251.2	89.9	415.4	12.4	51.6	1.8	240.7	284.6	330.0	104.0	10,781.6
31	Chitipa	Chitipa Boma	890	15,866	335	21	579	339.2	49.3	44.5	9.5	39.4	0.9	170.5	132.3	74.8	460.5	1,320.8
32	Karonga	TA Kilupula	6,386	16,574	2,780	53	4,627	3,681.9	116.5	323.5	0.6	236.5	0.0	249.3	214.0	124.2	72.2	5,021.7
33	Karonga	SC Mwakaboko	26,757	20,820	11,044	68	16,916	10,764.0	182.8	1,041.5	0.8	51.7	1.8	358.5	341.1	314.5	45.0	13,027.7
	Total		425,420	363,002	102,448	2,225	119,289	89,246	4,569	7,849	515	1,714	75	11,350	3,844	4,170	2,172	124,207

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from Administration and Social Services in US$ current 2010							
					Rainfed	Irrigated	TLU	Regional	District	Agriculture	Education	Health	Roads	Water	Total
1	Mbeya Rural	Iwiji	15,176	13,626	6,011	65	4,198	24.9	5.2	1.1	128.5	40.4	3.1	3.0	206
2	Mbeya Rural	Masoko	552	805	348	4	177	1.5	0.3	0.1	128.5	0.1	0.2	0.2	131
3	Kyela	Ikolo	2,056	18,134	896	16	3,177	31.8	4.1	1.7	0.0	37.2	2.2	2.4	79
4	Kyela	Katumba Songwe	3,545	13,237	3,144	12	5,455	43.3	3.0	1.3	197.4	27.1	1.6	1.7	275
5	Kyela	Ngana	6,731	6,054	1,434	5	1,339	19.8	1.4	0.6	90.3	12.4	0.7	0.8	126
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	25.9	1.8	0.8	118.0	16.2	1.0	1.0	165
7	Kyela	Ikimba	2,401	10,082	1,801	6	2,691	33.0	2.3	1.0	150.3	20.7	1.2	1.3	210
8	Kyela	Itope	736	1,024	183	1	94	5.7	0.2	0.1	20.4	2.1	0.1	0.1	29
9	Ileje	Itumba	10,138	9,704	4,474	102	4,536	52.2	6.0	1.2	258.2	32.9	4.8	3.7	359
10	Ileje	Male	11,221	4,664	1,667	49	2,587	25.1	2.9	0.6	124.1	15.8	2.3	1.8	173
11	Ileje	Itale	9,812	7,176	2,134	75	1,998	35.6	4.5	0.9	191.0	24.3	3.5	2.6	265
12	Ileje	Ibaba	14,971	7,600	2,220	80	2,630	40.9	4.7	0.9	202.2	25.7	3.7	2.9	281
13	Ileje	Ndola	13,576	6,497	2,242	68	2,595	34.9	4.0	0.8	172.9	22.0	3.2	2.5	240
14	Ileje	Ikinga	11,471	4,547	2,243	48	1,747	24.4	2.8	0.5	121.0	15.4	2.2	1.8	168
15	Ileje	Kafule	5,302	5,175	1,923	65	2,447	33.2	3.8	0.7	164.3	20.9	3.0	2.4	228
16	Ileje	Malangali	15,071	6,178	2,661	65	3,103	33.2	3.6	0.7	164.4	20.9	3.0	2.4	229
17	Ileje	Kalembo	4,167	3,370	1,204	35	1,857	18.1	2.1	0.4	89.7	11.4	1.7	1.3	125
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,296	31.5	3.6	0.7	155.8	19.8	2.9	2.3	217
19	Ileje	Isongole	5,855	9,425	2,902	99	2,956	12.4	5.8	1.1	102.6	31.9	4.6	3.6	162
20	Ileje	Chitete	8,811	8,253	2,350	86	3,577	10.9	5.1	1.0	89.9	28.0	4.1	3.2	142
21	Ileje	Mbebe	12,878	8,843	3,920	93	3,695	11.7	5.5	1.1	96.2	29.9	4.4	3.4	152
22	Mbozi	Iyula	6,044	12,611	5,315	194	4,103	18.9	3.3	1.8	36.7	27.1	2.0	2.6	92
23	Mbozi	Nyimbili	32,971	20,950	5,367	322	5,810	31.5	5.5	3.0	61.0	45.0	3.3	4.3	154
24	Mbozi	Vwawa	1,093	6,431	430	99	346	9.7	1.7	0.9	222.5	13.8	1.0	1.3	251
25	Mbozi	Isandula	7,788	6,653	4,313	102	3,145	10.0	1.8	1.0	230.2	14.3	1.1	1.4	260
26	Momba	Chiwezi	4,051	2,626	753	108	1,612	0.2	0.7	0.4	256.2	13.2	0.4	0.5	272
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	0.1	0.5	0.3	0.1	10.3	0.3	0.4	12
28	Chitipa	TA Mwabulambya	82,079	63,732	10,203	85	8,647	42.2	28.2	98.0	0.0	409.3	28.4	32.1	638
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,458	20	5,099	9.8	6.5	22.7	424.9	109.3	6.6	7.4	587
30	Chitipa	TA Kameme	43,316	20,770	7,680	28	9,730	11.1	9.2	31.9	214.2	94.0	9.3	10.5	380
31	Chitipa	Chitipa Boma	850	15,866	335	21	579	6.5	7.0	24.4	568.4	818.5	7.1	8.0	1,440
32	Karonga	TA Kilupula	8,398	16,574	2,780	53	4,827	0.0	2.9	53.0	27.0	1,191.9	2.3	0.0	1,257
33	Karonga	SC Mwakaboko	24,757	20,820	11,044	66	16,916	0.0	3.6	41.4	378.2	239.2	2.8	0.0	665
	Total		*425,420*	*363,002*	*102,448*	*2,225*	*119,289*	*695*	*144*	*276*	*5,183*	*3,441*	*118*	*113*	*9,970*

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from Development Projects in US$ current 2010					Grand total	Total US$ pc
					Rainfed	Irrigated	TLU	Water Supply	Health	Roads	Education	Total		
1	Mbeya Rural	Iwiji	15,176	13,626	5,011	65	4,198	1.9	0.2	0.1	0.0	2.2	5,548	407
2	Mbeya Rural	Masoko	562	805	348	4	177	0.1	0.0	0.0	0.0	0.1	397	493
3	Kyela	Ikolo	2,056	18,134	894	16	3,177	1.4	0.1	0.1	0.0	1.5	5,045	278
4	Kyela	Katumba Songwe	3,545	13,237	3,144	12	5,455	1.0	0.1	0.0	0.0	1.1	5,302	401
5	Kyela	Ngana	6,731	6,054	1,434	5	1,339	0.5	0.0	0.0	0.0	0.5	5,173	854
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	0.6	0.1	0.0	0.0	0.7	5,510	696
7	Kyela	Ikimba	2,401	10,082	1,801	9	2,691	0.8	0.1	0.0	0.0	0.9	4,445	441
8	Kyela	Itope	738	1,024	183	1	94	0.1	0.0	0.0	0.0	0.1	446	436
9	Ileje	Itumba	10,138	9,704	4,474	102	4,536	1.2	0.1	0.1	0.0	1.4	4,777	492
10	Ileje	Mlale	11,221	4,664	1,667	49	2,587	0.6	0.0	0.0	0.0	0.7	2,122	455
11	Ileje	Itale	9,812	7,176	2,134	75	1,998	0.9	0.1	0.0	0.0	1.0	2,540	354
12	Ileje	Ibaba	14,971	7,600	2,220	80	2,630	1.0	0.1	0.0	0.0	1.1	2,705	356
13	Ileje	Ndola	13,576	6,497	2,242	68	2,595	0.8	0.1	0.0	0.0	0.9	2,785	429
14	Ileje	Ikinga	11,471	4,547	2,243	48	1,747	0.6	0.0	0.0	0.0	0.6	2,571	565
15	Ileje	Kafule	5,302	6,175	1,923	65	2,447	0.8	0.1	0.0	0.0	0.9	2,657	430
16	Ileje	Malangali	15,071	6,178	2,861	65	3,103	0.8	0.1	0.0	0.0	0.9	3,514	569
17	Ileje	Kalembo	4,167	3,370	1,204	35	1,857	0.4	0.0	0.0	0.0	0.5	1,539	457
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,296	0.7	0.1	0.0	0.0	0.8	2,610	446
19	Ileje	Isongole	5,855	9,425	2,902	99	2,958	1.2	0.1	0.1	0.0	1.3	3,247	344
20	Ileje	Chitete	8,811	8,263	2,350	86	3,577	1.0	0.1	0.0	0.0	1.2	2,747	332
21	Ileje	Mbebe	12,878	8,843	3,920	93	3,696	1.1	0.1	0.1	0.0	1.3	4,226	478
22	Mbozi	Iyula	6,044	12,611	5,318	194	4,103	2.3	0.2	0.1	0.0	2.6	2,329	185
23	Mbozi	Nyimbili	32,971	20,950	5,367	322	5,810	3.9	0.3	0.2	0.0	4.4	2,827	135
24	Mbozi	Vwawa	1,093	6,431	430	99	346	1.2	0.1	0.1	0.0	1.3	677	105
25	Mbozi	Isandula	7,788	6,653	4,313	102	3,145	1.2	0.1	0.1	0.0	1.4	2,018	303
26	Momba	Chiwezi	4,051	2,626	763	108	1,612	0.5	0.0	0.0	0.0	0.6	804	306
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	0.4	0.0	0.0	0.0	0.4	979	479
28	Chitipa	TA Mwabulambya	82,079	63,732	10,203	85	8,647	0.1	0.0	0.0	0.0	0.1	12,501	196
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,458	20	5,099	0.0	0.0	0.0	0.0	0.0	8,293	562
30	Chitipa	TA Kameme	43,316	20,770	7,680	28	9,730	0.0	0.0	0.0	0.0	0.0	11,142	536
31	Chitipa	Chitipa Boma	850	15,865	335	21	579	0.0	0.0	0.0	0.0	0.0	2,761	174
32	Karonga	TA Kilupula	8,386	16,574	2,780	53	4,627	0.0	0.0	0.0	0.0	0.0	6,279	379
33	Karonga	SC Mwakaboko	24,757	20,820	11,044	66	16,916	0.0	0.0	0.0	0.0	0.0	13,693	658
	Total		**425,420**	**363,002**	**102,448**	**2,225**	**119,289**	**27**	**2**	**1**	**0**	**31**	**134,208**	**370**

5.2 DEPRECIATION OF NATURAL RESOURCES

No more than an indicative and partial estimate can be made of the cost of depreciation of natural resources to the regional economy in SRB and that will be confined to an estimate of the net loss of soil nutrients to rainfed crop production. Depreciation of other natural resources, in particular woody biomass and fish stocks, may well be taking place, but insufficient data is available about extraction rates, prices, stock depletion and recovery rates to make any meaningful quantitative estimate of the financial cost to the economy.

The area and production of crops and their residues has been estimated by administrative area for the period 2010-2012. Crop areas and yields were calculated from the detailed data available from District Agricultural Offices and are therefore reasonably accurate. The rate of nutrient extraction per ton of main crop and residue is also available by crop[4]. This allows a theoretical calculation of the annual extraction of NPK by crops by administrative area. This can be compared with the application rates of inorganic fertilisers (see Table 3-5 and Table 6-1).

This comparison, shown in Table 5-5, is crude. It ignores the significant quantities of farmyard manure applied to arable land each year and nutrients added by sedimentation and nitrogen fixation. Some nutrients in crop residues may be returned to the soil through burning and leaching. Some nutrients may be added to the soil by *chitemene* practices, though this has its own environmental cost in loss of woody biomass. The calculation also assumes that all fertiliser applied is actually taken up by crop growth. It ignores removal of nutrients from erosion, gaseous loss and leaching. On balance, unaccounted nutrient loss (particularly from erosion) is likely to be greater than unaccounted nutrient addition.

Table 5-5: Nutrient Removal by Crops and Addition by Inorganic Fertilisers

	Nitrogen, tons		Phosphate, tons		Potassium, tons		Net loss of	Depreciation of soil
	Lost to crops	Applied to crops	Lost to crops	Applied to crops	Lost to crops	Applied to crops	nutrients, tons	nutrients, US$
Mbeya Rural	336	99	131	17	216	17	550	590,117
Kyela	476	203	193	35	274	35	671	615,019
Ileje	2,019	5,002	797	881	1,175	881	-2,773	-1,487,847
Mbozi	467	719	186	127	326	127	7	7,190
Momba	33	2	13	0	24	0	68	172,144
Chitipa	879	486	365	85	736	85	1,324	1,927,956
Karonga	651	161	262	28	477	28	1,174	1,766,796
Total	4,861	6,672	1,947	1,172	3,229	1,172	1,021	3,593,376

Note: based on values from 2010

Nevertheless, the results are interesting and not entirely expected. Perhaps most striking is the overall imbalance of nutrient application in SRB, with an excess of nitrogen being applied and deficits of phosphate and potassium. Also striking is the distribution of net loss in the basin. Ileje District appears to be applying more nutrient than required (with the exception of potassium) while all other Districts apply less. This may be a statistical error (either fertiliser applications being over-recorded or the

[4] See Estimating the Rate of Nutrient Depletion in Soils of Agricultural Lands of Africa, Hanao and Baante, IFDC, Appendix 1

cultivated area under-reported) but there is no alternative evidence available. Finally, it may be remarked that overall nutrient mining is taking place in SRB. Multiplying net loss of nutrients by the reported price of fertiliser in 2010, expressed in cost per ton of nutrient, the net loss of value of soil nutrient, which may be considered as a measure of soil depreciation, amounts to US$ 3.6 million, or 4.7% of the value added of crop production (US$ 89.2 million). In addition, much of the apparently excessive nitrogen applications in Ileje District would be lost to the atmosphere. This is not a cost that should be added to the cost of environmental depreciation, but it is inefficient use of intermediate inputs which if avoided could increase the RGDP of crop production by nearly 2%.

It is not worthwhile to actually subtract the cost of environmental depreciation from the basin accounts. For one thing the cost estimate is incomplete, for another the accounts would then be less comparable with GDP estimates of Tanzania and Malawi. Few countries actually publish GDP statistics net of environmental depreciation. Nevertheless, the indicative calculation above shows that these costs are in the order of 5% of RGDP and they are paid year on year. The impact on long-term economic growth is therefore considerable.

6 THE RATE OF ECONOMIC GROWTH IN SRB

6.1 THE PERIOD 2010-2012

The SRB economy is neither large nor diverse. The principle economic activity is rainfed maize production which accounted for 40% of crop RGDP in 2010, while rainfed cropping itself accounts for 66% of total basin RGDP. Therefore the principle variables influencing economic growth are:

- The annual area under rainfed cultivation
- Crop prices
- The availability and price of fertiliser
- Changes in population number and distribution (through natural increase, migration and urbanisation)
- The relative strength of the Tanzanian and Malawian currencies.

There are also well-defined limits to the growth of the economy under its present agrarian structure, most notably the area, productivity and accessibility of land for rainfed cropping. The land resource has progressively increased in the basin in response to a steady increase in population, better access and the use of improved farm technologies, in particular the increased use of fertiliser. Overlain on this relatively predictable agricultural growth model are dramatic annual changes in crop prices and exchange rates that cause fluctuations in the annual value of SRB production to the point where a reliable trend in annual economic growth cannot be calculated for the period for which statistics are available – and therefore cannot be predicted. Through its trans-boundary position, the SRB population is highly exposed to economic risk, which leads to precarious livelihoods, smuggling and an unreliable investment environment.

It is easier to say this than to demonstrate it, because of the difficulties with statistics. It has already been mentioned that annual estimates of RGDP are usually composed of statistics for several years around the year of measurement. Further, some statistics are more reliable than others because they can be measured more easily (e.g. cattle are more easy to count than crop areas). Some may be “administrative estimates” (e.g. crop production may be estimated on an assumed yield for a District). Some statistics may be interpolated or even fabricated. Under these circumstances it becomes very difficult to compare year-on-year RGDP. The whole basin RGDP for 2010 could not be re-calculated for later years, but sufficient primary data on prices, yields, production and areas by crop was available to re-construct the crop RGDP for 2011 and 2012 with some confidence. As maintained above, the crops sector contains the drivers for economic growth in the SRB and can therefore most readily provide an indication of a year-on-year trend in economic growth.

The gross cropped area has seen steady expansion in the period 2010-2012 at a rate of up to 6% per annum, from 102,500 ha in 2010 to 115,000 ha in 2012. See Table 6-1. This is a high rate of growth and much higher than the assumed annual rate of

growth of population (2.5%). It suggests an unreported increase in the population from in-migration to the basin that has already been noted (usually negatively) in the Shared Vision discussions. Nearly 50% of the increase in cropped area is in Ileje and Chitipa (but see Section 6.3.2.1 for a more detailed analysis) that have accessible land suitable for rainfed cropping. These Districts must be considered as SRB growth areas.

Of equal importance to cropped area is land productivity. Productivity increases may be due to improved land husbandry, the use of better seeds and intensification of labour, but most is probably due to fertiliser use which must be considered high in the basin, rising from 88 kg of nutrient applied per cropped ha in 2010 to 94 kg of nutrient in 2012. See Table 6-1. The rate of application is particularly high in Ileje, rising from 210 kg of nutrient per cropped ha in 2010 to 244 kg of nutrient per ha in 2012. Here the yield of maize is reported to be a basin high of 4 tons per ha. All other Districts have much lower application rates, around 20 kg of nutrient per ha. The availability of subsidised fertiliser has generally declined from 24% of the total tonnage supplied in 2010 to only 12% in 2012, with declines being reported in all Districts except Momba and Karonga.

Table 6-1: District Cropped Area and Fertiliser Application, SRB 2010-2012

District	Cropped ha 2010	Cropped ha 2011	Cropped ha 2012	Fertiliser application, kg/ha 2010	Fertiliser application, kg/ha 2011	Fertiliser application, kg/ha 2012	Subsidised fertiliser proportion 2010	Subsidised fertiliser proportion 2011	Subsidised fertiliser proportion 2011
Mbeya Rural	6,359	6,366	6,366	21	18	14	96%	73%	32%
Kyela	9,809	8,975	9,666	28	33	32	75%	90%	93%
Ileje	32,271	34,638	36,092	210	206	244	14%	17%	5%
Mbozi	15,427	18,692	21,476	63	47	30	37%	22%	0%
Momba	1,303	1,328	1,225	12	12	12	100%	100%	100%
Chitipa	23,675	22,887	25,720	28	38	30	46%	61%	35%
Karonga	13,824	15,061	14,415	16	15	13	100%	100%	100%
Total	102,668	107,947	114,960	88	88	94	24%	20%	12%

Despite a 6% per annum increase in area cultivated and a similar increase in the rate of fertiliser application over the whole period, SRB crop production grew in the period 2010-2012 only by about 3.7% per annum and the tons of crops grown per cultivated hectare did not increase at all from a SRB average yield of 3.24 tons of produce per cultivated ha in 2010. This relatively low rate of increase is due to depressing falls in reported crop production in Mbeya Rural and Kyela, which may be an administrative reporting error or (in the case of the latter) a fall in paddy yields in that year. On the other hand Chitipa and Karonga reported massive increases in crops tonnage produced, presumably in response to strong increases in farm gate prices (see below). So the picture in respect of crop production per unit area is variable, but reinforces the impression of poor performance of the basin as a whole in establishing itself as a cereal exporter, despite probable in-migration of farm families, large areas of new lands being taken into cultivation and an aggressive fertiliser promotion policy which is now apparently on the wane.

Farm gate prices were collected for the main crops by the lowest administrative area and then weighted between crop types according to the volume of production, see Table 6-2. Even with this generalisation, farm gate prices show remarkable volatility during the period 2010-2012. Cereal prices show most stability between years in the big maize producing areas of Ileje, Mbozi and Chitipa. Wholesale markets are probably

good in areas with predictably large trading surpluses. In other areas, particularly the Lakeshore where the proportion of paddy rice is greater, cereal prices are much more volatile. In addition, the increase in cereal prices in Malawi in 2011 and 2012 are remarkable. Prices also vary widely between administrative areas. This suggests a lack of integration of markets that is expected in a trans-boundary basin.

Table 6-2: Generalised Farm Gate Prices by Crop Group, LCU per kg

	Farm Gate Prices 2010						
Crop group	Mbeya Rural	Kyela	Ileje	Mbozi	Momba	Chitipa	Karonga
cereal	359	400	401	274	272	36	50
roots	364	705	617	258	239	58	45
legumes	795	836	836	700	700	161	163
oilseeds	504	979	873	604	669	272	110
vegetables	1,122	214	595	176	288	93	38
cotton	440	440	440	440	440	53	53

	Farm Gate Prices 2011						
	Mbeya Rural	Kyela	Ileje	Mbozi	Momba 1/	Chitipa	Karonga
cereal	380	150	452	322	314	34	105
roots	365	500	656	379	337	56	70
legumes	917	917	818	950	950	148	299
oilseeds	633	1,943	900	718	767	147	391
vegetables	587	929	792	221	491	82	248
cotton	550	550	550	550	550	53	53

	Farm Gate Prices 2012						
	Mbeya Ru	Kyela	Ileje	Mbozi	Momba 1/	Chitipa	Karonga
cereal	379	369	446	364	358	47	125
roots	393	432	608	524	433	56	75
legumes	105	650	818	564	564	192	413
oilseeds	655	906	914	805	878	243	416
vegetables	423	265	816	230	437	109	50
cotton	572	572	572	572	572	53	53

NB Prices were weighted by tonnage produced for constituent crops in each crop group. Raw data were obtained from District Agricultural Offices by Ward and T/A

The food security status of the basin has not improved during the period. See Table 6-3. This is a cause for concern. Despite new lands being opened in the basin which are nominally proportionally greater than the growth of population, and despite relatively high fertiliser use, quite a large proportion of which has been subsidised, SRB cannot demonstrate an increased trading surplus in foodstuffs during the period, though one of the most significant economic characteristics of the basin is as a maize and paddy exporter.

Table 6-3: District Population and Food Security, SRB 2010-2012

District	Basin ha	Population 2010	Population 2011	Population 2012	kcals produced as % of kcal requirement 2010	kcals produced as % of kcal requirement 2011	kcals produced as % of kcal requirement 2012	tons of produce, 2010	tons of produce, 2011	tons of produce, 2012
Mbeya Rural	15,728	14,431	14,785	15,148	400%	149%	166%	16,930	6,875	7,691
Kyela	18,274	56,449	57,831	59,253	236%	219%	201%	45,571	43,325	36,915
Ileje	143,523	88,295	90,457	92,682	432%	456%	450%	107,530	115,799	116,961
Mbozi	40,107	39,992	40,971	41,979	155%	151%	147%	20,384	20,365	20,764
Momba	7,811	4,672	4,787	4,905	213%	206%	229%	2,705	2,681	3,037
Chitipa	159,045	115,115	118,258	121,427	155%	163%	199%	81,795	89,150	107,744
Karonga	33,143	37,395	38,415	39,445	394%	443%	381%	57,794	82,698	76,655
Total	**417,631**	**356,349**	**365,504**	**374,838**	270%	270%	272%	332,708	360,894	369,768

The final complication to consider is the impact of exchange rates on the financial performance of the crops sector. The value added and the cost of intermediate inputs are calculated in local currency units (LCU) at current prices. In order to compare them, these LCU are converted into US$ at the prevailing official exchange rate (OER) in the year in question. Exchange rates are taken from IMF country data. The Tanzanian shilling (TZS) depreciated by only 12% to the US$ in the period, but the Malawian kwacha (MWK) depreciated by 68%. See Table 6-4. The impact is a relative deflation of the value of Malawi's contribution to the basin economy during the period 2010 to 2012 when expressed in US$. This is offset to some extent by inflation in Malawi's food prices during the same period.

Table 6-4: Official and PPP Implicit Exchange Rates, 2010-2012

	OER 2010	Implicit PPP exchange rate 2010	OER 2011	Implicit PPP exchange rate 2011	OER 2012	Implicit PPP exchange rate 2012
Tanzania	1,410	522	1,574	559	1,583	612
Malawi	151	64	157	64	253	75

Source: IMF, http://www.imf.org/external/pubs/ft/weo/2013

In summary, the SRB has seen during the period 2010-2012:

- An expansion of the cultivated area
- An increase in the application of fertilisers and a fall in the subsidy offered for those fertilisers
- An increase in the population, which anyway is probably under-estimated due to un-reported in-migration to the basin
- A very small increase in land productivity overall, though Districts in Malawi have seen moderate increases
- Rapid farm gate crop price increases, especially in Malawi, but with wide price variations between years and administrative units
- A sharp decline in the value of the Malawian kwacha to the US$ relative to the slower decline in value of the Tanzanian shilling.

All these events have interacted to achieve a disappointingly indeterminate result on basin crop RGDP in the sense that a distinct change in economic performance over time cannot be determined, though the trend is generally upwards. See Table 6-5.

Table 6-5: District Crop RGDP and RGDP per capita, Current US$

District	***Crop RGDP 2010***	***Crop RGDP 2011***	***Crop RGDP 2012***	***RGDP pc 2010***	***RGDP pc 2011***	***RGDP pc 2012***
Mbeya Rural	4,631	2,680	2,229	321	181	147
Kyela	15,547	7,671	8,082	275	133	136
Ileje	27,353	29,899	29,490	310	331	318
Mbozi	4,919	5,906	9,270	123	144	221
Momba	760	761	729	163	159	149
Chitipa	27,022	28,638	27,018	235	242	223
Karonga	14,578	37,189	24,721	390	968	627
Total	**94,810**	**112,745**	**101,539**	**266**	**308**	**271**

The instability of exchange rates, and to a lesser extent prices, can be generalised by summing the crop RGDP for the three-year period and distributing between the two

countries. This results in a 49% share of Tanzania in the basin crop RGDP and a 51% share to Malawi. This is a convenient result and roughly commensurate with Malawi's 46% share of the basin area and 43% share of population.

The reasons behind the lacklustre performance of the SRB economy 2010-2012 are not apparent from the data to hand. However, a negative economic impact is expected in a trans-boundary basin when one of the constituent countries' currencies is declining in value sharply. Also there are policy differences between the two countries that result in lack of integration of the basin economy and an overall uncertain investment and development environment.

6.2 LIMITS TO SRB ECONOMIC GROWTH

The computation required to generate RGDP estimates for the period 2010-2012 was considerable and the results were unfortunately indeterminate in establishing an accurate growth path for the SRB economy in the medium term. However, what was established is the dependence of economic performance on the availability of land suitable for rainfed agriculture for a basin population that is growing rapidly from natural fertility increase and in-migration.

The area cultivated in the basin increased by 5% between 2010 and 2011 and increased again by 6% in the period 2011 to 2012. Expansion of the cultivated area was not uniform in the basin area: during the period 2010 to 2012 the cultivated area expanded in administrative areas covering 82% of the basin area and remained static or even declined over the remaining 18%. Further, the majority of the expansion of cultivation (87% in area terms) took place in only six administrative areas. These were Kameme and Mwabulambya in Malawi (23% of expansion), and on the Tanzania side Mbebe, Iyula, Nyimbili in the upper west basin, and Malangali in the central basin (67% of expansion). By far the greatest expansion of the cultivated area during the 2010-2012 period was in Nyimbli (40% of total expansion).

The characteristics of these administrative areas where cultivation (and therefore economic activity) is expanding relatively rapidly are as follows. Firstly, the areas of interest have a very wide range of altitude, from Iyula at an average elevation of 1,892 metres, down to Malangali, average elevation 1,232 metres. This altitude range covers 81% of the basin area. No significant expansion of cultivation is taking place in administrative areas either in the bottom 15% of the basin or the top 4%. See Table 6-6.

Table 6-6: Explanatory Variables for Change in Cultivated Area, 2010-2012

District	Administrative area	Expansion of cultivated area 2010-2012, ha	Cultivated area 2010, ha	Population, 2010	Total area, ha	Population density, people/ha	Land less than 6%, ha	Mean Rainfall mm	Mean Altitude, m
Mbeya Rural	Iwiji	0	6,011	13,626	15,176	0.90	2,671	1,229	1,885
Mbeya Rural	Masoko	8	348	805	552	1.46	97	1,679	2,105
Kyela	Ikolo	-13	894	18,134	2,056	8.82	2,040	2,496	482
Kyela	Katumba Songwe	-17	3,144	13,237	3,545	3.73	3,397	2,419	486
Kyela	Ngana	-2	1,434	6,054	6,731	0.90	3,956	2,025	642
Kyela	Ngonga	72	2,134	7,917	2,803	2.82	2,794	2,300	482
Kyela	Ikimba	-157	1,801	10,082	2,401	4.20	2,387	2,612	493
Kyela	Itope	-16	183	1,024	738	1.39	707	2,529	522
Ileje	Itumba	308	4,474	9,704	10,138	0.96	1,491	939	1,454
Ileje	Mlale	232	1,667	4,664	11,221	0.42	3,609	1,005	1,562
Ileje	Itale	161	2,134	7,176	9,812	0.73	1,175	1,395	1,861
Ileje	Ibaba	197	2,220	7,600	14,971	0.51	2,870	1,272	1,896
Ileje	Ndola	178	2,242	6,497	13,576	0.48	2,759	1,018	1,585
Ileje	Ikinga	200	2,243	4,547	11,471	0.40	861	1,621	1,044
Ileje	Kafule	159	1,923	6,175	5,302	1.16	342	1,378	1,481
Ileje	Malangali	1121	2,861	6,178	15,071	0.41	900	1,320	1,232
Ileje	Kalembo	168	1,204	3,370	4,167	0.81	172	1,305	1,809
Ileje	Bupigu	151	2,132	5,854	20,251	0.29	2,201	1,101	1,419
Ileje	Isongole	224	2,902	9,425	5,855	1.61	3,020	1,012	1,311
Ileje	Chitete	193	2,350	8,263	8,811	0.94	2,714	1,065	1,360
Ileje	Mbebe	529	3,920	8,843	12,878	0.69	8,147	1,112	1,440
Mbozi	Iyula	1585	5,318	12,611	6,044	2.09	1,511	1,212	1,892
Mbozi	Nyimbili	4963	5,367	20,950	32,971	0.64	10,450	1,076	1,578
Mbozi	Vwawa	164	430	6,431	1,093	5.88	137	1,112	1,589
Mbozi	Isandula	-663	4,313	6,653	7,788	0.85	4,303	1,112	1,455
Momba	Chiwezi	-98	763	2,626	4,051	0.65	3,920	1,112	1,392
Tunduma	Tunduma	20	539	2,046	3,760	0.54	1,541	1,112	1,549
Chitipa	Mwabulambya	1112	10,203	63,732	82,079	0.78	55,426	1,110	1,308
Chitipa	Mwenemisuku	-454	5,458	14,747	32,800	0.45	2,265	1,369	1,240
Chitipa	Kameme	1363	7,680	20,770	43,316	0.48	18,128	1,099	1,461
Chitipa	Chitipa Boma	23	335	15,866	850	18.66	820	1,012	1,275
Karonga	Kilupula	386	2,780	16,574	8,386	1.98	4,431	2,022	669
Karonga	Mwakaboko	205	11,044	20,820	24,757	0.84	8,695	2,175	648
	Total	12,302	102,448	363,002	425,420	0.85	159,937		

Secondly the areas of interest are all in the mid rainfall zone of the basin with average annual rainfall of 1,076-1,320 mm. This rainfall area covers 53% of the SRB area. In the high rainfall area (above 1,370 mm covering 22% of the basin area) and low rainfall areas (below 1,075 mm covering 25% of the basin area and in particular the mid-central area) little change in the cultivated area took place in 2010-2012.

Thirdly, cultivation expansion is mostly taking place where land of moderate slopes (<7%) is available and free from cultivation. With the exception of Iyula and Malangali, (where the area cultivated in 2010 had already exceeded the area of moderate slope by about 300%) in all other administrative areas cultivation in 2010 was only 30% of the land of moderate slope available.

Fourthly, expansion of the cultivated area takes place only in administrative areas with low population density, usually lower than 0.78 persons per ha. The only exception to this is Iyula, which has a population density of 2.09 per ha, cultivated areas exceeding land of less than 7% slope by 350% and high altitude (1,892 m). Iyula appears to be unsuitable for expansion of cultivation and clearly has particular issues that are beyond basin-level data to identify.

In summary, the moderate growth in the basin economy appears to be fuelled by an expansion of the maize-based rainfed cropping system in medium altitude and medium rainfall areas where significant areas of low to moderately sloping land is still available. Cultivated area expanded by 6% per annum in 2010-2012. This rate of expansion has its limits, depending on the amount of suitable land still available. When this is extinguished, and lacking any intervention to improve labour productivity in the basin, the economic growth will slow and RGDP per capita may even fall. It would be useful to have an idea of the time scale in which this might happen.

The issue was investigated using a simple model which expanded the cultivated area in administrative areas where it was observed to expand in the period 2010-2012, up to the limit of the availability of land less than 7% and at a rate similar to the observed rate in 2010-2012. The results are shown in Figure 6-1. There is sufficient land that is apparently suitable for the maize-based rainfed cropping pattern to expand up to 2021. After that year the "suitable" land resources of SRB will be fully committed. Further expansion will be onto marginal land and productivity per unit area will therefore decline without measures to improve suitability.

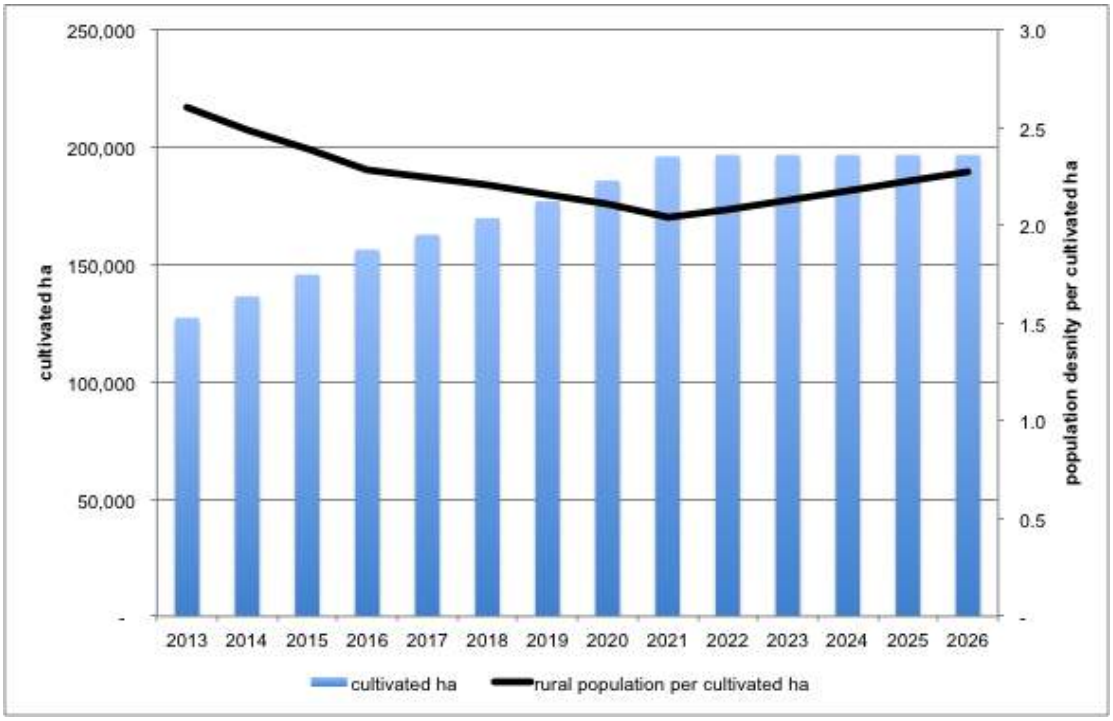


Figure 6-1: Projected Expansion of the SRB Cultivated Area

It is well known that the SRB population is expanding at rates exceeding 2.5% per annum. It is therefore important to check whether the projected expansion results in a feasible rural population density. A population projection which distinguished between the present and future rural and urban populations had already been made to estimate the likely number of electricity connections that might be expected in the SRB from 2022 when hydropower generation is expected to begin (see Section 8.2.1 for a description of this projection). Using the population growth estimates provided in the

Community Development Sub-programme (which consider the likelihood of continued in-migration to the SRB), the population in 2022 would be about 493,000 people in about 99,000 households. Then, disaggregating this 2022 estimate between those living in small rural settlements and those in the larger settlements, and applying coefficients to reflect rural to urban migration[5], increasing household size of rural families and declining household size of urban families, an estimate of 82,000 rural households and 17,000 urban households can be made. In 2022 probably about 13% of the basin population and 17% of households will be living in the larger settlements.

This shift in the balance of the rural and urban population can be accommodated within the increase in the cultivated area expected up to 2026. Figure 6-1 shows that overall the rural population density per cultivated hectare will decline slightly up to 2021 as urbanisation takes place and new lands are taken into cultivation. Thereafter, the rural population density begins to rise: urbanisation continues but not at a rate sufficient to hold down the increase in the rural population density, though in the time scale under consideration the increase is small. In general then, the predicted increase in cultivated area is commensurate with the expected growth of population. A relatively simple economic driver has been identified to steer a projection of the SRB economy in the medium term, assuming no SRBDP interventions.

The model can also be used to disaggregate the data for Tanzania and Malawi, as shown in Figure 6-2. The graph shows clearly that a larger proportion of the expansion of the cultivated area is likely to take place in Malawi. The proportion of the basin's cultivated area is greater in Tanzania now, but is likely to increase to roughly 50:50 by 2022. Now, the projected rural population per cultivated ha is higher than in Tanzania but is projected to fall more steeply to rather similar levels by 2022. A number of comments could be made on these trends, but they would depend on the accuracy of the baseline data and the validity of the projection. Sufficient to say that in the medium term, the Malawi administrative areas are likely to account for a larger proportion of SRB economic growth.

[5] The growth of the urban population is expected to be 4.77% per annum in Tanzania in the period 2010-2015 (www.indexmundi.com). This includes natural increase and in-migration. It is assumed in this model that the increase in urban population was 3% per annum in 2010, and will increase to 5% per annum in 2026. The size of the urban family will decrease to 10% of its present size during the same period.

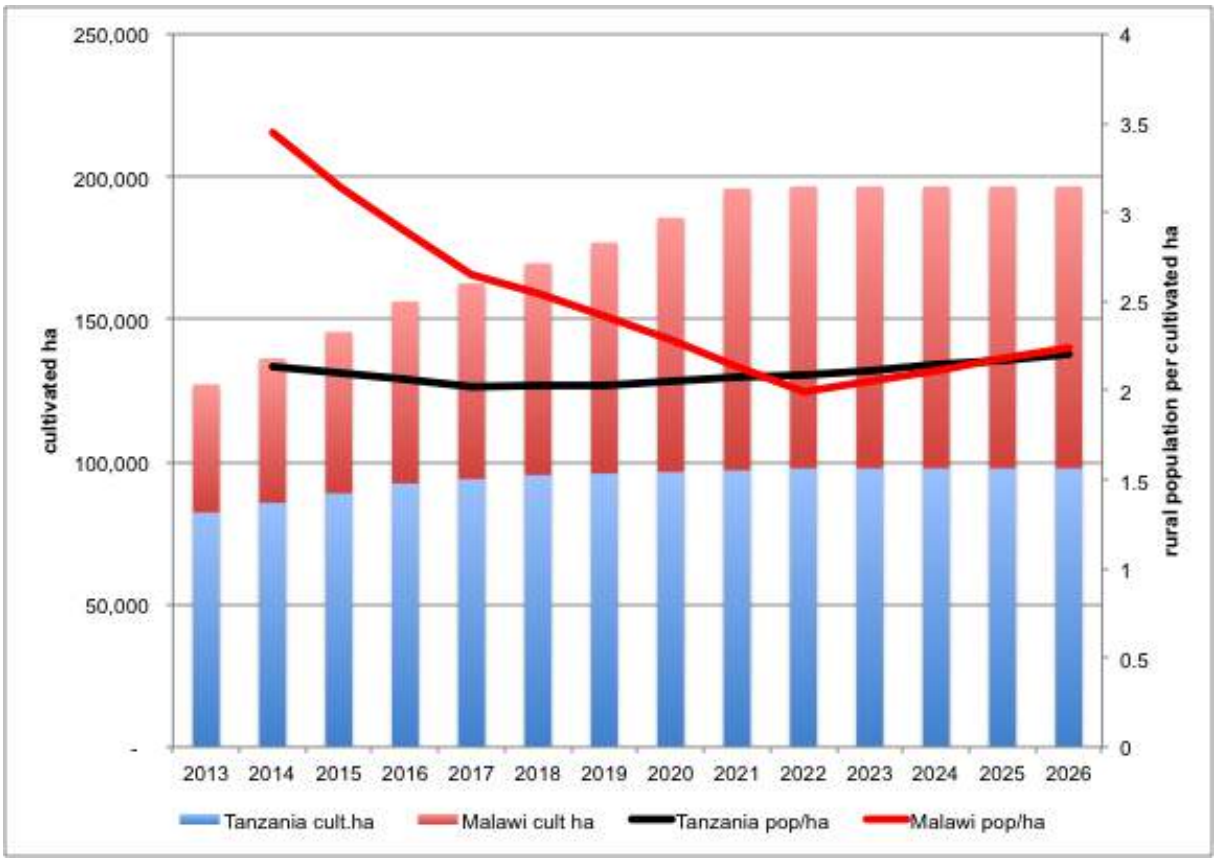


Figure 6-2: Projected Expansion of the Cultivated Area by Country

6.3 THE PERIOD 2012-2022

6.3.1 MODELLING PRINCIPLES

The projection of cultivated area also allows a prediction of how SRB RGDP may develop over the period 2013-2022. Working on the reasonable assumption that no major changes in cropping patterns and crop productivity will take place in the period, together with the calculated estimate that rainfed maize production accounts for 40% of crop RGDP in 2010, while rainfed cropping itself accounts for 68% of total basin RGDP, a reasoned projection of the SRB RGDP can be made up to 2022.

In order to do this, a further model was prepared, based on value added, the use of intermediate goods excluding the cost of labour, and the expected use of labour. These parameters are closely connected as described in Section 2.3:

The **Gross Value of Production** (GVP) is the market value of the production of an establishment, whether a family farm for production for own use or a large industry oriented to sales (i.e. GVP = Value added + intermediate costs + cost of labour).

The **Value Added**[6] is the GVP minus the bought-in costs of production and is equal to the sum of wages and profits. Value Added is therefore computed inclusive of labour costs of production.

The **Return to Labour** is Value Added divided by the units of labour required to produce it. Return to labour is an objective measurement of the comparative productivity of labour between sectors or zones.

Values of these parameters for each of the main sectors of economic activity in the basin have been calculated for the period 2010-2012. Year on year rates of change are available for 2010-2011 and 2011-2012 but after careful investigation (see Section 6.1) it was found difficult to establish any definite growth trends on which an economic projection could be based. One important reason for this was the variability introduced by macro-economic change. An alternative approach to projecting SRB economic growth is discussed in Section 6.3.2.

6.3.2 INPUT-OUTPUT COEFFICIENTS

6.3.2.1 RAINFED AND IRRIGATED CROPPING

Rainfed crop RGDP can be calculated on the projected rainfed cultivated area (see Section 6.2) multiplied by the RGDP per cultivated hectare based on observed RGDP per cultivated during the period 2010-2012. The latter can itself be adjusted by a factor to represent the annual change in Value Added resulting from increased use of inputs and labour per unit area cultivated. In turn, this will enable the increase in RGDP to be calculated. The basic data required for this calculation are shown in Table 6-7.

Table 6-7: Rainfed Cropping: District Level Data for 2010

	US$ current 2010			ha of rainfed cultivation 2010	US$ per ha current 2010			cereal yield, kg/ha	Cereal price, 2010 US$/kg
	Value added	Intermediate inputs	labour days		Value added	Intermediate goods	labour days		
Mbeya Rural	4,444,568	516,823	425,262	6,359	699	81	67	3304	0.25
Kyela	14,459,227	1,666,432	723,854	9,590	1,508	174	75	2449	0.28
Ileje	26,767,404	4,822,486	1,978,455	32,271	829	149	61	4001	0.28
Mbozi	4,094,296	2,617,906	1,205,286	15,427	265	183	78	2299	0.19
Momba	684,055	127,987	76,842	1,303	525	98	59	2585	0.19
Chitipa	24,350,940	8,342,777	1,755,339	23,675	1,029	352	74	2585	0.56
Karonga	14,445,878	3,305,368	1,146,554	13,824	1,045	239	83	2915	0.78
Total	89,246,369	21,599,780	7,311,591	102448.3					

The second stage of the calculation requires determining the impact of a specified yield increase on value added and the increase in cost and quantity of intermediate inputs and labour required to achieve it. Allowing for lower yields in drier and lower areas, yield responses will be relatively high in those Districts where yields are relatively low. The historic data 2010-2012 indicate that yield increases account for very little of the

[6] Value added measures the contribution of to the economy of individuals, households firms and sectors. The sum of Value added (with adjustments where required) is equivalent to the Gross Domestic Product (GDP).

increase in agricultural production during the period. Tons of crops grown per cultivated hectare did not increase at all from a SRB average yield of 3.24 tons of produce per cultivated ha in 2010. Production increases were accounted for by an expansion of the cultivated area. Nevertheless, such a very short run of time series is likely to hide a long-term increase in production per hectare. For now, this is assumed to be 0.25% per annum.

Table 6-8 shows the calculated relationship in financial terms: according to the economic relationship assumed, an increase in rainfed yields of 0.25% in Mbeya District in 2010-11 would result in a 0.3% increase in value added. It would also require a 0.5% increase in the cost of intermediate goods and a 0.6% increase in labour days.

Table 6-8: Relationship of Yield, Value Added, Inputs and Labour Use

District	Annual Yield Increase (kg/ha)	Incremental Value Added, US$	Total Value Added, US$	% Increased Value Added	Assumed yield response to one unit of		Increase in use, units per ha		Cost of input	Incremental use		Required to raise yield by 0.25% per annum	
					Input, kg of cereal	Labour, kg of cereal	Input, units	Labour, units	US$ per unit input	Total cost of incremental inputs, US$	Total incremental labour, days	Increase in cost of intermediate inputs	increase in labour days
Mbeya Rural	8.26	13,373	4,457,940	0.3%	10	20	0.83	0.41	1,072	5,633	2,626	1.1%	0.6%
Kyela	6.12	16,656	14,475,883	0.1%	5	15	1.22	0.41	916	10,760	3,914	0.6%	0.5%
Ileje	10.00	91,802	26,859,206	0.3%	10	20	1.00	0.50	537	17,322	16,140	0.4%	0.8%
Mbozi	5.75	17,230	4,111,526	0.4%	10	20	0.57	0.29	1,072	9,501	4,433	0.3%	0.4%
Momba	6.46	1,624	685,679	0.2%	10	20	0.65	0.32	2,529	2,129	421	1.7%	0.5%
Chitipa	6.46	86,062	24,437,003	0.4%	10	20	0.65	0.32	1,456	22,281	7,650	0.3%	0.4%
Karonga	7.29	78,706	14,524,585	0.5%	5	15	1.46	0.49	1,507	30,369	6,716	0.9%	0.6%
Total		305,453	89,551,822							97,996	41,900		

There are some simplifications in the Table. Cereals (maize, rice, millets etc.) comprise 55% of the cropping pattern and so for simplicity the determination of value changes are based on these crops. The technical coefficients that determine yield increase for unit increases in intermediate goods and labour are Consultant's estimates based on regional agro-economic studies. These coefficients would change with time: the trend would be as yields increase then the incremental yield response to one incremental unit of input would decrease. Nevertheless, even if rainfed yields increased at 1% per annum (rather than the 0.25% assumed) then the average yield (weighted by the area of the rainfed cropping pattern) would increase by no more than 21% between 2010 and 2030, from 3.1 tons per ha to 3.7 tons per ha. At this rate of yield increase, which is typical for low input rainfed farming, the coefficients are unlikely to change much over time.

Technical coefficients for irrigated farming can be worked out in a similar way, recognising that with irrigation water, the response to each incremental unit of input or labour day is likely to be greater than that of rainfed agriculture. It was assumed to be double. Further, the possibility for farmers to achieve sustained year-on-year yield increases is greater (because of reduced impact of variation in annual rainfall), so it was assumed that a 1% yield increase per annum is possible without additional interventions. According to the economic relationship assumed, an increase in irrigated yields of 1% in Mbeya District in 2010-11 would result in a 0.2% increase in value added. It would also require a 2.3% increase in the cost of intermediate goods and a 5.6% increase in labour day. Such a rate of yield increase would see overall irrigated yields grow from 4.7 tons per ha in 2010 to 5.7 tons per ha in 2030.

6.3.2.2 LIVESTOCK AND APICULTURE

Calculating long-term changes in value added, cost of intermediate goods and labour requirements for livestock is more challenging than crop production because the technical coefficients of production are less well known (e.g. meat and milk yields per TLU per annum and mortality rates). An additional problem is costing inputs: dry fodder has not been costed in the RGDP estimate, assuming that it is freely available from naturally regenerating dry matter. The availability of dry fodder in SRB in 2010 was not believed to be a constraint (see Section 3.2). But with a larger TLU population dry matter availability will decline, perhaps to critical levels that affect technical coefficients of production.

Reasonably accurate data exists on the number of TLU in the SRB in the period 2010-2012 (livestock are easier to count than hectares of crops). From 119,000 TLU in 2010 the number grew to 126,500 TLU in 2012, an increase of 6%. However (and as with cropping area statistics, see Section 6.3.2.1) the basin statistics hide large differences between administrative areas. Livestock numbers are static over 21% of the basin area during the period and growing elsewhere. But the strong growth in numbers is confined to only 18% of the basin area, in the administrative areas of Itumba and Malangali (the relatively dry centre of the basin), Tunduma, Nyimbili and Iyula (in the western periphery) and Kilupula in the northern part of Karonga District. These areas account for 78% of the growth in TLU in the period 2010-2012.Three of the administrative areas in Tanzania where livestock have expanded have also seen an important expansion of cultivated area in the period (Malangali, Iyula and Nyimbili, see Section 6.2). The growth of livestock numbers in the six administrative areas varies between 9% and 17% per annum and is therefore in excess of the biological reproduction capacity of a resident herd: unless the statistics are wrongly reported, livestock in-migration has occurred in these areas.

In projecting TLU numbers, and deriving a realistic estimate based on observed change in 2010-2012 it is only necessary to cap the observed growth in these areas, in a similar way that was done by capping the growth of the cultivated area to land below 7%. It is therefore assumed that after 2014 annual growth of TLU in these areas slows to 2% per annum.

A check is necessary to match this projection of TLU numbers against dry matter availability, see Table 6-9. Under the assumptions described above, TLU may expand in the basin from about 122,000 now to 170,000 in the long term. Dry matter requirement (at an assumed 7 kg/TLU/per day, following FAO) will increase by about 65% to 430,000 tons per annum. Some of that will be provided by an increase in crop residues the production of which is estimated as 93,000 tons now, but will grow as the cultivated area expands to about 144,000 tons per annum. 100% access to crop residues is assumed: although some residues may be burned for fuel cultivated land also provides a good source of weeds which are usually fed to stock. It is then possible to estimate the dry matter yield required from the uncultivated land in the basin to provide the balance. Overall, a dry matter yield of about 0.5 tons per ha per annum is required now, increasing to about 1.2 tons per ha in 2030.

Table 6-9: Estimate of Dry Matter Requirements for Livestock Grazing

	Mean TLU 2010-12	Mean TLU 2030	Dry matter requirement, tons per annum, 2010-12	Dry matter requirement, tons per annum, 2030	Available Crop residues, tons pa, 2010-12	Available Crop residues, tons pa 2030	Required Dry matter yield per annum, tons/ha 2010-2012	Required Dry matter yield per annum, tons/ha 2030
Mbeya Rural	4,452	6,443	11,374	16,462	7,107	10,983.93	0.27	0.59
Kyela	16,755	20,915	42,810	53,438	6,076	9,391.18	2.01	33.39
Ileje	36,802	46,920	94,028	119,880	36,469	56,365.81	0.40	0.64
Mbozi	14,226	21,758	36,348	55,591	11,953	18,473.66	0.51	1.57
Momba	3,439	5,146	8,786	13,148	863	1,333.41	1.01	3.20
Chitipa	24,153	27,604	61,711	70,528	19,022	29,400.28	0.27	0.54
Karonga	22,543	38,869	57,597	99,311	11,716	18,107.82	1.38	4.68
Total	122,370	167,655	312,654	428,358	93,205	144,056	0.52	1.23

Such an increase in demand for dry matter from the basin is considered to be sustainable (see Section 3.2): SRB grazing resources were estimated to be about 525,000 tons per annum, excluding the contribution of crop residues. The exception is the Lakeshore areas in Kyela and Karonga where it will not be possible to expand livestock numbers much beyond present levels using a low-input production system[7]. Growth rates of TLU in Kyela wards and Kilupula T/A were therefore held to 0% per annum.

Once the projection of TLU is established, then the growth of Value Added, intermediate goods and labour days required for livestock activities can be estimated in direct proportion to the change in number of TLU. The calculation rests on the assumption that no change is envisaged in productivity in the livestock sector, either negatively from declining dry matter resources or positively from increases in input or labour use.

The performance of the apiculture sub-sector is unlikely to influence the projection of basin RGDP. During the period 2010-2012 it accounted for only 0.5%. The data for 2010-2012 shows a general increase in the number of hives so it may be assumed that the sub-sector is growing. It was assumed that the apiculture sub-sector would grow so that by 2022 it retains its share of the basin economy. This would require a growth in apiculture RGDP of about 4.3%, which is above the rate of growth of population. It was also assumed there would be no change in the present relation of value added, use of intermediate goods and labour days required per unit of production.

6.3.2.3 FISHERIES AND AQUACULTURE

There is no evidence to show that SRB fish production will expand without systemic reform, for which government assistance will be needed. The production statistics 2010-2012 show marked declines in RGDP that are commensurate with the decline in

[7] Lakeshore livestock owners already have a good supply of supplementary feed including rice bran, cocoa husk and oil press residues. Their dependence on natural grazing will therefore be much reduced.

Lake fisheries due to over-fishing. This trend is projected to continue, resulting in fisheries reducing its share of basin RGDP from 0.4% in 2010-2012 to only 0.2% in 2022. Even to achieve this dismal performance an increase in labour input may be required (more fishing days to maintain catch in the face of diminishing stock). However, for lack of data this has not been modelled.

Aquaculture is a tiny activity (only 0.1% of RGDP in 2010-2012 with a possible total production of about 40 tons per annum) but with big potential. If fisheries decline (as assumed above) but fish consumption in SRB is in the order of 14 grams per person per day (i.e. similar to land-locked Zambia following FAOStat data) then the present market for fish could approach 2,000 tons per annum. However, there is no evidence that aquaculture as an economic activity is expanding, even as it faces rapidly increasing unsatisfied demand as a result of the decline of capture fisheries. This suggests that support is required to the sub-sector to orientate potential producers to their opportunities.

6.3.2.4 FORESTRY

Forestry is an important economic activity in the basin, accounting for nearly 8% of RGDP in 2010. However, empirical data on the use and consumption of woody biomass is hardly available and the estimate is indicative only. Some assumptions were made about the per capita use of fuel wood, charcoal, forest products and timber in the period 2010-2012 which are described in section 3.2. Projecting the use of woody biomass in the medium term, it was assumed that per capita use would not change but the population accessing wood products, particularly for fuel and forest products would be confined to the rural population. The rural population declines as a proportion of the total over time, reflecting urbanisation. This means that the use of woody biomass per capita also tends to decline, from about 835 kg per capita per annum in 2013, to about 700 kg per capita per annum in 2026. But this still represents an annual use of about 390,000 tons. SRB has (very roughly) a woody biomass stock of about 2 million tons and a mean annual increment of only 100,000 tons per annum (see **Error! Reference source not found.**). If these figures are accepted then, on the face of it, the use of woody biomass under the present production systems and demand levels in SRB are unsustainable, with sufficient woody biomass reserve for about a decade.

In fact, more use of alternative fuel sources will be made well before woody biomass reserves are extinguished. The urban population will consume more electricity and fossil fuel, the rural population will use more animal dung and crop residues as woody biomass becomes expensive and in short supply. Also alternative wood production systems will be introduced and wood markets will become more organised and profitable for producers. As most of the use of woody biomass will be for the rural population, it may be expected that farm woodlots will be established. This will be a new production system distinct from the informal collection of wood and forest products by households, uncontrolled charcoal burning and timber production from the mobile pit saws that may be seen throughout the basin at present.

An indicative enterprise has been costed, on the assumption that private woodlots would supply 50% of the basin's woody biomass demand from 2025 or about 190,000 tons of wood per annum. About 30,000 ha of woodlots will be required, yielding at 10m^3(6 tons)/per ha per annum. There will be about 80,000 rural farm families by 2025, which would lead to an average of 0.4 ha of woodlot per household.

A gross margin is available for the enterprise and shown in Table 6-10. Yields are assumed to be 10m^3 per ha per annum, clear-felled after year 10 yielding about 600 tons per ha and re-planted. Note that value also accrues from fodder harvested in the woodlot after year 3. Wood price is US$ 39 per ton compared with about US$ 33 per ton in 2010 prices (see **Error! Reference source not found.**). At US$ 39 per ton, the net present value of the enterprise is over 20% and therefore attractive to smallholder investors.

Table 6-10: Indicative Financial Budget for Private Woodlots, 2010

Item	Unit	Years 1 Units/ ha	Years 1 Price (US$)	Years 1 Value (US$)	Year 2 Units/ ha	Year 2 Price (US$)	Year 2 Value (US$)	Years 3 to 9 Units/ ha	Years 3 to 9 Price (US$)	Years 3 to 9 Value (US$)	Year 10 Units/ ha	Year 10 Price (US$)	Year 10 Value (US$)
RETURNS													
Fuelwood/timber [1]	tons	0	39	0		39	0		39	0	60	39	2,355
Fodder [2]	tonne	0.0	20	0	0.0	20	0	1.0	20	20	1.0	20	20
Gross Returns				**0**			**0**			**20**			**2,374**
PRODUCTION COSTS													
Establishment													
Supervisory staff	LS	1	12	12			0			0			0
Nursery (2,500 seedlings)	LS	1	39	39			0			0			0
Tree establishment	day	200	1	157			0			0			0
Security	day	5	1	4									
Gulley/Runoff control	LS	1	12	12			0			0			0
Roads/firelines	LS	1	4	4			0			0			0
sub-total				227			0			0			0
Maintenance													
Supervisory staff	LS	1	0	0	1	6	6	1	6	6	0	0	0
Thinning	day	0	1	0	5	1	4	5	1	4	0	1	0
2031 2032	day	0	1	0	10	1	8	10	1	8	0	1	0
Maint. of roads/firelines	day	0	1	0	5	1	4	5	1	4	0	1	0
				0			22			22			0
Harvesting and Transport													
Fodder harvesting/transport	tonne	0	7	0	0	7	0	1	7	7	1	7	7
Timber felling	m^3			0			0			0	60	5	294
sub-total				0			0			7			302
Total Production Costs				227			22			29			302
NET RETURNS				**-227**			**-22**			**-9**			**2,073**

[1] Fuelwood/timber production after 10 years (mean increment of 10 m^3 per annum). Fuelwood/timber price at forest side.
[2] Annual fodder production after first two years (no access is allowed during first two years when woodlot is being established).
Source: Financial Forestry Budget: Private and Community Woodlots, Lake Hawassa Sub-basin Watershed Management Project, MWR/Helcrow, Ethiopia 2010

It is possible to schedule planting to meet the assumption that 50% of estimated wood demand would be met from private planting in 2025. To achieve this, private planting would have to begin in 2016 and about 3,000 incremental ha of woodlots would be planted each year to reach about 30,000 ha by 2025. The wood produced annually from 2025 onwards would be about 50% of predicted annual demand.

It is possible to obtain an indication of where in the basin woodlots may be established to meet declining supply from other sources. This was attempted by:

- Estimating the standing stock and mean annual increment from areas of physiognomic vegetation types (see **Error! Reference source not found.** for coefficients used) for each administrative area
- From the standing stock, subtract annual demand and add mean annual increment until the stock is estimated to be exhausted
- When the stock is exhausted, introduce woodlot areas in proportion to the total woodlot area required to meet 50% of total demand by 2025.

The results are shown in Table 6-11. The present stock of woody biomass, estimated to be 1.9 million tons, will become critically short in most administrative areas by 2025. The mean annual increment is only about one third of expected demand and may be expected to decline with stock, although wood harvesting from the annual increment of pollard plants is always possible even if the stock is small. To meet 50% of estimated 2025 woody biomass demand, about 31,000 ha of woodlots producing an average of

6 tons of wood per ha per annum will be required, located in the administrative areas suggested in the Table. The Table also suggests those administrative areas that may retain significant amounts of woody biomass stock – it may be worth considering reserving parts of these areas to conserve woody biomass stock at basin level.

Table 6-11: Estimate of the Location of and Production from Woodlots in 2025

District	Administrative area	Area in ha	Woody biomass reserve, 2013, tons	Estimated Mean Annual Increment, tons	Average annual woody biomas demand, 2013-2015, tons	Modelled area of woodlots, 2025, ha	Production from modelled area of woodlots 2025, tons
Mbeya Rural	Iwiji	15,176	104,000	6,700	18,000	2,155	15,240
Mbeya Rural	Masoko	552	2,000	100	1,000	138	978
Kyela	Ikolo	2,056	5,000	200	11,000	1,292	9,136
Kyela	Katumba Songwe	3,545	8,000	400	5,000	438	3,098
Kyela	Ngana	6,731	34,000	1,900	4,000	-	-
Kyela	Ngonga	2,803	7,000	300	5,000	564	3,989
Kyela	Ikimba	2,401	6,000	300	2,000	80	565
Kyela	Itope	738	2,000	100	1,000	76	534
Ileje	Itumba	10,138	34,000	1,800	4,000	-	-
Ileje	Mlale	11,221	27,000	1,300	5,000	644	4,557
Ileje	Itale	9,812	28,000	1,500	9,000	1,124	7,951
Ileje	Ibaba	14,971	46,000	2,500	10,000	1,207	8,538
Ileje	Ndola	13,576	33,000	1,600	8,000	907	6,413
Ileje	Ikinga	11,471	45,000	2,500	4,000	-	-
Ileje	Kafule	5,302	21,000	1,300	7,000	822	5,814
Ileje	Malangali	15,071	41,000	2,100	6,000	727	5,143
Ileje	Kalembo	4,167	21,000	1,300	4,000	517	3,658
Ileje	Bupigu	20,251	74,000	4,100	6,000	-	-
Ileje	Isongole	5,855	18,000	900	10,000	1,155	8,172
Ileje	Chitete	8,811	21,000	1,100	9,000	1,038	7,343
Ileje	Mbebe	12,878	40,000	2,200	10,000	1,155	8,166
Mbozi	Iyula	6,044	16,000	800	6,000	196	1,384
Mbozi	Nyimbili	32,971	98,000	5,100	25,000	2,916	20,622
Mbozi	Vwawa	1,093	12,000	700	8,000	899	6,362
Mbozi	Isandula	7,788	25,000	1,300	7,000	875	6,188
Momba	Chiwezi	4,051	6,000	300	1,000	33	232
Tunduma	Tunduma	3,760	23,000	1,300	2,000	-	-
Chitipa	TA Mwabulambya	82,079	341,000	19,200	75,000	9,283	65,655
Chitipa	TA Mwenemisuku	32,800	185,000	11,300	17,000	-	-
Chitipa	TA Kameme	43,316	224,000	12,700	26,000	-	-
Chitipa	Chitipa Boma	850	2,000	100	12,000	1,149	8,130
Karonga	TA Kilupula	8,386	71,000	4,200	13,000	1,541	10,902
Karonga	SC Mwakaboko	24,757	231,000	13,700	16,000	-	-

Once the administrative areas where woodlot interventions may be required are identified, it is possible to insert the enterprise scenario into the SRB RGDP, by disaggregating the budget shown in Table 6-10 into annual value added, intermediate costs and return to labour day which is available by dividing value added by the annual labour requirement.

6.3.2.5 HOUSING

Section 3.4 describes the calculations to estimate the contribution of housing to the SRB RGDP. The calculation depended on identifying the types of houses in the basin (drawn from the Household Survey), their value (from the Resettlement Action Plans) and the annual increase in population that will determine the construction of new housing. In the long term, the growth of population will continue to determine the annual increase in the number of housing units. However, it is also necessary to take into account the long-term change in the type of housing. If the basin population becomes

significantly wealthier, higher income groups will seek to replace their low cost housing with improved housing. Urbanisation will also lead to an improvement in the housing stock. However, if economic growth is sluggish, the replacement rate will be lower. Assuming "business as usual" in SRB the change in housing stock will be slower. An estimate was made of the value of housing in SRB in 2030 by assuming the 2030 population will live in the house types in the proportions shown in Table 6-12. This is estimated to represent a moderate change in house quality during the period.

Table 6-12: Assumed Proportion of Housing Stock, SRB 2030

Tanzania		2010	2030
1	Grass thatched roof house, mud and wattle	20%	15%
2	House with corrugated iron sheeets, basic finish	65%	68%
3	House with corrugated iron sheeets and good finish	15%	17%
Malawi			
1	Grass thatched roof house, mud and wattle	20%	16%
2	Grass thatched roof house, sun dried bricks	20%	18%
3	House with corrugated iron sheeets & sun dried bricks	30%	42%
4	House with corrugated iron sheeets & basic finish	10%	12%
5	House with corrugated iron sheeets and good finish	10%	12%

The assumption is probably reasonable for a low growth scenario: using the 2030 house type proportions the annual value added of housing in constant 2010 prices increases from US$ 3.8 million in 2010 to US$ 5.9 million in 2025 which is a growth in real terms of about 3.5% per annum and a little greater than the projected growth of population. This means the growth of the housing sector will have only a small impact on RGDP per capita, which gives more clarity to the RGDP projection.

6.3.2.6 WATER SUPPLY

Section 3.5 gives a description of the method of valuation of water supply services in 2010. The assumptions made to do this are adaptable to re-calculating this value in the medium term. The future number of "semi-urban" households can be substituted for the population in the larger villages identified in 2010. The proportion of rural households with improved supply can be revised upwards, from a basin average of 50% in 2010 to the Tanzania target cover of 75% by 2017[8] and the Malawi target cover of 87% to meet the MDG in 2015. While water consumption by the rural population without access to improved supply is assumed not to change, both rural and urban populations with improved supply will consume a little more per capita.

These assumptions are also orientated towards a local growth scenario for SRB development in the medium term. The value added of the water supply sector increases from about US$ 4 million per annum in 2010 to about US$ 13 million in 2025, or about 14% per annum. This is well above population growth, but obviously acknowledges that governments are committed to raising coverage and that the basin

[8] Big Results Now, 2013

population will become increasingly urban, thus allowing improved and more efficient cover.

6.3.2.7 SMALL AND MEDIUM INDUSTRIES

Section 3.6 describes the approach to estimating the value of SMI to the basin economy. The estimate was limited by the difficulty of finding data on the number and type of industry in the basin as well as their distribution. Nevertheless, it became apparent that SMI are dominated by agricultural processing ventures of which the greater part is milling maize and rice. Enterprise budgets were prepared for these activities (see **Error! Reference source not found.**) on which estimates of value added, cost of intermediate goods and labour requirements of SMI could be based. These budgets are likely to be similar for other agro-processing SMI. No budgets are available for the service sector (dominated by transport, restaurants and hotels).

Small-scale milling technologies are unlikely to change in the near future: mills serve only the basin market and will not compete with the much larger enterprises found outside the basin serving major population centres. The argument that local mills have a comparative advantage in location does not hold true: bottlenecks in transport, milling capacity and marketing mean processing losses (in both weight and quality) are less if grains are exported un-milled from the basin. Therefore the milling sector will not expand more quickly than the increase in basin demand for milled products and it is the number of mills that will increase, not their efficiency or size. Milling (and SMI in general) will expand more rapidly in larger settlements where markets are larger and factors of production (labour, power, raw materials) are easier to obtain.

With these arguments in mind, it was assumed that SMI will expand numerically at a rate of 3% per annum in rural administrative units and 6% per annum in administrative units where an urban population exists.

6.3.2.8 GOVERNMENT SERVICES

Government services in administration and other public services are important in the basin and comprised at least 6% of value added of the economy in 2010. See Chapter 4 for a description of the estimate of their value. While this estimate is complicated, its projection need not be. General government expenditure is given as an item on IMF country summaries (both actual and projected) and it was straightforward to calculate this, divide it by the population, express it in constant prices and calculate the annual rate of growth for the period. This was estimated as 3.6% per annum for Tanzania and 3.4% for Malawi. See Table 6-13. This rate of growth was used to project the detailed government expenditure estimate.

Table 6-13: Estimate of the Rate of Growth of Government Expenditure

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Malawi													
General government total expenditure, MWK billion in current prices		217.31	247.14	285.89	296.68	399.46	586.45	672.52	779.62	904.79	998.25	1,042.92	1,195.81
Population, million		14.85	15.27	15.71	16.17	16.63	17.11	17.60	18.11	18.63	19.17	19.72	20.29
Government expenditure per capita		14,638	16,101	18,193	18,352	24,018	34,273	38,203	43,047	48,561	52,076	52,884	58,939
Gross domestic product, deflator	100	109	118	126	131	155	197	229	245	259	274	290	308
Government expenditure per capita, constant 2007 MWK		13,472	13,741	14,388	13,968	15,531	17,405	16,663	17,563	18,723	18,984	18,236	19,161
Year on year change					-3%	11%	12%	-4%	5%	7%	1%	-4%	5%
Tanzania													
General government total expenditure, TZS billion in current prices		6,062.28	7,609.59	8,875.60	10,101.97	11,738.49	13,920.19	16,215.11	18,363.51	20,420.12	22,788.77	25,595.58	28,743.27
Population, million		40.74	41.78	42.83	43.88	44.93	46.28	47.67	49.10	50.57	52.09	53.65	55.26
Government expenditure per capita		148,822	182,122	207,219	230,218	261,290	300,881	340,188	374,040	403,815	437,377	477,111	520,174
Gross domestic product, deflator (rebased to 2007)	100	110	118	126	138	154	167	177	189	199	209	220	231
Government expenditure per capita, constant 2007 TZS		135,158	154,034	163,898	166,773	169,885	179,971	191,767	198,001	202,882	208,947	216,882	225,068
Year on year change					2%	2%	6%	7%	3%	2%	3%	4%	4%

Source: IMF Country Statistics 2013

6.3.3 PRICE ADJUSTMENTS

It is very important to standardise prices. Constant prices are preferred, that is monetary prices and values of goods and services are given with reference to a defined base time period. 2013 was chosen as the reference year, so it was necessary to raise 2010 prices to 2013. It is also essential to use the correct deflators and exchange rates for each economy. The procedure for standardising prices was:

- Values of goods and services were estimated in constant 2010 local currency units (LCU) and converted to US$ at the 2010 official exchange rate to arrive at the RGDP estimate 2010-2012 described in section 5

- To project the RGDP, prices in 2010 US$ were re-converted to LCU at the official 2010 $ exchange rate, inflated by the country-specific GDP deflator (rebased to 2010) for the period 2010-2013 and converted to constant 2013 US$ at the official exchange rate in 2013.

The exchange rates and deflators used in this calculation are taken from IMF country summaries:

	2010 LCU/$	deflator 2010-2013	2013 LCU/$
Tanzania	1,410	1.32	1,622
Malawi	151	1.49	366

This adjustment has the important effect of reducing the value of the Malawian economy compared to the Tanzanian economy. The TZS at the OER fell only 15% against the US$ during the period, while MWK lost 143% of its value. Inflation was also greater in Malawi than in Tanzania. It would be possible to convert prices using the respective purchasing power parity exchange rates (PPP) for the two countries. Unfortunately shrinkage of the Malawian economy relative to the Tanzanian would still occur. So for clarity the OER has been used.

6.3.1 RESULTS OF THE PROJECTION

The result of the projection is an estimate of the future performance of the SRB economy assuming no significant interventions by the SRBDP. See

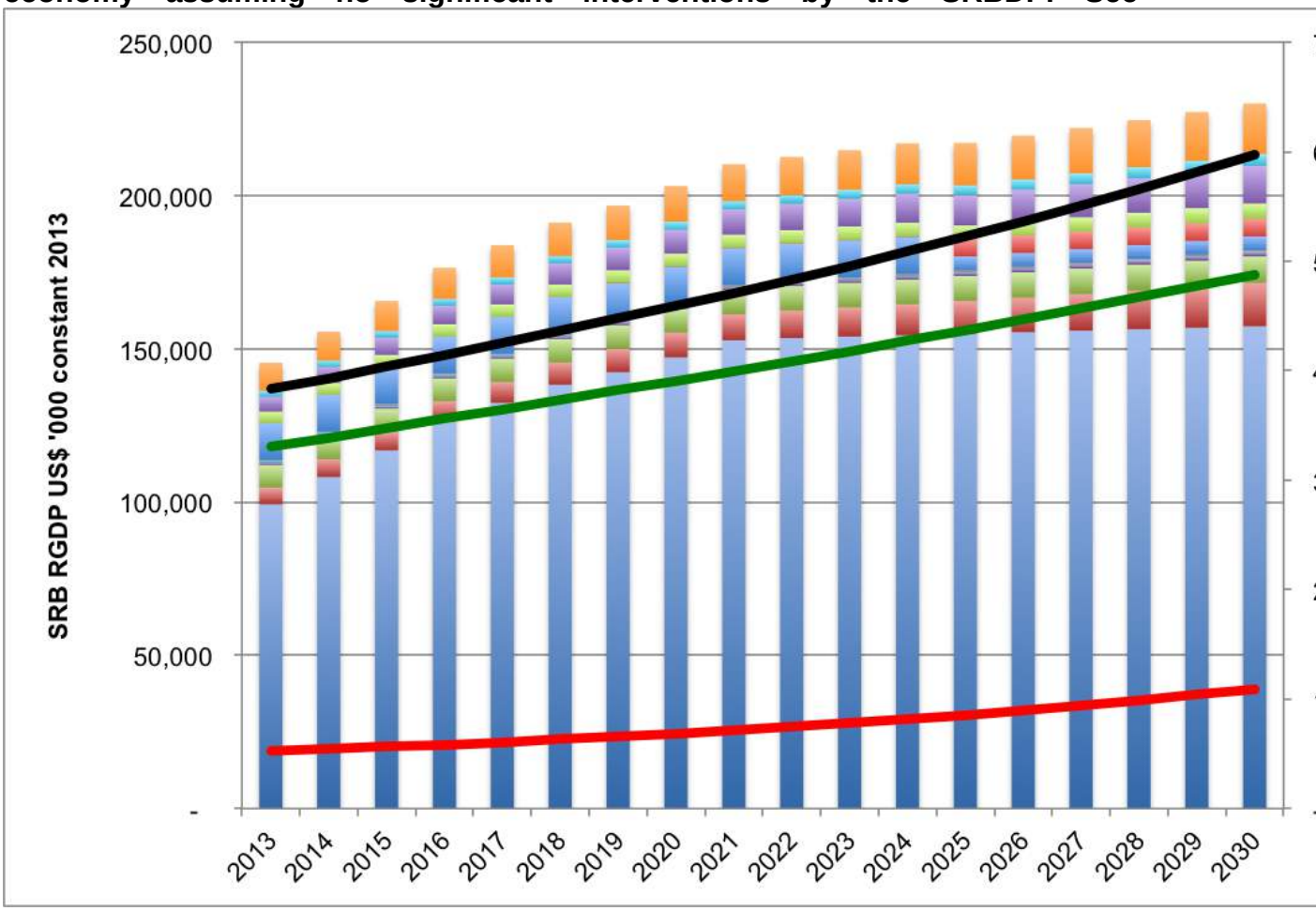


Figure 6-3 below. The graph shows growth by sector under the assumptions described above in Section 6.3.2.

The most important message contained in the estimate is the importance to economic growth of the up-take of unused but suitable land, under conditions of a slow growth (0.25% per annum) in productivity per cultivated hectare. The graph shows that the contribution of rainfed agriculture to the economy stalls after 2021 and RGDP per capita begins to decline (see Figure 6-4).

Other sectors perform reasonably well: note that irrigation RGDP expands by about 7% per annum (assuming an annual increase in productivity of 1%), but from a low base (less than 4% of the RGDP in 2013) and is therefore insufficient to substitute for weak productivity increases in rainfed agriculture.

Livestock RGDP grows at about 1% per annum; like rainfed agriculture productivity per production unit is not expected to increase and the sector grows only in response to increased livestock numbers. This growth is constrained by the availability of grazing. In value terms, growth is slower than the growth of population. Fisheries, aquaculture and apiculture are tiny sectors and can never provide an alternative engine of growth for the basin.

Forestry is an important sector but does not grow at all during the period: this is not only because demand for wood is driven by the rural population, the rate of growth of which is reduced by urban migration. About 50% of the output from the traditional production system is replaced by production from woodlots in 2025. The market price, value added and intermediate costs of woodlots are similar to the traditional production system so little change is observed in the RGDP accounts but if the cost of depreciation of natural resources (i.e. the cost of replacing the woody biomass stock) under the traditional system were fully taken into account and added to intermediate costs then value added under traditional forestry would be correspondingly less.

The performance of the housing and domestic water sectors reflects the low rate of growth of the SRB RGDP over the period. Only modest improvements are seen in housing stock and water supply. Given that in the early part of the projection most growth is seen in areas where new cultivable lands are being opened, there will be a lag in the establishment of quality housing and services. When the mini-boom in the basin economy is over in 2021, RGDP per capita is likely to fall, further delaying investment in housing and associated services.

SMI growth is also disappointing. Given that SMI contribute less than 2% to the basin RGDP in 2013 it is obvious that even if growth rates were very high SMI would not become significant as an engine of growth in the medium term. Depressed demand from the dominantly rural population, lack of benefits of scale to agricultural processing enterprises and slow infrastructure growth in the basin mean that the projected value of production from SMI remains relatively small.

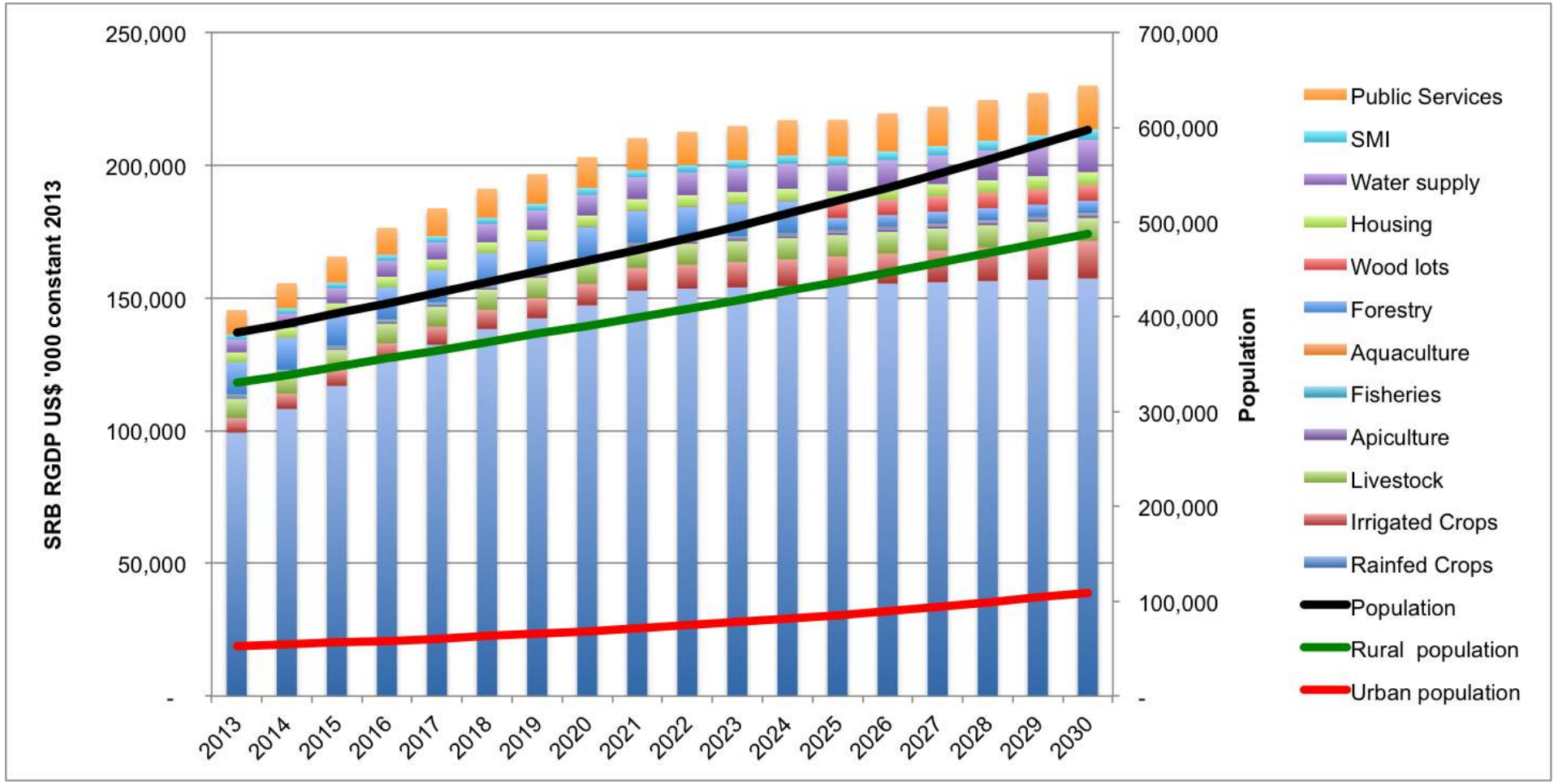


Figure 6-3: SRB RGDP Projected to 2030, constant 2013 '000 US$

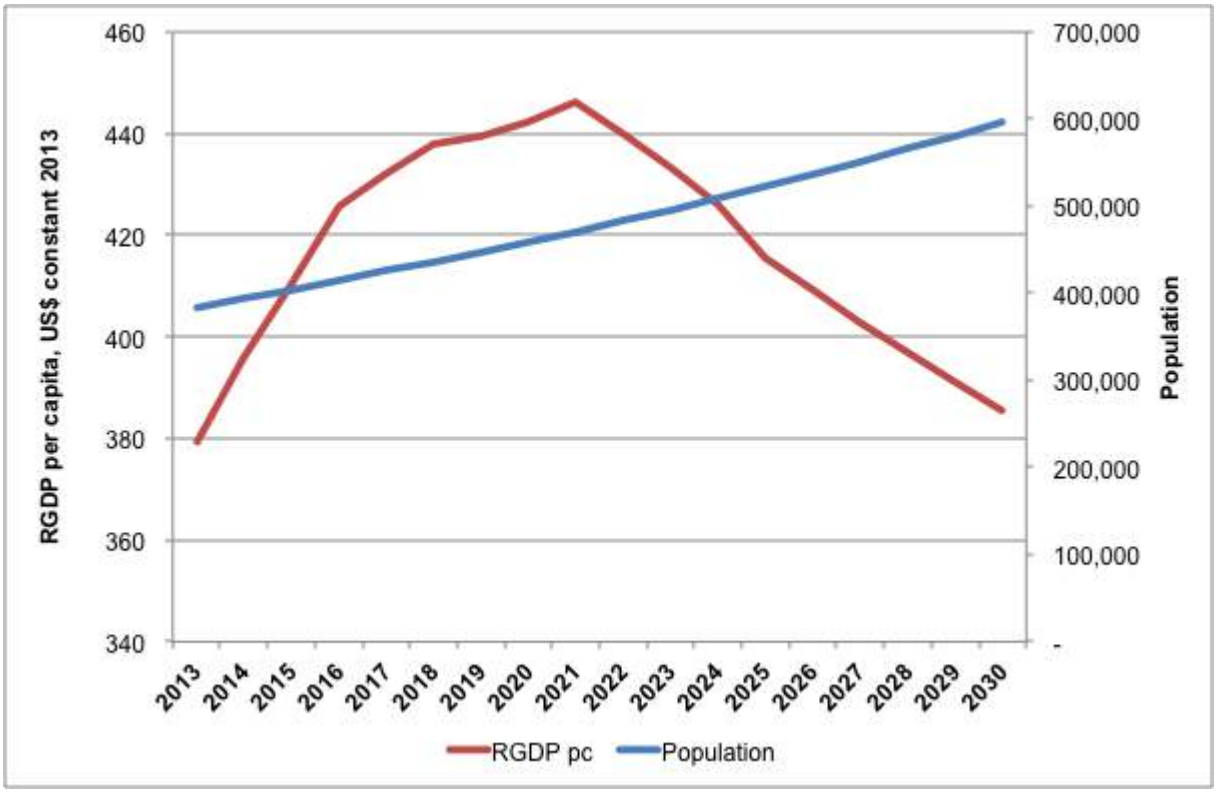


Figure 6-4: Projected Change in RGDP per capita

The value added of public sector expenditure in the basin is projected to grow corresponding to the observed and projected growth rate per capita during this decade. These rates are well above the growth of population, so the proportion of government services in the RGDP increases from 6% to 7% over the projection period.

7 SOCIAL ACCOUNTING

7.1 THE PURPOSE OF THE SAM

The purpose of a social accounting matrix (SAM) is to identify flows of value between socio-economic groups. These can be broadly categorized in SRB as farms, households, firms and government. The summary of economic transactions even within this simple categorisation is complex. It should reflect the monetary value of all bills and receipts made by formal trading entities (firms and government) and distinguish the nature of the goods and services exchanged. It should also reflect exchanges in kind, many of which are not specifically accounted for (e.g. the labour a household expends in obtaining domestic water and energy). The economic relationship between the rural household and its farming enterprise (if it has one) is also complex.

Households (according to the census data there were about 140,000 households in SRB in 2010) and farms (the number of which has not been estimated in this report) are different and distinct economic units. The farm manager uses agricultural inputs, land and labour (which may or may not be paid) to produce crop and livestock products. Households supply labour (to their farms or to other farms, to household activities within their own household or to other households and to firms and to government) in return for wages, salaries or goods in kind (such as farm produce and firewood). Households also buy manufactured goods and services (water, energy, health, education etc.) from firms and government.

Firms are economic units that buy labour from households (for wages and salaries) and sell manufactured goods to farms, households, government and other firms. Government buys labour from households, buys finance through taxes, buys goods from firms and provides services to households, firms and households. These services may include subsidies as well as public services such as health and education. The economic activities of firms and governments can usually be identified through their formal accounts. The purpose of a SAM is to clarify the economic relationships between farms, households, firms and government.

A SAM can be prepared using the RGDP accounts. In the RGDP the value of physical inputs required to generate value added to production are specified as intermediate costs. These intermediate costs are deducted from the market value of production to estimate the value added to produced goods by labour. Dividing the number of labour days into the value-added of a product gives the return to the labour required to produce the product. Return to labour between sectors and the economy as whole is a useful indicator of labour productivity. The value added produced by an economy is a well-known measure (expressed in either RGDP or RGDP per capita) of economic performance. However, the SAM includes the value of all transactions required to achieve the market value of products (the cost of the inputs to the producer, the price paid for labour and the sale price of the products) not just the value added to the product. The sum of a SAM is therefore greater in value than the RGDP. The SAM will also distribute the value of transactions between identified socio-economic groups as described above.

7.2 HOME CONSUMPTION AND SALES OF FARM PRODUCE

An important element of the SAM will be the value of crop produce produced on family farms (estimated as 66% of the RGDP) but a major problem in the distribution of this value is that the farm business provides an un-quantified contribution to the household economy through home consumption of farm produce. Unless this contribution can be quantified, transfers between the farm and the household cannot be identified and the farm and household enterprises become indistinguishable. However, transfers of farm produce can be estimated. A generalised daily diet based on the proportion of food energy consumed by commodity group was prepared for the basin as shown in Table 7-1. The basis of the estimate was FAO Food Balance Sheets 2010 for Malawi and Tanzania. These are national balances that subsume regional differences including rural and urban diets. Nevertheless they can be adapted, based on the total production statistics by commodity aggregated by District, which are already calculated for the RGDP calculation.

The objective of the adaptation was to minimise commodity trade on the assumption that commodities will not be traded if a close food substitute is available locally. Thus it is estimated that 64% of food energy consumed in SRB is derived from cereals (compared with 60% of food energy derived from cereals in Tanzania and Malawi as a whole) and 20% from roots (compared with 16% of food energy derived from roots in Tanzania and Malawi as a whole). This high proportion of consumption of cereals and roots in the SRB diet is a logical consequence of negligible imports of non-cereal crops and livestock products into the basin.

These proportions can further be sub-divided within the different food groups identified in the Food Balance on the assumption that commodities within the same food group are close substitutes and will therefore not be traded. The Table suggests for example that about 85% of food energy derived from cereals in the overall basin diet comes from maize. All sorghum and millet grown in the basin will be consumed, but none will be imported because of the existence of a large maize and rice surplus. It is also assumed that very little animal protein will be imported into the basin, so the population can only consume what it produces: in food energy terms this amounts to only 4% of the daily diet.

Table 7-1: Generalised Dietary Consumption by Commodity, SRB 2010

Commodity	Generalised by food group	Food group subdivided by commodity	kcals of consumption per day	m kcals/ton
Maize	64%	85.0%	1,197	3,071,898
Rice		12.0%	169	3,582,715
Sorghum		2.0%	28	3,166,541
Millets		1.0%	14	3,096,173
Wheat		0.0%	0	2,906,224
Cassava and yams	20%	80.0%	352	1,098,959
Sweet Potatoes		19.0%	84	954,653
Irish poptatoes		1.0%	4	774,043
Beans	5%	5.0%	110	2,322,130
Oilseeds	2%	2.0%	44	2,902,663
Vegetables	1%	1.0%	22	362,911
Fruit	2%	2.0%	44	1,297,619
Cow meat	1.25%	40.0%	11	2,359,963
Goat meat		5.0%	1	2,159,019
Sheep meat		15.0%	4	2,159,019
Pig meat		20.0%	6	3,096,173
Poultry meat		20.0%	6	1,470,000
Milk	2%	1.8%	39	621,003
Eggs	0.3%	0.3%	7	1,290,279
Honey	0.2%	0.2%	3	3,040,000
Fish	1%	0.5%	11	690,236

It was then possible to calculate the consumption in tons of each commodity listed in Table 7-1 and subtract this from the production figures (adjusting for crop losses and use of held-over seed) of each commodity (which have already been estimated, see Section 3.1**)**. The result is an estimate of production surplus that might be available for sale. This is shown in Table 7-2. Maize accounts for over half the tonnage. Potatoes, paddy rice and beans are also significant: together these crops account for 90% of the total quantity of surplus production.

It would have improved the estimate of the production surplus if an average daily diet by District had been derived, but for lack of data this was not attempted. This omission introduces distortions in the estimate of intra-basin trade. The Karonga population for example will consume more cassava per capita than the Ileje population which itself will consume proportionally more maize and the difference in the District trade balance of these two commodities will be reduced. This means that the value of SRB intra-basin food trade will be an over-estimate. But if the SRB diet and the basin-level crop production estimates are reasonable than the estimated production surplus at basin level will also be reasonable. The estimate of SRB production surplus in Table 7-2 suggests the basin has notable surpluses of maize, rice and potatoes and so a significant export of these commodities is very probable. Small amounts of beans and oilseeds are also likely to be exported. Quantities of other traded foodstuffs are likely to be very small in comparison.

Table 7-2: Estimate of SRB Production and Consumption 2010, tons

	Mbeya rural	Kyela	Ileje	Mbozi	Momba	Chitipa	Karonga	Total
Maize	10,026	-4,179	63,158	6,227	678	4,594	9,144	89,647
Rice	-248	16,492	3,577	-803	0	-1,610	8,082	25,490
Sorghum	78	-183	-251	514	3	-361	-121	-321
Millets	-24	-94	-66	-22	0	454	-40	209
Wheat	133	8	73	1	0	0	0	214
Cassava and yams	-1,674	7,171	-5,314	-5,444	-511	7,943	6,531	8,702
Sweet Potatoes	928	2,735	1,538	-1,359	-73	15,497	14,577	33,842
Irish poptatoes	464	-117	-172	82	-5	293	-78	469
Beans	499	-886	3,705	1,803	676	2,712	-238	8,271
Oilseeds	110	-104	302	658	174	1,107	460	2,707
Vegetables	-253	-1,238	-751	-962	-97	1,307	1,111	-884
Fruit	-179	413	-1,093	-577	-58	-190	2,824	1,140
Cow meat	-8	28	23	-33	1	-59	76	27
Goat meat	1	-13	4	-8	-0	-21	-7	-45
Sheep meat	11	-38	96	15	9	-21	-13	58
Pig meat	-1	-5	-24	19	10	-19	37	17
Poultry meat	1	-28	3	21	16	-62	46	-2
Milk	-123	307	204	-482	8	-890	954	-22
Eggs	258	180	-84	-32	6	-153	-6	171
Honey	-3	-22	152	-12	1	-35	-15	65
Fish	-8	348	-50	-26	-3	-65	739	935

The financial value of the production and consumption balance can be estimated by multiplying the balance by the farm gate price, an estimate of which is available by District and commodity. The value of the balance between estimated production and consumption is shown in Table 7-3.

Table 7-3: Estimate of Value of SRB Production and Consumption

	Mbeya Rural	Kyela	Ileje	Mbozi	Momba	Chitipa	Karonga	Total
Maize	2.54	-1.19	17.92	1.13	0.12	0.98	2.42	23.92
Rice	-0.08	4.68	1.01	-0.25	0.00	-0.71	3.59	8.24
Sorghum	0.03	-0.08	-0.10	0.21	0.00	-0.19	-0.06	-0.19
Millets	-0.01	-0.06	-0.04	-0.01	0.00	0.46	-0.03	0.31
Wheat	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.06
Cassava and yams	-0.54	4.07	-3.02	-0.73	-0.07	4.23	1.97	5.91
Sweet Potatoes	0.24	0.81	0.46	-0.25	-0.01	3.39	4.26	8.89
Irish potatoes	0.12	-0.03	-0.05	0.02	-0.00	0.06	-0.02	0.09
Beans	0.28	-0.53	2.20	0.90	0.34	2.89	-0.26	5.82
Oilseeds	0.04	-0.07	0.19	0.28	0.08	2.00	0.34	2.86
Vegetable oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vegetables	-0.20	-0.19	-0.32	-0.12	-0.02	0.81	0.28	0.25
Fruit	-0.05	0.12	-0.31	-0.16	-0.02	-0.06	0.78	0.30
Total	2.40	7.54	17.95	1.01	0.42	13.87	13.26	56.45
Per cent share	4%	13%	32%	2%	1%	25%	23%	100%

Note: All figures in US$ million 2010

The Table is confined to food crops on the assumption there will be little inter-basin trade in livestock products: the household will consume all livestock production and consumption will not be augmented by imports. All Districts have a financial surplus in food crop production, but the Districts that account for the greatest shares are Ileje (maize), Chitipa (diverse crops but especially roots, beans oilseeds and maize) and Karonga (roots, maize and rice). In value terms the key crops with a production surplus are maize (42% of total value), rice (15%), beans (10%) and roots. The significance of the production surplus in roots is uncertain because of measurement issues in cassava yields (wet or dry weights) and the possibility of substitution of cereals by roots in local diets.

If the production surplus is translated into sales outside the SRB (rather than carry-over stock, animal feed, wastage etc. within it) then it could have a value of nearly US$ 50 million per annum or 35% of RGDP in 2010. This is a very high proportion and emphasises the exposure of the basin economy to rainfed cropping conditions and price fluctuations, both within the basin and in the wider region.

7.3 THE SOCIAL ACCOUNTING MATRIX

Having estimated the proportion of crops retained for home consumption and the proportion that is potentially sold, it is possible to prepare the SAM, distinguishing between households, farms, firms and government. It was assumed that:

- Purchased farm inputs for crop production (improved seed, agro-chemicals and equipment) was sold to farms by firms
- Ox power was supplied by farms to farms
- Government paid a subsidy to farms for fertiliser purchased (see Sections 4.1 and 4.2)
- Households consumed the estimated value of the home consumption of crops
- Firms bought surplus crop production
- Purchased farm inputs for livestock production (veterinary supplies and equipment) was sold to farms by firms
- Animal and fish feed, oxen and breeding stock was sold to farms by farms
- Households consumed the full value of livestock production except for production surpluses of honey, wax and fish which were purchased by firms
- Wood and forestry products were produced and consumed by households, except for sawn construction timber which was carried on as a commercial activity (firm to firm)
- Unimproved housing (materials and labour) was produced by households
- Materials for improved housing were supplied to households commercially (by firms) and labour for improved housing was supplied to firms by households for construction
- Labour for water supply was provided by households to households, equipment for water supply was supplied by firms to households, government expenditure on water supply was identified separately
- Milling was provided by firms to households, labour for milling was provided by households to firms and milling equipment was provided by firms to firms
- The government budget was explicitly distributed by services to households, except for administration that is a service to government.

These assumptions are necessary because statistical records of transactions for the basin are not available. The assumptions are logical but can allow only an imputed impression of the flow of financial transactions in the basin, not one that is measured. The resulting SAM is shown in Table 7-4.

Table 7-4: Social Accounting Matrix, SRB 2010, US$ '000 current prices

		Buyers						
		Farms	Households	Firms	Government	Total	Total sales by seller	% sales by seller
Sellers	**Firms**							
	Seeds	916	0	0	0	916		
	Agro-Chemicals	2,762	0	0	0	2,762		
	Fertiliser	6,441	0	0	0	6,441		
	Veterinary supplies	1,009	0	0	0	1,009		
	Equipment	7,340	73	212	0	7,625	**43,152**	**19%**
	Transport	0	4	13	0	17		
	House construction materials	0	1,291	0	0	1,291		
	Water supply equipment	0	1,410	0	0	1,410		
	Water supply services	0	184	0	0	184		
	Government supplies				7,697	7,697		
	Milling services	0	2,172	11,628	0	13,800		
	Households							
	Labour	14,039	2,783	5,396	2,273	24,491		
	Fuel energy and forest products	0	10,238	0	0	10,238		
	Timber	0	0	1,414	0	1,414		
	Transport	0	0	0	0	0	**50,370**	**22%**
	Local housing materials	0	194	0	0	194		
	Water supply labour	0	5,266	0	0	5,266		
	Education services				5,183	5,183		
	Health services				3,443	3,443		
	Water services				140	140		
	Farms							
	Fertiliser subsidies	0	0	0	3,755	3,755		
	Extension and research services				276	276		
	Oxen	4,817	0	0	0	4,817		
	Animal feed	666	0	0	0	666		
	Breeding stock	94	0	0	0	94	**133,615**	**59%**
	Fish feed	1	0	0	0	1		
	Home consumption	0	61,598	0	0	61,598		
	Crop sales	0	0	61,296	0	61,296		
	Fish sales	0	0	433	0	433		
	Honey and wax	0	0	680	0	680		
	Government						**958**	**0.4%**
	Regional and District administration				958	958		
	Total purchases by purchaser	**38,086**	**85,211**	**81,072**	**23,726**	**228,095**		
	% of purchases by purchaser	**17%**	**37%**	**36%**	**10%**	**228,095**		

The total payments made or imputed for value received in the SRB in 2010 was about US$ 228 million. The largest item is the value of farm crop and livestock production. 27% of payments are accounted for by farms transferring production to households (the share of crop production which was estimated to be consumed and all livestock production except for commercial fisheries and apiculture). A further 27% of payments are attributed to farms selling to firms, mostly through sales of surplus crop production but including small values of honey, beeswax and fish.

Households acting as buyers account for 37% of the value of payments. As sellers they account for only 22%. One way of interpreting this is that households are being

subsidised by their farm enterprise. Firms have a similar balance between purchases and sales. Firms buy surplus farm production in the basin and export it. Payments are accumulated by farming enterprises. Sales from farms account for 59% of basin payments while farm purchases are only 17% of payments: the generation of SRB value added is obviously in the farming sector. Government “sales” accounts for 10% of SRB receipts. Government has virtually no activity as a “buyer”: this means that the basin economy is paying few taxes and relies on funding from other regions for its public administration and development costs.

7.4 THE USE OF THE SAM

The preparation of the SAM is one of the expected outputs of the Basic Assessment and Modelling (item d) to be carried out within the SRB Economic Development Programme. It is intended for use as “a statistical base for the elaboration of an economic model for the regional economy”. The SAM however is an output of the RGDP model prepared and described in Section 5 and therefore cannot be manipulated directly. However, the RGDP model itself can be manipulated in many ways. Examples include assessing the financial impact on the basin economy of expanding the cultivated area, increasing crop yields, increasing livestock productivity, expanding aquaculture enterprises etc. The impact of any initiative modelled would be reflected in the output of the SAM. The SAM presented in this report is a summary of District level SAMs. SAMs can also be prepared by District and sector of the SRB economy. However, the quality of the statistical data that supports the RGDP estimate should be improved before more detailed SAMs can be prepared. In particular, inter and intra-basin trade statistics are required to calibrate the modelling already attempted.

8 THE ECONOMIC DEVELOPMENT SUB-PROGRAMME

8.1 HYDRO-POWER GENERATION

Investment costs of the planned Lower Dam site are estimated to be US$ 473.4 million to be incurred during the period 2015-2021. Post commissioning, the dam will produce about 686 GWh per annum. Operational costs will be about US$ 6.15 million per annum. If all the power produced is sold in bulk by the operating authority, SRBC to TANESCO and ESCOM for about US$ 0.10 per kWh (close to the long term marginal cost of production for each country and similar to the price for bulk electricity offered by the supply companies in 2013) the gross value of production of the hydropower business will be about US$ 68.6 million per annum. Subtracting operating costs of US$ 6.15 million per annum, of which it could be assumed 50% are for intermediate costs and the balance for labour costs, the value added to the basin economy would be in the order of US$ 65.8 million in 2013 prices. This can be compared to the projected value of SRB RGDP in 2022 of US$ 213.4 million, also expressed in 2013 constant prices. Adding the value of the hydropower business to basin RGDP leads to the prospect of hydropower generation comprising 24% of the economy in 2022. This is a substantial proportion and it is reasonable to investigate the impact on the basin economy of this structural change in economic activity – hence the EDSP.

It is possible to attribute the value added for hydroelectric power to administrative units in the basin. Water is the main factor of hydropower production, even though it is not given a cost. It is possible to attribute hydropower value added according to the share of each administrative area in the dam catchment. Alternatively, a more exact measure might be according to the share of runoff that each administrative area contributes to the dam volume each year: rainfall multiplied by area would be a surrogate for this. The results of the two methods are similar. Figure 8-1 shows the result of the distribution of hydropower value added in this way, assuming that Tanzania and Malawi share the value added from power generation equally between the countries. Clearly administrative areas in the lower catchment do not share in value added distribution. Bigger, poorer administrative areas get a substantial incremental RGDP from hydropower value added, notably Bupigu, Nyimbili and Mwenemisiku: hydropower increases their RGDP by up to 48%.

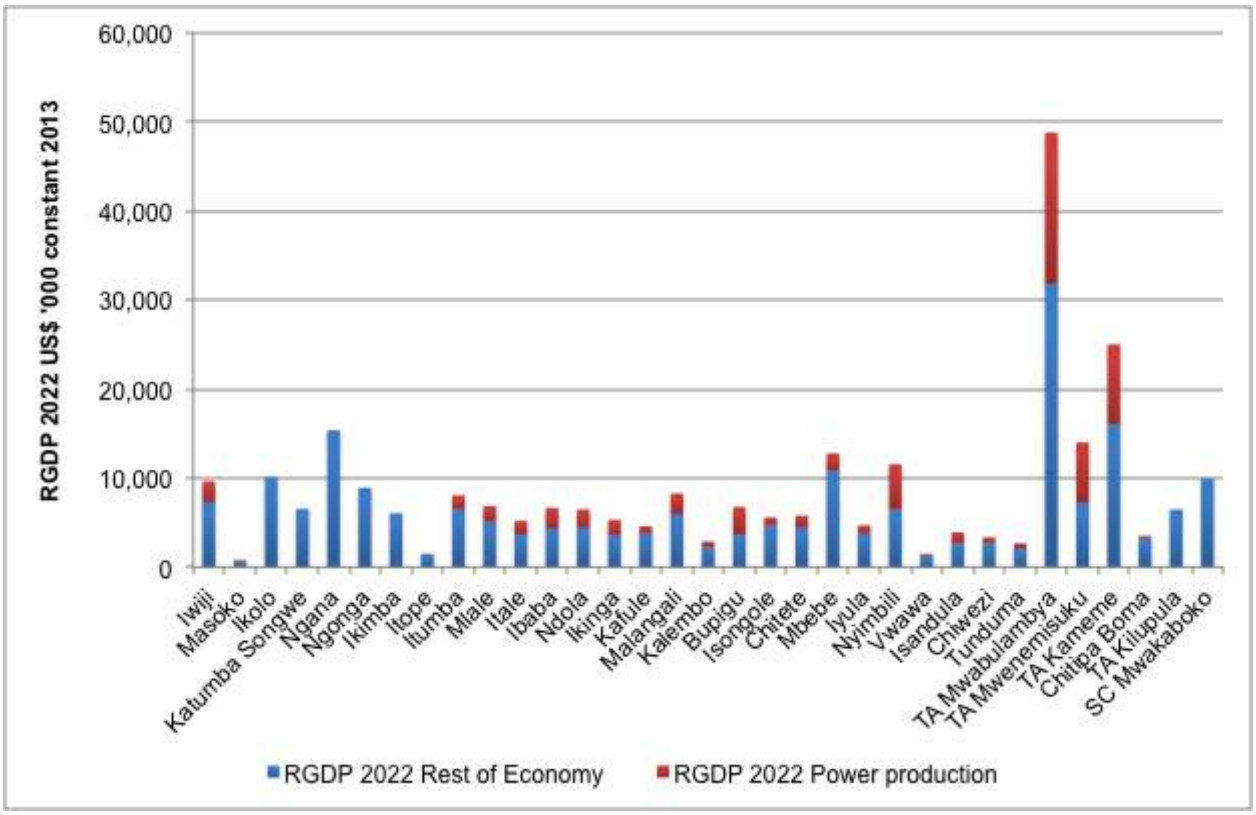


Figure 8-1: Contribution to SRB RGDP Hydroelectricity Production, 2022

The principles for value added distribution from hydropower production is an interesting subject but cannot be pursued further without a mechanism for actually accounting for and distributing that value. One such mechanism might be that it may be decided to reward administrative areas with a share of the benefits of power generation in return for maintaining catchment quality. The total amount of that "reward" would be fixed according to the value of catchment quality as a factor of production in hydropower generation. Figure 8-1 provides an indication of how that "reward" would be distributed between administrative areas, assuming that the return to the money spent per unit area in each administration area was similar. But some administrative areas may have a greater or lesser improvement in catchment quality per unit of the "reward" spent.

The value added of hydropower generation will mostly be exported. Although supporting data is not available, the SAM suggests that SRB is probably a net exporter of maize (42% of total value of surplus), rice (15%) and beans (10%). Total value of food exports might be nearly US$ 50 million per annum or 35% of RGDP in 2010 (see Section 7.2). If all hydropower was exported for use outside the basin then its export value, at about US$ 68 million per annum, would substantially exceed food exports and more than double the value of exports from the basin. It has already been argued that reliance on food exports is risky because of price fluctuations. In consequence returns to basin agricultural exporters are very variable. Hydropower production would therefore increase stability in the basin economy. But SRBC would be sole producer, and profits from production would presumably accrue to the Malawian and Tanzanian Governments. A strategy is required for distributing a share of this revenue to the SRB population. Various distributive strategies are considered in this report. The remainder

of this section investigates the implication of sharing hydropower benefits by allocating some of the hydropower generated to electrification schemes in SRB (Section 8.2). In addition, the economic benefit from allocating a proportion of water stored in the dam to irrigation schemes (Section 8.3) and water supply (Section 8.4) is considered. Later sections review distributive strategies included in the Natural Resources and Land Use Management Sub-Programme (Section 8.8) and the Community Development Sub-programme (Section 8.9).

8.2 RURAL ELECTRIFICATION

8.2.1 THE SCOPE FOR ELECTRIFICATION

8.2.1.1 MAJOR SETTLEMENTS

Production of electricity from the Lower Songwe Dam site is expected to come on stream in 2022. By this time the SRB population will have increased from its 2013 level of about 391,000 people in 81,000 households, of which about 11% of the population are living in six settlements numbering greater than 6,000 inhabitants. For convenience, the inhabitants of these larger settlements can be called “urban”, though their main characteristic for this analysis is a high population density to which it will be relatively cheaper to provide electricity. Using the population growth estimates provided in the Community Development Sub-Programme (which consider the likelihood of continued in-migration to the SRB), the population in 2022 would be about 493,000 people in about 99,000 households. Then, disaggregating this 2022 estimate between those living in small rural settlements and those in the larger settlements, and applying coefficients to reflect rural to urban migration[9], increasing household size of rural families and declining household size of urban families, an estimate of 82,000 rural households and 17,000 urban households can be made. In 2022 probably about 13% of the basin population and 17% of households will be living in the larger settlements.

It is important to know the location of these settlements, as shown in Table 8-1. Note that this Table was derived from settlement level population data, not administrative area statistics[10]. Large settlements will have priority for electricity connections because (i) it will be relatively cheap to provide them and (ii) because the settlements are potentially growth centres and are likely to include a significant proportion of small and medium industries (SMI). The economic return to connections will therefore be higher than in areas of more dispersed settlement.

[9] The growth of the urban population is expected to be 4.77% per annum in Tanzania in the period 2010-2015 (www.indexmundi.com). This includes natural increase and in-migration. It is assumed in this model that the increase in urban population was 3% per annum in 2010, and will increase to 5% per annum in 2026. The size of the urban family will decrease to 10% of its present size during the same period.

[10] There are small differences in estimates of total population and households. These differences arise because the settlement level dataset is not exactly matched with SRB administrative areas and household number and size data in the year of census is incomplete.

Table 8-1: Location and Population of Large Settlements in SRB

District	WARD	VILLAGE	Population 2013	Households 2013	Population 2022	Households 2022
Chitipa	Chitipa Boma	Charete	2,129	323	3,013	467
Chitipa	Chitipa Boma	Admarc	1,778	377	2,516	546
Chitipa	Chitipa Boma	Chitipa	1,829	367	2,587	531
Chitipa	Chitipa Boma	Chitipa Boma	1,788	420	2,531	608
Chitipa	Chitipa Boma	Katutula	1,484	306	2,100	442
Ileje	Isongole	Isongole	5,807	1,098	8,218	1,589
Ileje	Itumba	Itumba	9,287	1,755	13,142	2,541
Kyela	Ikimba	Mbako	8,015	1,515	11,341	2,192
Kyela	Katumba Songwe	Njisi	6,352	1,201	8,988	1,738
Mbozi	Ihanda	Ihanda	8,625	1,630	12,205	2,359
Mbozi	Iyula	Ilomba	6,556	1,239	9,277	1,793
Mbozi	Iyula	Idiwili	6,108	1,155	8,644	1,671
Momba	Chiwezi	Katete	5,901	1,115	8,351	1,614
Urban population			65,660	12,501	92,912	18,092
Rural population			312,642	57,485	386,166	67,170
Basin population			378,302	69,986	479,078	85,262
of which "urban"			17%	18%	19%	21%

Of the settlements listed in Table 8-1, the settlements located in Kyela, Ileje and Chitipa are known to be administratively and economically important. There should be no doubt they would be included in a plan for expansion of electricity supply. The large settlements in Mbozi and Momba are less obvious choices. Ilomba is remote, being situated in the north on the basin periphery, so transmission costs to access this area may be high. Nevertheless, with an estimated 5,000 households in 2022 it is an important centre of population. Katete in Momba District is also remote, situated on the SRB periphery in the west. With an estimated 2022 population of only 2,400 households it is not an important settlement in SRB.

8.2.1.2 MINOR SETTLEMENTS

Amongst the dispersed rural settlement it would be more cost effective to provide power to those in areas with (i) higher population densities, (ii) higher absolute population and (iii) a higher share of basin RGDP per capita to limit affordability of connection issues. The Table 8-2 below gives this information by administrative area. If the major centres of population were served as a priority as discussed above, it would be sensible to target also neighbouring dispersed rural populations if they had favourable characteristics in these three respects.

Table 8-2: Household Numbers, RGDP and Number of Settlements by Administrative Area

DISTRICT	ADMINISTRATIVE AREA	Area, km²	RGDP 2022	RURAL HH 2022	URBAN HH 2022	TOTAL HH 2022	HH/KM²	Number of settlements
Mbeya Rural	Iwiji	152	7,315	2,635	-	2,635	17	6
Mbeya Rural	Masoko	6	581	1,136	-	1,136	206	3
Kyela	Ikolo	21	10,092	1,014	-	1,014	49	3
Kyela	Katumba Songwe	35	6,519	1,543	1,738	3,280	93	6
Kyela	Ngana	67	15,363	1,568	-	1,568	23	4
Kyela	Ngonga	28	8,911	1,640	-	1,640	59	5
Kyela	Ikimba	24	6,031	510	2,192	2,703	113	2
Kyela	Itope	7	1,476	222	-	222	30	1
Ileje	Itumba	101	6,492	256	2,541	2,797	28	2
Ileje	Male	112	5,145	966	-	966	9	3
Ileje	Itale	98	3,685	1,502	-	1,502	15	4
Ileje	Ibaba	150	4,354	1,590	-	1,590	11	5
Ileje	Ndola	136	4,402	1,346	-	1,346	10	4
Ileje	Ikinga	115	3,558	1,544	-	1,544	13	6
Ileje	Kafule	53	3,769	1,470	-	1,470	28	4
Ileje	Malangali	151	5,950	1,280	-	1,280	8	4
Ileje	Kalembo	42	2,228	705	-	705	17	2
Ileje	Bupigu	203	3,641	1,213	-	1,213	6	4
Ileje	Isongole	59	4,675	856	1,589	2,444	42	3
Ileje	Chitete	88	4,424	1,712	-	1,712	19	4
Ileje	Mbebe	129	10,797	1,832	-	1,832	14	4
Mbozi	Iyula	60	3,756	919	3,464	4,383	73	3
Mbozi	Nyimbili	330	6,478	4,122	-	4,122	13	7
Mbozi	Vwawa	11	1,249	-	-	-	-	1
Mbozi	Isandula	78	2,695	1,461	-	1,461	19	4
Momba	Chiwezi	41	2,706	541	1,614	2,156	53	2
Tunduma	Tunduma	38	2,093	423	-	423	11	2
Chitipa	Mwabulambya	821	31,720	12,572	-	12,572	15	39
Chitipa	Mwenemisuku	328	7,197	5,030	-	5,030	15	22
Chitipa	Kameme	433	16,016	3,958	-	3,958	9	14
Chitipa	Chitipa Boma	9	3,291	-	2,595	2,595	305	0
Karonga	Kilupula	84	6,312	3,798	-	3,798	45	7
Karonga	Mwakaboko	248	9,710	4,503	-	4,503	18	12

Although data by administrative area is interesting, planning electricity supply is done at settlement level (see Water Related Social Infrastructure Rural Electrification Report, DDIP-SRBDP, 2014). There are about 212 settlement areas (including the "urban" category described in section 8.2.1.1 in the SRB GIS database). Information by settlement can be shown graphically as shown in Figure 8-2. Not all settlement names can be shown on the horizontal axis. This graph ignores all settlement areas with a population density of less than 10 households per km^2 (41 settlements) on the assumption it would be uneconomic to provide power to such a low density of population. Note also that none of these low-density settlements have an estimated RGDP[11] of greater than US$ 2 million per annum. The graph suggests that quite a large proportion of the population and RGDP (about 45%) could be captured by providing power infrastructure to 71 settlements with a population density greater than about 22 households per km^2. An additional 10% of estimated RGDP could be gained by extending electrification to 24 more settlements with population density of greater than 18 households per km^2.

[11] Settlement RGDP is estimated by weighting the RDGDP of the administrative area in which the settlement is located by its population. The estimate is therefore crude.

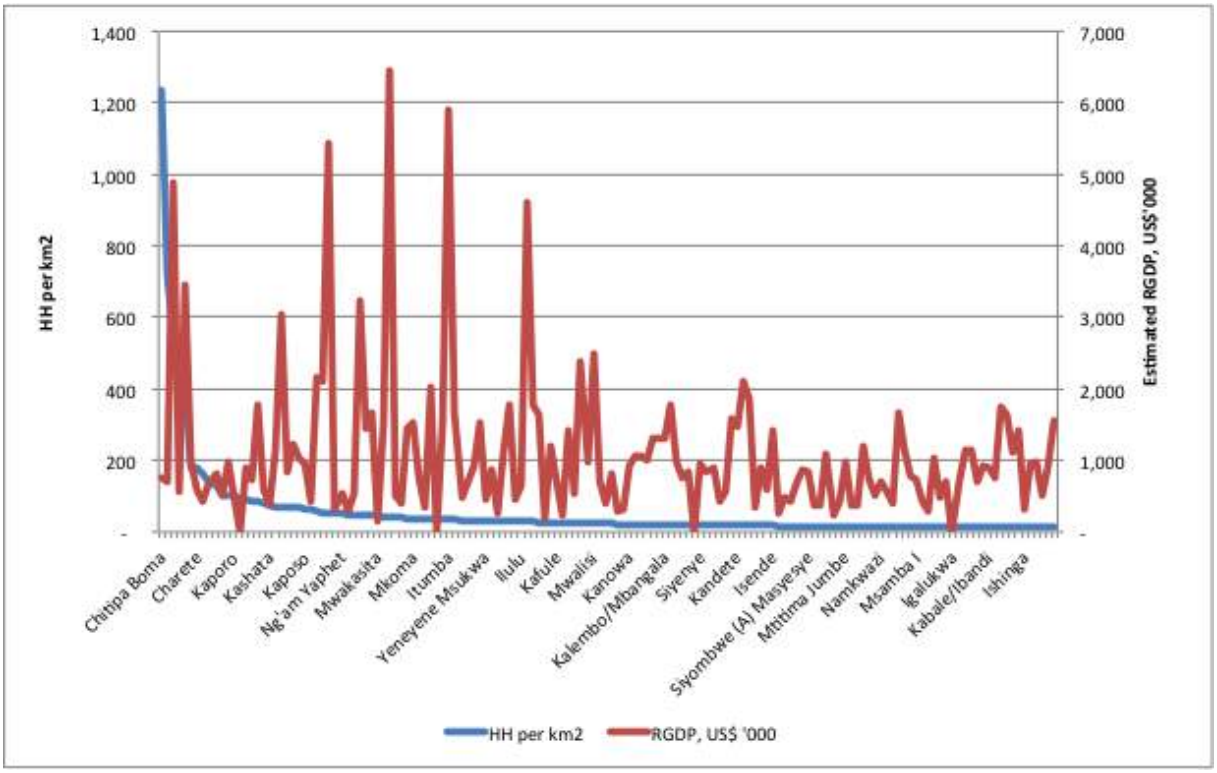


Figure 8-2: Settlements Ranked by Population Density and Estimated RGDP

8.2.2 PRESENT AND PLANNED ELECTRICITY SERVICE

The SRBDP Water Related Social Infrastructure Rural Electrification Report identified the settlements with present and planned supply of electricity in SRB from TANESCO and ESCOM. This report, the EDSP refers to settlement areas with electricity services now as “powered” and settlements that are scheduled for power supply in the future are referred to as “planned”. Settlements without power supply now and not planned for power supply in the future are termed “unplanned”. The Rural Electrification Report assumes “planned” supply will be installed by 2022. By this time the Lower Dam should be generating electricity and therefore supply may be available for “unplanned” settlements. The Rural Electrification Report identifies priority settlements for power supply from the “unplanned” category and the selected settlements are referred to as “SRBC Electrification Plan”. The SRBC Planned Areas include all settlements unplanned by TANESCO and ESCOM classified as urban and all settlements with a population density of greater than 25 households per km^2 and with projected RGDP of greater than US$ 2 million in 2022. Table 8-3 summarises pre and post 2022 cover by administrative area and Table 8-4 shows the settlements that will be included in the SRBC Electrification Plan.

Table 8-3: The SRBC Electrification Plan by Administrative Area, post 2022

DISTRICT	ADMINISTRATIVE AREA	RURAL HH 2022	URBAN HH 2022	2022 cover, rural households	2022 cover, urban households	Post 2022 cover, rural households	Post 2022 cover, urban households	Rural cover without SRBC Plan	Rural cover with SRBC Plan	Urban cover without SRBC Plan	Urban cover with SRBC Plan
Mbeya Rural	Ilelji	2,635	-	514	-	1,793	-	20%	68%		
Mbeya Rural	Masoko	1,136	-	-	-	1,136	-	0%	100%		
Kyela	Ikolo	1,014	-	870	-	1,014	-	86%	100%		
Kyela	Kasumbe Songwe	1,543	1,738	580	-	1,196	1,738	38%	75%	0%	100%
Kyela	Ngana	1,568	-	1,125	-	1,125	-	72%	72%		
Kyela	Ngonga	1,640	-	703	-	1,640	-	43%	100%		
Kyela	Ikimba	510	2,192	510	2,192	510	2,192	100%	100%	100%	100%
Kyela	Itope	222	-	-	-	-	-	0%	0%		
Ileje	Itumba	266	2,541	-	2,541	-	2,541	0%	0%	100%	100%
Ileje	Malai	988	-	801	-	801	-	83%	83%		
Ileje	Itale	1,502	-	668	-	1,196	-	44%	80%		
Ileje	Ibaba	1,590	-	1,400	-	1,400	-	88%	88%		
Ileje	Ndola	1,346	-	778	-	778	-	58%	58%		
Ileje	Ikinga	1,544	-	840	-	988	-	54%	64%		
Ileje	Kafule	1,470	-	1,286	-	1,286	-	87%	87%		
Ileje	Malangali	1,280	-	768	-	768	-	60%	60%		
Ileje	Kalembo	705	-	418	-	418	-	59%	59%		
Ileje	Bupigu	1,213	-	942	-	942	-	78%	78%		
Ileje	Isongole	856	1,589	856	1,589	856	1,589	100%	100%	100%	100%
Ileje	Chitete	1,712	-	1,278	-	1,278	-	75%	75%		
Ileje	Mbebe	1,832	-	783	-	783	-	43%	43%		
Mbozi	Iyula	919	3,464	-	1,671	919	3,464	0%	100%	48%	100%
Mbozi	Nyimbili	4,122	-	572	-	3,110	-	14%	75%		
Mbozi	Vwawa	-	-	-	-	-	-				
Mbozi	Isandula	1,461	-	614	-	614	-	42%	42%		
Momba	Chitete	541	1,614	-	-	541	1,614	0%	100%	0%	100%
Tunduma	Tunduma	423	-	355	-	355	-	84%	84%		
Chitipa	Mwalusembya	12,572	-	3,239	-	4,813	-	26%	38%		
Chitipa	Mwenemauku	5,030	-	474	-	1,604	-	9%	32%		
Chitipa	Kamema	3,958	-	805	-	1,458	-	20%	37%		
Chitipa	Chitipa Boma	-	2,595	-	2,127	-	2,595			82%	100%
Karonga	Kilupula	3,798	-	516	-	3,220	-	14%	85%		
Karonga	Mwakaboko	4,503	-	819	-	2,864	-	18%	64%		
Mbeya Rural		3,771	-	514	-	2,929	-	14%	78%		
Kyela		6,497	3,930	3,788	2,192	5,441	3,930	58%	84%	56%	100%
Ileje		16,272	4,129	10,815	4,129	11,488	4,129	66%	71%	100%	100%
Mbozi		6,502	3,464	1,186	1,671	4,643	3,464	18%	71%	48%	100%
Momba		541	1,614	-	-	541	1,614	0%	100%	0%	100%
Tunduma		423	-	355	-	355	-	84%	84%		
Chitipa		21,560	2,595	4,518	2,127	7,875	2,595	21%	37%	82%	100%
Karonga		8,301	-	1,335	-	6,083	-	16%	73%		
	Tanzania	34,007	13,138	18,699	7,993	25,402	13,138	55%	75%	61%	100%
	Malawi	29,861	2,595	5,853	2,127	13,959	2,595	20%	47%	82%	100%
	Overall	63,868	15,733	22,552	10,120	39,361	15,733	35%	62%	64%	100%

The settlements targeted by the SRBC Electrification Plan are shown in Table 8-4. The GIS was used to calculate the values of four parameters describing the distance of the settlement from an existing medium voltage supply and the amount of low voltage line required to connect individual households. These parameters and their unit costs are described in the Water Related Social Infrastructure Rural Electrification Report. The total cost of connection is estimated as US$ 37 million, 53% would be incurred in Tanzania and 47% in Malawi. The average cost per connection (based on the proportion of the investment incurred within the village (transformer, 400v lines and house connection including pre-paid meter) divided by the estimated number of households) is estimated to be US$ 1,217 per household with little difference between the Tanzania and Malawi sectors of the basin.

Table 8-4: The SRBC Electrification Plan by Settlement, post 2022

COUNTRY	DISTRICT	WARD_TA	VILLAGE	Rural HH 2022	Urban HH 2022	L1 km	L2 km	L km	LL km	Cost of supply to the village, US$	Cost of supply within the village, US$	Total, US$	Cost US$ per connection
TANZANIA	Kyela	Katumba Songwe	Njisi	-	1,738	2	4	6	8	141,035	434,222	575,257	250
MALAWI	Chitipa	Chitipa Boma	Charete	-	467	2	4	6	8	141,035	307,196	448,231	657
MALAWI	Karonga	Kilupula	mwakyusa	490	-	3	4	7	8	164,540	309,417	473,958	632
MALAWI	Karonga	Mwakaboko	Ndengela	450	-	2	5	7	10	164,540	370,536	535,076	824
MALAWI	Karonga	Mwakaboko	Mayoka	410	-	4	5	9	8	211,552	333,982	545,534	815
TANZANIA	Kyela	Ngonga	Itenya	324	-	1	5	6	10	141,035	358,021	499,056	1,103
TANZANIA	Kyela	Katumba Songwe	Mpunguti	429	-	4	6	10	11	235,058	401,019	636,077	935
MALAWI	Karonga	Kilupula	Kapoko	574	-	3	7	10	14	235,058	513,255	748,313	893
TANZANIA	Kyela	Ngonga	Lugombo	385	-	1	6	7	12	164,540	429,234	593,775	1,114
TANZANIA	Mbeya Rural	Masoko	Mwakaafa	326	-	3	3	6	10	141,035	358,217	499,252	1,097
TANZANIA	Mbozi	Iyula	Ilomba	-	1,793	5	15	20	29	470,116	1,123,505	1,593,620	626
TANZANIA	Momba	Chiwezi	Katete	-	1,614	8	7	13	15	305,575	649,803	955,378	403
TANZANIA	Mbeya Rural	Iwiji	Izumbwe II	695	-	7	10	17	19	399,596	682,101	1,081,699	1,074
TANZANIA	Mbeya Rural	Masoko	Italazya	356	-	9	5	14	9	329,081	328,660	657,741	922
TANZANIA	Mbeya Rural	Masoko	Masoko	453	-	5	10	15	30	352,587	1,022,058	1,374,644	2,255
MALAWI	Chitipa	Mwabulambya	Chesa saburi	387	-	3	8	11	17	258,564	592,144	850,707	1,531
MALAWI	Chitipa	Mwabulambya	Syupile	415	-	6	10	16	21	376,093	725,238	1,101,330	1,746
TANZANIA	Ileje	Itale	Iwala	528	-	7	12	19	23	446,610	801,597	1,248,207	1,519
TANZANIA	Mbeya Rural	Iwiji	Iwiji	644	-	6	14	20	28	470,116	975,967	1,446,083	1,516
TANZANIA	Momba	Chiwezi	Nandanga	541	-	6	13	19	26	446,610	900,615	1,347,225	1,664
TANZANIA	Mbozi	Nyimbili	Haraka	692	-	6	14	20	28	470,116	980,845	1,450,961	1,417
TANZANIA	Mbozi	Nyimbili	Nyimbili	1,054	-	7	15	22	31	517,127	1,114,714	1,631,842	1,057
TANZANIA	Mbozi	Iyula	Idunda	919	-	8	2	10	4	235,058	222,103	457,160	242
TANZANIA	Mbozi	Nyimbili	Mpanda	792	-	9	18	27	36	634,656	1,251,233	1,885,889	1,581
MALAWI	Karonga	Kilupula	Mwambuli	250	-	3	3	6	6	141,035	187,766	328,800	752
MALAWI	Chitipa	Mwenemisuku	Mwamkono	354	-	9	3	12	7	282,069	263,314	545,383	744
MALAWI	Karonga	Mwakaboko	Mwangwale	343	-	5	4	9	8	211,552	294,805	506,357	858
MALAWI	Karonga	Kilupula	Ngoto	355	-	2	4.5	6.5	9	152,788	328,486	481,274	926
TANZANIA	Kyela	Ngonga	Nsasa	227	-	2	4	6	7	141,035	250,599	391,634	1,104
MALAWI	Karonga	Mwakaboko	Ndenga	485	-	8	6	14	12	329,081	439,148	768,229	906
MALAWI	Karonga	Kilupula	Mwasuluma	269	-	2	5	7	10	164,540	351,552	516,093	1,353
MALAWI	Karonga	Kilupula	Mwakatika	186	-	2	4	6	9	141,035	311,626	452,661	1,675
MALAWI	Chitipa	Mwabulambya	Ng'am Yaphet	216	-	5	4	9	8	211,552	282,071	493,623	1,305
TANZANIA	Kyela	Katumba Songwe	Kabanga	147	-	3	4	7	7	164,540	242,566	407,107	1,654
MALAWI	Karonga	Kilupula	Chawinga	311	-	2	5	7	11	164,540	389,230	553,771	1,252
MALAWI	Chitipa	Mwenemisuku	Kasambala	277	-	8	5	13	10	305,575	353,305	658,880	1,274
TANZANIA	Kyela	Ikolo	Lupembe	145	-	3	5	8	11	188,046	372,599	560,645	2,576
MALAWI	Chitipa	Kameme	Mkoma	376	-	45	7	52	13	1,222,301	460,872	1,683,173	1,225
MALAWI	Karonga	Mwakaboko	Kakuyu	357	-	1	9	10	18	235,058	621,754	856,812	1,741
TANZANIA	Ileje	Ikinga	Ibeta	145	-	3	3	6	6	141,035	209,891	350,925	1,443
MALAWI	Chitipa	Mwenemisuku	Yeseyene Msukwa	314	-	9	7	16	14	376,093	487,181	863,273	1,553
MALAWI	Chitipa	Mwabulambya	Adam	342	-	20	7	27	14	634,656	490,045	1,124,701	1,431
MALAWI	Chitipa	Mwenemisuku	Makeye Kasumbi	181	-	6	5	11	10	258,564	344,062	602,626	1,661
MALAWI	Chitipa	Kameme	Iyenga	277	-	38	9	47	18	1,104,772	613,766	1,718,537	2,213
MALAWI	Karonga	Kilupula	Kalumbi	279	-	1	3	4	6	82,270	223,196	305,466	801
MALAWI	Chitipa	Mwabulambya	Simon Nyondo	214	-	3	6	9	9	211,552	314,368	525,921	1,472
TANZANIA				5,743	5,145					6,534,608	13,109,569	19,644,178	
MALAWI				8,106	467					7,780,415	9,908,313	17,688,728	
TOTAL				16,849	5,613					14,315,023	23,017,882	37,332,906	1,217

The Tables can be summarised to estimate present and planned coverage of the estimated rural and urban populations in 2022 and the proportion of the estimated 2022 RGDP produced within areas that are or will be served by electricity. Table 8-5 shows that only 11% of rural households will be (in 2022) in areas served by electricity now, but with the planned extension of services by TANESCO and ESCOM the proportion will increase to 49%. The SRBC planned initiative will serve areas in which an additional 15,000 households are located (in 2022) and will raise cover to rural households to 71%.

Table 8-5: Service Levels of the Rural Population

	Estimated Rural HH 2022	Powered	% of Rural population	Powered and planned	% of Rural Population	SRBC Planned	% of Rural Population
Mbeya Rural	3,771	-	0%	514	14%	2,750	87%
Kyela	6,497	659	10%	3,788	58%	1,139	76%
Ileje	16,272	2,059	13%	10,815	66%	2,037	79%
Mbozi	6,502	614	9%	1,186	18%	4,852	93%
Momba	541	-	0%	-	0%	541	100%
Tunduma	423	355	84%	355	84%	-	84%
Chitipa	21,560	2,540	12%	4,518	21%	2,039	30%
Karonga	8,301	1,009	12%	1,335	16%	1,923	39%
Total	63,868	7,236	11%	22,512	35%	15,281	59%
Malawi	29,861	3,549	12%	5,853	20%	7,674	45%
Tanzania	34,007	3,687	11%	16,659	49%	7,333	71%

Table 8-6 shows that 50% of urban households will be (in 2022) in areas served by electricity now, but with the planned extension of services by TANESCO and ESCOM the proportion will increase to 64%. The SRBC planned initiative will serve areas in which an additional 5,613 households are located (in 2022) and will raise cover to urban households to 100%.

Table 8-6: Service Levels of the Urban Population

	Estimated Urban HH 2022	Powered	% of Urban Population	Powered and planned	% of Urban Population	SRBC Planned	% of Urban Population
Mbeya Rural	-	-		-		-	
Kyela	3,930	-	0%	2,192	56%	1,738	100%
Ileje	4,129	4,129	100%	4,129	100%	-	100%
Mbozi	3,464	1,671	48%	1,671	48%	1,793	100%
Momba	1,614	-	0%	-	0%	1,614	100%
Tunduma	-	-		-		-	
Chitipa	2,595	2,127	82%	2,127	82%	467	100%
Karonga	-	-		-		-	
Total	15,733	7,928	50%	10,120	64%	5,613	100%
Malawi	2,595	2,127	82%	2,127	82%	467	100%
Tanzania	13,138	5,800	44%	7,993	61%	5,145	100%

Table 8-7 shows that 20% of 2022 RGDP will be produced in areas served by electricity now, but with the planned extension of services by TANESCO and ESCOM the proportion will increase to 59%. The SRBC planned initiative will serve areas in which an additional US$ 45 million of RGDP will be produced (in 2022) and will raise cover to 84%.

Table 8-7: Proportion of RGDP 2022 in Service Areas

	Estimated RGDP 2022	Powered	% of RGDP	Powered and planned	% of RGDP	SRBC Planned	% of RGDP
Mbeya Rural	7,896,000	-	0%	1,428,000	18%	5,060,000	82%
Kyela	48,392,000	6,456,000	13%	30,679,000	63%	8,163,000	80%
Ileje	63,119,000	16,846,000	27%	43,714,000	69%	8,903,000	83%
Mbozi	12,929,000	2,565,000	20%	3,463,000	27%	8,674,000	94%
Momba	2,706,000	-	0%	-	0%	2,706,000	100%
Tunduma	2,093,000	1,758,000	84%	1,758,000	84%	-	84%
Chitipa	58,224,000	9,708,000	17%	14,806,000	25%	5,737,000	35%
Karonga	16,021,000	1,921,000	12%	2,624,000	16%	3,621,000	39%
Total	211,379,000	39,254,000	19%	98,472,000	47%	42,864,000	67%
Malawi	74,245,000	11,629,000	16%	17,430,000	23%	9,358,000	36%
Tanzania	137,135,000	27,625,000	20%	81,042,000	59%	33,506,000	84%

There were no large industries in SRB in 2012: the coalmines in Ileje and Chitipa Districts had not yet begun production and in any event they use mostly fossil fuel. The number of SMI in 2013 located in the SRB was roughly estimated as 520, mostly being agricultural processing establishments (mills, oil expellers and vegetable processors), restaurants and bakeries and transport services. A large proportion is located in the population centres described in section 8.2.1.1 all of which either have or are schedule for electricity supply. The expansion of SMI in the period 2013-2022 is conjectural but there is no economic reason for significant growth without an injection of additional productive resources or a change of skill level of the basin population. Growth in agricultural processing will however expand with the agricultural economy (there is still land to be brought into production and in-migration and population growth to develop this resource) and service industries will expand with population growth. It is reasonable to postulate that the potential SMI connections may reach 1,000 by 2022, equally divided between Malawi and Tanzania. The number of SMI connections will be divided equally between Malawi and Tanzania. The locations may be either urban or rural.

8.2.3 POTENTIAL ELECTRICITY CONSUMPTION

The electricity consumption required by the incremental connections of the SRBC Plan can be roughly quantified to estimate the proportion of electricity produced by the Lower Dam that may be used within the basin, and the proportion that can be "exported" for use outside the basin. These proportions will determine a financial envelope within which SRB electricity use can be financed.

It is well known that the use of electricity by rural domestic users in Sub Saharan Africa is very low. One estimate is about 124 kWh per capita per annum per connection; another is 30 kWh per month per connection[12]. Multiplying 124 kWh by the average number of household members in SRB gives an estimate of about 546 kWh per connection per annum. Urban consumers will use somewhat more; a figure of 1,000 kWh per connection per annum may be used. SMI will consume more. A notional figure of 5,000 kWh per connection per annum is assumed.

[12] Energy Subsidy Reform in Sub-Saharan Africa: Experiences and Lessons, Alleyne et al, IMF, 2013

Technical losses are assumed to be relatively low because the distribution system will be new, 5% is assumed[13]. Technical losses must be generated over and above demand in order to deliver power to consumers. Non-technical losses may be very high; the median loss of revenue in Sub Saharan electricity utility companies is about 50%[14]. On the advice of TANESCO and ESCOM, an estimate of 15% has been assumed for non-technical losses in this calculation. Non-technical losses apply to revenue collected; they do not necessarily have to be generated unless they are illegal connections not included in the number of budgeted connections.

Table 8-8 shows these assumptions and estimates an annual use of electricity in SRB of about 21,300 MWh per annum for the SRBC incremental connection scenario described in section 8.2.2 above, to which should be added an additional 1,000 MWh to allow for technical losses. It is assumed non-technical losses are of revenue. The calculation assumes that every potential connection in the target areas shown in Table 8-3 is taken up: this is a very optimistic assumption so the estimate of annual electricity consumption is probably over-estimated.

Table 8-8: Estimate of Annual Electricity Consumption in SRB

	Number	kwh per annum per connection	Consumption MWh per annum	Technical Losses MWh per annum	Non-technical losses MWh per annum	Total power use MWh per annum
Urban consumers	5,613	1,000	5,613	281	-	5,893
Rural consumers	16,849	546	9,200	460	-	9,660
SMI consumers	1,000	5,000	5,000	250	-	5,250
Total			19,812	991	-	20,803

The total use of power in SRB after 2022 (including powered and planned by TANESCO and ESCOM) is estimated as MWh 44,335 per annum, so the incremental SRBC Electrification Plan is expected to increase consumption by about 47%.

The Lower Dam will have a generation capacity of about 108.2 MW and it is estimated it will produce about 686 GWh per annum. Under the electricity connection scenario developed above, consumption in SRB would account for about 3% of electricity produced from the Lower Dam. The total consumption by SRB would be about 6.5% if all connections envisaged under the “powered”, “planned” and SRBC Electrification Plan were connected. It is important that this proportion should be reasonably low: most electricity produced in SRB should be exported for use in growth areas with high demand for power outside the basin in order to maximise the economic benefit of the hydropower investment.

[13] Analysis of Technical Losses in Electrical Power Systems in Nigeria, Anumaka, 2012, IJRRAS

[14] Reducing Technical and Non-Technical Losses in the Power Sector, 2008, World Bank Energy Sector Strategy

8.2.4 COST OF ELECTRICITY CONNECTIONS IN SRB

8.2.4.1 INVESTMENT COSTS

The total costs of power generation (including bulk transmission) for the Lower Dam are known to be US$ 473.4 million for construction of the dam infrastructure and a further US$ 6.15 million per annum in operating costs. The operating life of the dam is expected to be 50 years during which time it will generate some 34,400 GWh of electricity which will therefore cost about US$ 0.014 per kWh in investment costs (excluding any payments for financing) and about US$ 0.009 per kWh in operating costs. The total cost of power generation and transmission will be about U$ 0.023 per kWh. Using the estimate of incremental power expected to be consumed in the basin as a proportion of expected generation from the Lower Dam, the approximate cost of electricity generation and transmission for use in SRB will be US$ 485,300 per annum, including investment and operational costs but excluding financing costs, over the life of the Lower Dam. This estimate needs converting to a cost per household and verifying.

Investment estimates required for universal electricity access by 2030 made by the World Bank[15] suggest that SSA will require US$ 87 billion in generation and transmission costs and a further US$ 193 billion in distribution costs to supply about 200 million households by 2030. This works out to generation and transmission costs of US$ 435 per household and US$ 965 per household for distribution and connection. These estimates are only for investment costs and are expressed in 2006 US$. Inflating to 2013 prices[16], the estimate is:

Generation and transmission: US$ 467 per household

Distribution and connection: US$ 1,036 per household.

If 3% of the investment cost of the Lower Dam can be attributed to meeting SRB incremental consumption and losses, which is shared between 24,462 connections in the SRB area, then the investment cost of generation and transmission is US$ 612 per connection, compared with the World Bank estimate (made in 2010 using 2008 data or earlier) of US$ 467. An increase is to be expected: the marginal cost of hydroelectric power production will increase as new dam sites are brought into production and the opportunities for cheaper generation are taken up.

The investment cost of distribution and connection (stepping down bulk power, distributing and connecting it to users) is usually more than investment for generation and transmission. The World Bank estimate of US$ 1,036 (in 2013 prices) is a composite estimate of distribution and connection investment costs varying from US$ 500 per household up to US$1,500 per household. It is reasonable to expect that SRB distribution and connection costs will be on the lower side: consumers will be close to the dam so conveyance infrastructure and associated losses will be relatively low.

[15] Addressing the Electricity Access Gap, World Bank 2010
[16] http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG

A World Bank report[17] on connection charges (to the consumer, not specifically the investment cost of distribution and connection) quotes US$ 300 per connection for Tanzania and US$ 400 per connection in Kenya in 2011. In detail, TANESCO domestic and light industry connection charges for new customers in 2011 were US$ 297 for customers within 30 metres of existing electricity lines, US$ 871 for customers 30-71 metres away and US$ 1,288 for customers up to 200 metres away. The report notes the poor financing available for the one-off and typically very large connection charge to potential consumers and attributes low take-up rates to this problem.

The Water Related Social Infrastructure Rural Electrification Report also makes estimates of connection charges, using distance from the supply source to calculate the length of medium voltage overhead line to the settlement, the area of the settlement to determine the length of medium and low voltage overhead line inside and the number of households in the settlement. These distances are indicated in Table 8-4. The length from the centroid of the closest existing service village to the centroid of the proposed village was measured for the length L1. This represents the main, medium distance line, assumed to be 33 kv.

For distribution within the village, two types of distribution were assumed: L2, which is the main distribution across the village, measured as the sum of length and width of the village, and also assumed to be a 33 kv line. Along every 500m of L2 a transformer will be located to step down power to 400v.

LL, which is the length of the distribution line within the village is assumed to be a 400 kv line. LL will connect the transformer to each location served. The location will be served by a “ready board” which includes a pre-paid meter.

Costs for electrification of each selected village are determined by the length of L1 + L2 times the unit cost per km of a 33 kv line, plus the LL length times the cost per km of an 400v line. Unit costs have been determined at US$ 23,506 per km for 33 kv and US$ 30,558 per km for 400v lines (130% more than the cost of a 33kv line). According to ESCOM, a transformer to step down power from 33kv to 400v costs US$ 4,000 and a ready board for each connection costs US$ 100.

The indicative incremental investment cost to supply the SRB electricity connections proposed in Table 8-3 are shown in Table 8-9. Investment costs of the incremental connections (including SMI as well as domestic connections) planned under the SRBC Electrification Plan are estimated to be US$ 39 million.

[17] Connection Charges and Electricity Access in Sub-Saharan Africa, Golumbeanu and Barnes, World Bank Policy Research Working Paper 6511, 2013

Table 8-9: Investment Cost for Electrification Project in SRB

	US$ per connection	Number of connections	Total investment cost, US$
Generation and transmission	612	23,462	14,356,000
Distribution and connection	1,662	23,462	38,995,000
Total investment	2,274		53,351,000

8.2.4.2 OPERATIONAL COSTS

The annual operating costs to supply consumers from a newly constructed and relatively compact grid supplied from a hydropower source should in theory be relatively cheap: operating costs of such a system of about US$ 0.15 per kWh supplied are cited in several sources[18]. Using this figure, an annual operating cost of US$ 3.1 million might be expected, which would include an annual U$ 0.19 million as the share of total Lower Dam generation and transmission operational costs required to supply SRB with the electricity supply equivalent to that estimated in Table 8-8. Using an estimate of operating costs of US$ 0.15 per kWh, the annual cost of operation is about 6% of the required investment costs shown in Table 8-9.

8.2.4.3 TARIFFS

According to TANESCO[19], the tariff for a Domestic Low Usage connection with energy use of less than 50 kWh per month in 2014 is TZS 65 per kWh (about US$ 0.04 per kWh). Higher use domestic consumers are charged TZS 506 per kWh (about US$ 0.29 per kWh). T1 (which might be equivalent to the tariff levied on an SMI) is TZS 6,506 fixed charge (US$ 3.79) and TZS 352 per kWh (US$ 0.21 per kWh).

ESCOM charges (from the ESCOM website, 4th April 2014) are not directly comparable by connection type, but the approximate charge for low domestic use is a fixed monthly charge of MWK 1,750 (about US$ 4.38) and MWK 25.88 per kWh (about US$ 0.065 per kwh). Higher users in the domestic bracket are charged MWK 5,000 per month (about US$ 12.52 per month) and MWK 35.91 per kWh (US$ 0.90 per kWh). Commercial users are charged MWK 3,500 fixed monthly charge (US$ 8.77) and MWK 53.46 per kWh (US$ 0.14 per kwh).

These tariffs allow a comparison with estimated operating costs for SRB and the tariff revenue expected, as shown in Table 8-10. A deduction of 15% in tariff revenue is assumed to cover theft and collection inefficiencies. Domestic electricity tariffs are substantially higher in Malawi than in Tanzania.

[18] Energy Subsidy Reform in Sub-Saharan Africa, Alleyne et al IMF, 2013

[19] TANESCO Tariff Review Application, September 2013

Table 8-10 Estimated Tariff Revenue from Incremental SRB Connections

Type of connection	Predicted number of connections		Estimated use per connection, KWh/per annum	Malawi		Tanzania		Fixed charges per annum		Variable charges per annum		Total tariff revenue per annum, US$ [1]			Annual charge, US$per connection	
	Malawi	Tanzania		Fixed monthly tariff, US$	US$/kWh	Fixed monthly tariff, US$	US$/kWh	Malawi	Tanzania	Malawi	Tanzania	Malawi	Tanzania	Total	Malawi	Tanzania
SMI	500	500	5000	8.77	0.14	3.15	0.17	52,620	18,878	350,000	436,050	342,227	386,689	728,916	684	773
Rural	8,106	8,743	546	4.38	0.065	0.00	0.06	426,044	-	287,677	272,107	606,663	231,291	837,954	75	26
Urban	467	5,145	1000	12.52	0.9	0.00	0.20	70,216	-	420,622	1,026,505	417,212	872,529	1,289,741	893	170
Total	9,073	14,389										1,366,102	1,490,509	2,856,611		
Operating costs [2]												1,164,423	1,956,023	3,120,446		
% shortfall												17%	-24%	-8%		

[1] Reduced by 15% to account for non-technical losses

[2] Operating costs are divided according to power consumed; 63% of which will be in Tanzania

Tariff income is less than the assumed operating costs of the system (operational cost US$ 3.1 million, tariff US$ 2.9 million). Tariffs are only 92% of operational costs. There is no annual surplus generated to expand the system and consequently reduce unit operational costs to all users. Disaggregating the operational costs and tariff revenue by country, it is apparent that the ESCOM tariffs lead to an operational profit, but TANESCO's rates lead to a substantial operating loss. It is notable that the quoted rates in TANESCO's tariff application to the Government of Tanzania in late 2012 were higher, and would have resulted in an operational profit.

This is a tariff problem and not a problem of the costs of generation. Operating costs of rural connections are quoted as US$ 0.15 per kWh supplied (see for example Energy Subsidy Reform in Sub-Saharan Africa, Alleyne et al, IMF, 2013). Using the estimate of power demand by the rural and urban connections envisaged for SRB post 2022 the present TANESCO tariff would recover only US$ 0.11 per kWh, compared to the ESCOM tariff, which would recover US$ 0.18 per kWh. ESCOM, therefore begins to recover some of investment costs, TANESCO does not. At national level it means that TANESCO has financing problems, which is well known and much discussed.

On the other hand, ESCOM tariffs appear to be on the border of affordability, at least for the SRB population. While noting that RGDP per capita or per household is not the same as annual income, the RGDP estimate per household provides some basis for estimating the affordability of the official tariffs. The average RGDP per household in the Tanzania sector of SRB is about US$ 1,500 per annum and the annual cost of a rural domestic electricity bill is only US$ 26. At only 1% of the family's RGDP this is a small item of expenditure for an important service. In Malawi, where tariffs are higher, the proportion is 5%. Urban domestic connections are much more expensive, especially in Malawi, but one would expect RGDP per household to be substantially greater than the basin average. Superficially, there is nothing to suggest that the official tariffs are unreasonably high. Also, it is entirely reasonable that the electricity supply companies generate annual income to fund future investment.

8.2.4.4 CONNECTION CHARGES

The official connection charges, at anything between US$ 300 and US$ 1,300 per connection (TANESCO, 2011), are of course entirely unaffordable to the SRB population. This report estimates an average financial cost in 2014 of US$ 1,217 per household[20]. Ideally, connection costs should be partly financed by the year-on-year profit from tariff revenue, with the view to gradually reducing operating costs per unit connection by increasing the size of the supply system. This strategy would benefit both consumer and supplier in the long run. However, what is proposed in SRB is an entirely new system, so such an accumulation of profit from tariff revenue in previous years is not available.

However, the population in SRB is in the enviable position of being located in a catchment suitable for hydropower development that will be managed by SRBC. It has already been shown that the investment and operational costs of generation and bulk

[20] This estimate assumes that the cost of connection aims to recover the cost of transformer, within-village transmission and house connection.

transmission are about US$ 0.02 per kWh. The sale cost of power by SRBC to the electricity boards has not yet been fixed, but could be about US$ 0.10 per kWh, giving a margin in the order of eight US cents[21]. The annual power generation of the dam is expected to be about 686 GWh, of which only 3% will be consumed in SRB[22]. This will lead to annual revenue in the order of US$ 66 million. Clearly SRBC will be responsible for other activities (for example re-payment of the loan principal for dam construction) but it appears quite possible for the Commission to allocate part of this income to electricity investment costs within SRB. The investment costs for distribution and connection for the scenario described in Table 8-3 has been estimated as US$ 39 million (see Table 8-9).

The annual operational costs of generation and transmission for SRB consumption has already been estimated (US$ 0.19 million) and included in the SRB system operational costs of US$ 0.15 per kWh. This could be recovered through tariff revenue (if the tariff rates were realistically calculated in the Tanzania sector), as well as 15% non-technical losses.

8.2.5 SRBC ELECTRIFICATION BUSINESS PLAN

A business plan quantifies the financial implications of a venture for the partners involved; in order to arrive at a feasible technical solution that maximises returns to all the partners at an acceptable level of risk. The proposed venture is to provide electricity services to the Songwe River Basin (SRB) as part of a wider initiative to provide power to national and regional markets in Malawi and Tanzania. The goal of the venture is that basin inhabitants will have a reasonable and defensible share of the benefits of a major investment in hydropower generation in SRB.

The principle partners in the venture are therefore:

- The Songwe River Basin Commission, which will own and operate the dam and hydropower facility on behalf of the Malawian and Tanzanian governments
- ESCOM and TANESCO, the institutions responsible for the generation and distribution of electricity in Malawi and Tanzania respectively
- External financing institution(s) (as yet unspecified) who may seek to play a part in financing both the wider initiative and/or SRB electrification
- Consumers in the SRB, assumed in this business plan to be (i) small and medium industries, (ii) rural households and (iii) urban households
- Consumers outside the SRB, supplied by ESCOM and TANESCO.

[21] The bulk price of SRBC electricity is discussed in section 10.6.2.2. The aim should be to recover the full cost of the Lower Dam including financing from its multi-purpose uses.

[22] But total consumption in SRB could be as high as 6.5% of the output of the Lower Dam

The objectives of the venture are:

- To supply electricity to sufficient basin consumers to raise general access to electricity in SRB to at least national connection averages for Malawi and Tanzania
- To ensure the supply of electricity to consumers outside SRB in national and regional markets in sufficient quantity to make a significant increase to the existing supply
- To ensure that the investment and operational costs of SRB electrification (which are potentially substantial in a river basin with relatively low population densities) are targeted to bring benefit to the greatest possible proportion of the basin population
- To ensure the price of electricity (including both connection fee and variable cost), is affordable to the basin population and, if necessary, transparently financed.

A preliminary budget[23] can be constructed for SRBC operation in electricity generation, distribution and sales, see Table 8-11. The two enterprises (i) production for sale to power distributors and (ii) the SRB rural electrification exercise are distinguished. The former is highly profitable; the latter has a positive cash flow from 2024 but the high investment costs to extend the SRB grid, as well as tariff revenue not meeting operating costs, result in a negative financial net present value (NPV) of US$ -17.9 million at 10% over the 50 year period. Another reason is the assumed requirement to pay financing costs on the dam investment[24]. But even if financing charges are excluded, the NPV would still be negative. For a sustainable financial environment, it is most important that tariff revenues are set to achieve an operational profit, in order to generate funds for future investment and expansion of connections.

[23] Outline SRBC Business Plan accounts, which include other uses of the Lower Dam are given in section 10.6.1.

[24] The financing assumed is the standard African Development Fund 10 year grace period, with a 0.75% per annum service charge on outstanding balances and 0.50% per annum commitment fee on undisbursed commitments. This is a working assumption, not based on any financing agreement.

Table 8-11: Indicative Business Plan for SRBC Production, Distribution and Sales of Electricity, US$m

Year	Dam and transmission construction			Loan repayment			Operating cost of Lower Dam								
	Total	For generation of proportion sold to power companies	For generation of proportionof power consumed in SRB	Total	For generation of proportion sold to power companies	For generation of proportionof power consumed in SRB	Total	For generation of proportion sold to power companies	For generation of proportionof power consumed in SRB	Construction of SRB grid	Operation of SRB grid	Fund in for dam and tmsmission construction	Power sales	Tariff income from SRB	Overall balance sheet	Balance sheet for Rural Electrification
2017	-18.94	-18.36	-0.57	- 2.27	- 2.20	- 0.07						473.40			430.98	13.71
2018	-108.88	-105.58	-3.30	- 1.73	- 1.68	- 0.05									-221.22	-3.35
2019	-142.02	-137.71	-4.31	- 1.02	- 0.99	- 0.03									-286.08	-4.34
2020	-127.82	-123.94	-3.88	- 0.38	- 0.37	- 0.01									-256.39	-3.89
2021	-75.74	-73.45	-2.30	-	-	-									-151.49	-2.30
2022				-	-	-				-6.50					-6.50	-6.50
2023				-	-	-	-6.15	-6.09	-0.06	-6.50	-0.49		68.25	0.48	49.43	-6.57
2024				-	-	-	-6.15	-6.06	-0.09	-6.50	-0.98		67.91	0.95	48.07	-6.62
2025				-	-	-	-6.15	-5.97	-0.19	-6.50	-1.47		67.56	1.43	46.71	-6.72
2026				-	-	-	-6.15	-5.97	-0.19	-6.50	-1.96		67.21	1.90	46.35	-6.74
2027				- 12.95	- 12.55	- 0.39	-6.15	-5.97	-0.19	-6.50	-2.44		66.87	2.38	22.10	-7.14
2028				- 12.88	- 12.49	- 0.39	-6.15	-5.97	-0.19		-2.93		66.52	2.86	28.38	-0.65
2029				- 12.81	- 12.42	- 0.39	-6.15	-5.97	-0.19		-2.93		66.52	2.86	28.52	-0.65
2030				- 12.73	- 12.35	- 0.39	-6.15	-5.97	-0.19		-2.93		66.52	2.86	28.67	-0.65
2031				- 12.66	- 12.28	- 0.38	-6.15	-5.97	-0.19		-2.93		66.52	2.86	28.81	-0.65

8.2.6 SRB ELECTRICITY CONSUMPTION AND THE RGDP

The use of power for export from the SRB and the use of power for local rural, urban and SMI connections can now be identified, as shown in Table 8-12. The computation to derive this Table is extensive, but the principle is simple. Energy generated at the dam is distributed to the different uses and quantity by use is multiplied by sale price (taking into account the different tariffs by user and country) to get the gross value of production. Operational costs of US$ 6.15 million per annum are distributed pro rata to the energy generated by use assuming 50% are intermediate costs and 50% is for labour. The value added and labour productivity can then be calculated.

Lower Dam power production totals 686 GWh of which 3% is consumed for the incremental consumption planned in the SRBC Electrification Plan and 6.5% is consumed under the “powered”, “planned” and SRBC Electrification Plan scenarios. It is appreciated that just because the Lower Dam is located in SBR that does not mean it will supply power to the basin, but in economic terms it is a convenient assumption.

The gross value of production is calculated assuming power is sold by SBRC to the electricity companies for US$ 0.10 per kWh and the electricity companies sell power to SBR consumers at the 2014 tariff rate. For power generation for export, intermediate goods for generation are assumed to be 50% of dam operating costs on the proportion of power exported. For SBR consumption, intermediate costs are:

- 50% of the share of dam operating costs attributed to local power generation
- 40% of the operational costs incurred by the power companies, calculated as US$ 0.15 per kWh delivered.

Labour days are estimated assuming the Lower Dam employs 750 full time staff, whose labour days are distributed proportional to power use. The power companies will incur labour costs as 60% of operating costs to distribute and sell power in the basin and the number of staff, their labour days and return to labour can be estimated on the basis of their average salaries.

Having gone through these calculations, a problem arises. TANESCO’s intermediate costs (their own costs plus the costs of generation) exceed the gross value of production of electricity the company sells in rural (not urban) settlements, which results in a negative value added on the electricity sold. As noted above (see Table 8-10), TANESCO’s tariffs do not even cover their expected operating costs in SRB. An adjustment has to be made: national accounts treat subsidies as an asset to the beneficiary. This subsidy was calculated by multiplying estimated SRB power consumption (i.e. incremental consumption under the SRBC Electrification Plan) by the difference between TANESCO’s overall selling rate for power (US$ 0.11 per kWh, calculated by dividing total power used by tariff revenue) and the amount that TANESCO should sell at to cover costs (US$ 0.21 per kWh[25]). The subsidy offered to consumers in SRB obviously varies depending on the

[25] http://allafrica.com/stories/201312160267.html 15th December 2013 has a useful commentary on recent electricity tariff negotiations in Tanzania up to that date

mix of rural and urban connections because electricity is subsidised more in rural areas. The incremental scenario described under the SRBC Electrification Plan includes a large proportion of rural connections so the subsidy paid is greater.

Table 8-12: Allocation of Electricity Production for Consumption and Export

	Units	SRB Power Generation			Power Generation for Export			Total Generation		
		Malawi	Tanzania	Total	Malawi	Tanzania	Total	Malawi	Tanzania	Total
Power production GWhr	GWhr	7.76	13.04	20.80	335.24	329.96	665.20	343.00	343.00	686.00
Gross value of production	US$ 000 2013	1,366	1,491	2,857	33,524	32,996	66,520	34,890	34,486	69,376
Value added	US$ 000 2013	606	288	893	30,484	29,979	60,463	31,089	30,267	61,356
Subsidy by Government	US$ 000 2013	230	1,152	1,382				230	1,152	1,382
Intermediate goods	US$ 000 2013	496	782	1,279	3,040	3,017	6,057	3,536	3,799	7,335
Labour days	days	28,075	41,076	69,151	135,326	134,273	269,599	163,401	175,350	338,750
Return to labour	US$/day	22	7	13	225	223	224	22	230	181

Table 8-12 summarises all these calculations, basically accounting for the economic use of the Lower Dam under the scenario envisaged in this EDSP. Were all powered, planned and SRB Electrification Plan consumption supplied by the Lower Dam (56,000 connections rather than 24,000), the percentage would rise to 6.5%. The mix of users would change too: urban users would be 30% of connections; they are only 23% of the incremental connections planned in the SRBC Electrification Plan. This means that subsidy would not rise as much as expected. Under the Plan it is US$ 1.3 million, under all connections it would be US$ 2.6 million.

Another calculation can distribute value added between administrative units, because the location of the expected connections has already been determined as part of the planning scenario (see Table 8-3). Recalculating the data in Figure 8-1 (i.e. recalculating the value of power exports after subtracting the power used within SRB) and including the value added of power used in SRB leads to the distribution of Electricity RGDP as shown in Figure 8-3. All “power producers” (administrative areas in the Lower Dam catchment) are planned to receive power (except Itope which only has a tiny share of SRB area).

As a whole, electricity adds about US$ 6.2 million to SRB RGDP in 2022, or about 3.2%, and 60% of the SRB rural population and 100% of the urban population are expected to benefit.

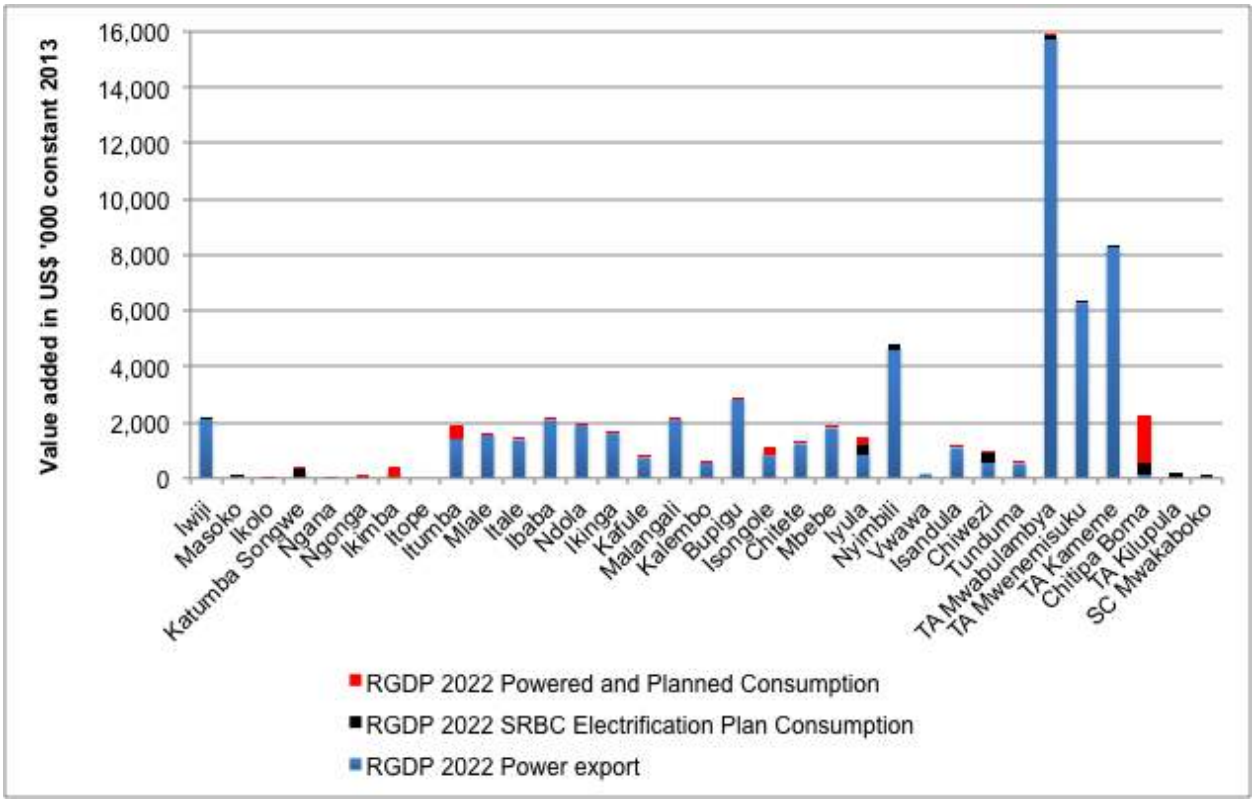


Figure 8-3: RGDP Hydroelectricity Production

The value added from the incremental power sold under the SRBC expansion proposed after 2022 in SRB is calculated in Table 8-12. Value added is Gross Value of Production of electricity (tariff x power sold) minus value of intermediate goods and divided by labour days required for production to get a return to labour. It is a strictly financial calculation for inclusion in the RGDP and does not include any assumptions about expansion of livelihood activities, which would be required for an economic analysis.

8.3 IRRIGATION

Large-scale irrigation schemes have been planned in SRB administrative areas of both Tanzania and Malawi that will be serve by feeder canals from the Lower Dam. The capital costs of the irrigation schemes are expected to be in the order of US$ 80 million. The design, agronomic characteristics, and cost-benefit analysis (CBA) have all been reported in detail in other SRBDP reports as part of the Update of the 2003 Feasibility Study. For the EDSP, it is only necessary to express the expected financial performance of the schemes in terms which can be reported within the SRB RGDP framework and locate the expected economic impact within the basin economy.

The calculation of incremental gross value of production (which is incremental crop quantity produced multiplied by price), intermediate costs (incremental costs of crop inputs used excluding labour), value added (GVP minus intermediate costs) and incremental labour days were calculated using with and without project crop gross margins prepared for the Irrigation Cost Benefit Analysis. Because the CBA was prepared by scheme, one of which is in Tanzania and the other in Malawi, it was possible to distinguish these parameters by left and right bank of the Songwe River. Phasing of

construction and production build up by irrigation block had already been calculated as part of the CBA so the parameters could also be presented by year. The result is an incremental contribution to the regional accounts that can simply be added to the RGDP projections already prepared.

See Figure 8-4 for a graphical presentation of the incremental value of the Malawi and Tanzanian schemes. The total incremental value added is expected to exceed US$ 11 million in constant 2013 prices over an irrigated area of about 5,653 ha. Value added is rather greater from Malawian irrigation than Tanzanian irrigation; partly this is to do with higher crop prices. Incremental return to labour is greater from Tanzanian irrigation; this is because present productivity is comparatively lower. The details of the analysis have been fully reported in the Update of the 2003 Feasibility Study.

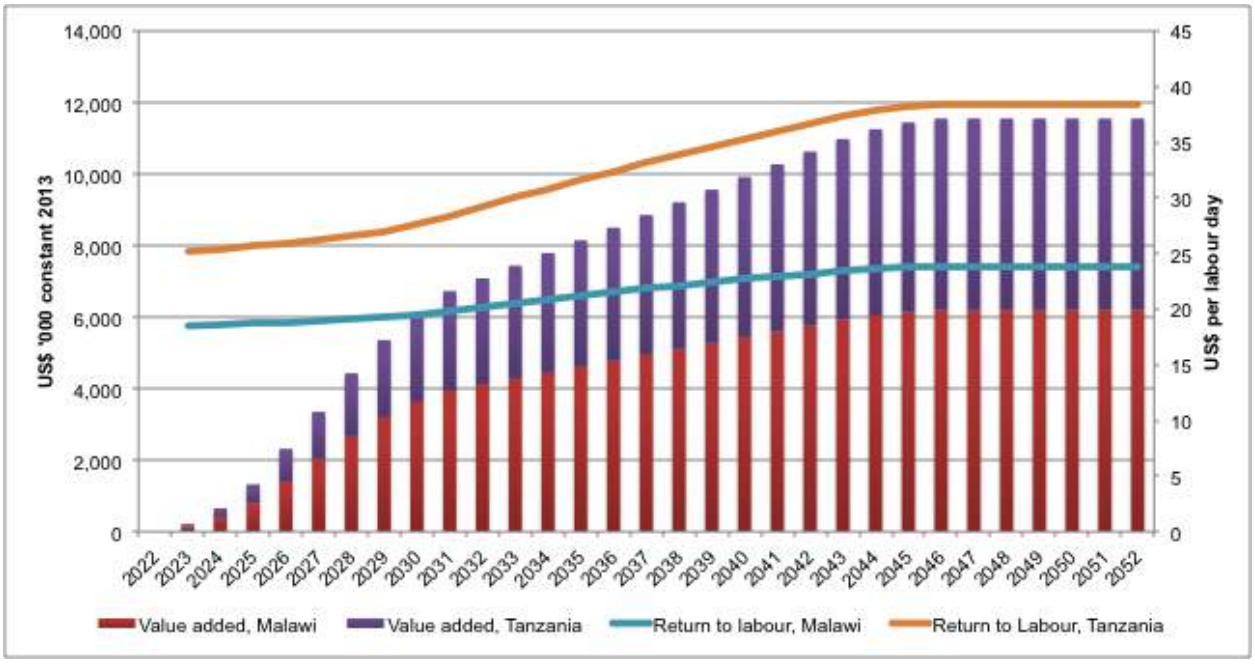


Figure 8-4: Contribution to SRB RGDP Incremental Value Added from Irrigation and Return to Labour

Without any interventions from SRBD, the RGDP of SRB in 2022 is projected to be about US$ 213 million in 2013 constant prices, rising to about US$ 232 million by 2030. Adding the incremental value added from these major irrigation schemes will increase the size of the economy from 2022, but slowly. Irrigation cannot begin until the Lower Dam is commissioned. After that, incremental benefits will slowly build up to approaching US$ 7 million per annum by 2030 at which time these large-scale irrigation schemes will account for about 5% of the basin economy.

It is useful to compare the expected economic performance of these large-scale schemes with minor irrigation already existing in the basin. Minor irrigation has been predicted to expand slowly, from about 2,500 ha in 2013 to about 6,000 ha in 2030. Total value added from minor irrigation will be about US$ 14 million in 2030 if all schemes (established and new) achieve about 0.5% per annum yield increases. Bearing in mind the incremental

value added from major irrigation schemes will be US$ 12 million per annum at full development, the projections seem comparable.

The location of the proposed large-scale irrigation schemes will be in Kyela and Karonga Districts. By 2030 the projections used suggest that production from the large-scale irrigation schemes will add 24% to the RGDP of SRB administrative areas in Karonga and 10% to the RGDP of SRB administrative areas in Kyela.

8.4 KASUMULU AND SONGWE WATER SUPPLY

Interventions in water supply under the SRBDP and coordinated by the SRBC are distinguished from support to water supply and sanitation under SRBDP to the District administrations. The requirements for the latter have been specified in the Community Development Sub-programme and their economic impact is discussed in Section 8.9.3. This section is concerned with the contribution to the economic value of the economy by the proposed Kasumulu and Songwe Water Supply Project, which will be implemented directly by SRBDP.

The Kasumulu population (including 20 downstream villages, also to be served) will be in the order of 21,000 semi-urban persons in 2025, or about 4,650 households. The level of access to the water supply scheme will be 100%. The system will supply about 2,000 m^3 per day, sufficient for a per capita consumption of about 30 litres per day for the estimated 2025 population. The capital cost of the system is estimated to be US$ 4.04 million (Option 2, supply via feeder canal).

To capital cost must be added the cost of maintenance and repair and the management costs of the system (MOM). As a rule of thumb, “tariffs of about US$0.40 per m^3 are considered sufficient to cover operating costs in most developing-country contexts, while US$1.00 would cover both operation, maintenance and infrastructure”[26]. Note there will be no metering for the water supply and so tariffs will not be levied, but a realistic estimate of system MOM costs are needed. Applying the rule of thumb, if the full tariff would be applied for cost recovery, households would pay an average of US$ 190 per annum, or 11% of RGDP per household. This would be unaffordable. Applying a tariff to pay for MOM costs only would raise about US$ 286,000 per annum (assuming no defaults), which is about 7% of scheme costs and about 4% of household RGDP. This tariff would be affordable.

MOM costs are divided between intermediate costs (spare parts and materials for repair and maintenance) and the management and labour costs of operating the system: a 50:50 split is assumed. The distinction is important if the value added of the water supplied (and therefore the contribution of the project to RGDP) is to be calculated. However, there is an additional labour cost between point of collection and consumption. This is borne by the household and represents the cost of labour to carry water from the standpipe to home. It is assumed that on average 0.34 labour days per m^3 are required, leading to an

[26] http://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_Sub-Saharan_Africa

estimate of 80,000 per days per annum. This labour has to be costed, if the daily labour rate is used it would be about US$ 160,000 per annum. This is likely: an urban population may pay for home delivery while a rural population are likely to use the labour of women and children who have a low opportunity cost.

The gross value added of water can now be calculated, it is the full MOM cost plus the cost of labour to carry the water to the house: US$ 445,000 per annum. Subtracting the cost of intermediate products (materials and spare parts) gives a value added of US$ 302,000. The labour days required would be 80,000 days for home delivery divided by the wage rate, plus 50% of MOM costs (management) divided by the cost of salaries and wages. The scheme would have a staff of about 60 and the overall return to labour would be about US$ 3.22 per labour day.

The total value added to the economy would be US$ 302,000 per annum, which is only about 3% of the predicted value added of the SRB water sector and 0.1% of the predicted basin RGDP in 2025. The Kasumulu Water Supply Project does not therefore in itself represent a measurable increase in basin RGDP, but the value added it represents can nevertheless be added to the estimate of value added of the water sector.

Water supply interventions for Songwe town are still under design.

8.5 ACCESS ROADS

The expected contribution of the Lower Dam access roads to the SRB economy is dealt with in Section 8.9.4 below. The dam access roads are a special case: they are planned to provide access to a specific location that is not determined by basin economics. Nevertheless, they will have an economic impact (if they are open to public use). It is better to consider this impact in the wider context of the proposed road development for the whole SRB.

8.6 SMALL AND MEDIUM INDUSTRY

Rural economies in transition often show high person to land ratios in excess of four persons per hectare (i.e. close to the limit of carrying capacity for rainfed subsistence agriculture), high population growth rates and rapid urbanisation. Such economies are characterised by the rapid growth of an “informal” sector, which provides limited and unreliable opportunities for labour displaced from subsistence farms to urban areas. Although capitalisation and productivity of its varied enterprises are very low, the informal sector is important for generating employment, value added production and increasing RGDP. The informal sector also includes small, unregistered enterprises that may be managed as cottage or family industries. In this economic environment, there are opportunities for the growth of small and medium scale industries (SMI).

SRB does not yet have the economic pressures to generate an informal sector. Firstly, the person to land ratio remains low. In 2012 the population density in the basin as a whole was only 0.9 persons per hectare while the population per gross cropped ha was 3.33. There is still a relatively large area within the basin to bring into cultivation. The opportunities for this expansion and its likely consequences are described in Section 6.3.2.1. Secondly, urbanisation remains very limited in the basin. Although this study has

talked-up the future growth of centres of population in SRB and taken account of rural to urban migration in population projections, the present character of these centres are not urban. They were established as administrative centres. The proportion of the population not involved with administration retains strong economic and social connections with surrounding rural areas.

Weak urbanisation means that SMI have a limited contribution to basin RGDP. There are an estimated 1,087 SMIs in the basin's constituent Districts (see Section 3.6) and it is estimated that only about 518 of these are actually within the SRB. These SMI are strongly oriented to agricultural processing, particularly milling. But despite the SRB being an important cereal exporter, it is estimated that only about 20% of grain production is milled in the basin and a considerable proportion of this, perhaps half, is actually done in the home. Local mills cannot compete with the large scale milling enterprises of major urban areas either in price or location: milling financial margins are very fine and milling is usually done close to demand centres to preserve grain quality during transport.

Further, there does not appear to be any systematic support on offer to develop SRB SMIs. Despite visits to local revenue offices and SMI support units at regional level it was not possible to obtain a consolidated list of SMIs. Neither was it possible to obtain information on their financial and technical characteristics.

So opportunities to promote SMI growth, and therefore economic diversity, value added and higher returns to labour, look limited in the short term. Even though the population of the larger centres might increase from 11% of the SRB population in 2013 to about 13% by 2022, rural electrification and improvements in road connectivity can be expected under SRBDP and informal trade will increase as a result of labour brought into the basin to undertake major engineering works (notably the Lower Dam), none of these initiatives in themselves are sufficient to bring about an increase in effective demand for industrial products by the basin population, nor to provide a locational advantage for SMI within the basin to export production to demand centres outside. But acknowledging this implies that the SRB economy and population will remain essentially rural through the 2020s and therefore no intervention for SMI growth is justified in the Economic Development Programme. Such an uninvolved attitude should be avoided.

It is useful to consider if any initiative can be adopted by SRBDP to promote the share of SMI in the basin economy. A wide range of initiatives to promote SMI have been developed[27], which include:

- Provision of **financial advisory services** directly to individual SMI (at firm level) to assess investment opportunities, prepare business plans and raise financing
- Provision of **centralised training services** to groups of SMIs
- Encouraging **business services to be provided by private firms** (rather than governments or donors) and for SMIs to pay for these services

[27] A Synthesis Evaluation of Four IFC-Supported Small and Medium Enterprise Facilities, International Finance Corporation, Operations Evaluation Group 2005

- Establishing **business training and consulting centres** under the same self-funding principle
- Provision of **training for consultants and financial institutions** to improve local services available to SMIs
- Establishment and servicing of **business associations** for SMIs
- Efforts to improve the **business climate** under which SMIs operate, in particular define the nature of the problems confronting businesses and outline potential reforms
- Identification of **linkage opportunities** between SMIs
- Promote **subcontracting and partnership relations** between SMIs and large enterprises and among SMEs
- **Identification of clusters of SMI clients** and bring specialized experience to bear, permitting economies of scale
- Addressing the needs of groups of **SMI in a specific region** through engaging consultants or establishing business services
- Provision of **web-based services**, including SMI Toolkits that offers a range of business tools, software applications, and online training materials
- **Matching grant programmes** with financial institutions to provide services to SMIs
- Establish **credit information registries** to facilitate access to credit.

It is not easy for a non-specialist in SMI development to mix and match these various initiatives and come up with a coherent strategy. Nevertheless, some observations on the applicability of the various approaches listed above can be made. Firstly the number of SMIs in SRB is small and the basin itself is not large. SMI are likely to be concentrated in the basin's main population centres. These are Chitipa in Malawi and Isongole, Itumba, Mbako, Njisi, Ihanda, IlombaIdiwili and Katete in Tanzania. Now and in the future, these areas will have better labour markets, locational advantages and preferential access to water and electricity. Outreach from a SMI Development Facility to individual SMI therefore does not appear to be a problem, though the approach is more expensive than the provision of centralised services.

Given the apparent homogeneity of SMIs (small scale, under capitalised, a relatively undereducated workforce, mostly concerned with low value agro-processing) training of SMI personnel would appear to be an essential approach to developing the sector.

Trade organisations are important in Tanzania and to some extent Malawi with Trade Associations and Chambers of Commerce located at regional level in both countries. Opportunities for development of SRB SMIs through these trade organisations need to be explored.

The medium term prospects for economic development are mostly connected with value added to agricultural products. Animal protein (particularly meat, fish, milk and eggs) is in very short supply in SRB diets. Any real increase in household incomes will result in an increase in consumption of higher value foodstuffs and avoidance of home food processing. SMI can play an important role in improving quality and quantity of food supply through processing, packaging and distribution. Development initiatives for SMI should focus on this.

Access to the factors of production is likely to be a key problem for most SMIs, in particular machinery, power supply, adequately skilled labour and packing materials. Ensuring an adequate supply of quality raw materials from agricultural producers will also be a challenge for most small food processing industries. Establishing linkages would be a legitimate intervention in a basin with a dominantly agrarian economy.

Because SMI are small and under capitalised, financing expansion of capacity or adopting improved technology will also be an important issue.

SMIs in SRB are well located to exploit opportunities for cross border trade, though there is a disadvantage in that the larger centres of population in both countries are far from the basin.

Some interventions described above are unlikely to be helpful. For example, SMIs in SRB are unlikely to be able to afford commercial consultancy and financial advisory services. Attempting to improve the business climate will not help small industries in a region that is peripheral to two countries.

With these characteristics of a potential SMI support project in mind, it is possible to list potential impacts. In the food-processing sector these might be:

- Expansion of capacity of existing milling services, with the objective of replacing home milled cereals with a commercial product
- Expansion of commercial rice milling and packaging from the substantially increased production from large scale irrigation planned under SRBDP
- Introduction and expansion of higher value food supply in SRB's major population centres, which would include packaged milk, meat and fish products
- Improvement in output and quality of the oil expelling industry, leading in particular to increasing commercial sales of sunflower, groundnut, sesame and palm oil, for which crops the basin has a comparative advantage in production
- Improved marketing initiatives for honey and beeswax, particularly from Ileje District
- Fruit and vegetable processing, including grading, packaging and juicing
- If opportunities in the national markets permit, improvements in processing and packing of cash crops including cocoa, coffee and cashew, and industrial crops including pyrethrum.

Additional opportunities may exist for improved and expanded production from SRB cottage industries, including:

- Furniture
- Handicrafts including cloth and basketry.

Quantifying benefits from an expansion of value added from SMI is not easy. Since maize milling is the largest contributor to SMI value added now, quantification of increased value added to satisfy SRB consumption would probably account for the greatest proportion of value added in the future. Maize milling capacity in the basin in 2012 (based on about 480 milling units) was about 30,000 tons per annum while about 53,000 tons per annum was required for home consumption. To meet future requirements from the formal milling

sector, eliminate home milling and take into account the increased demand from population growth, maize mill capacity would have to double. As concluded from many studies of rural milling in Africa, production efficiency needs to improve and small units need to be upgraded to medium sized units to gain benefits of scale[28] and lower prices to consumers[29]. This would result in a much-needed increase of labour productivity in the maize milling sector (presently only about US$ 6 per day) and more than doubling milling value added (because of a decline in intermediate costs as well as doubling the volume of production). As a result, the contribution of value added to RGDP from SMI would increase from about 3.3% (in 2012) to nearly 7% once the transformation of the maize milling industry is completed. So there should be identifiable economic benefits from an SMI support project that seeks to make such a transformation.

Recognising the potential benefits, a SMI development facility was designed to be implemented under SRBDP and to achieve specific growth targets in the sector. At an estimated project cost of US$ 1.25 million, value added by SMI was expected to increase by 50%, the industrial workforce would increase by 30% and return to labour would increase by 15%. The incremental growth in the sector as a result of the project was estimated and distributed into the main population centres, on the assumption that the project would target SMI in these areas. Overall, gross value of production by SMI will increase by 10% as a result of the project and additional jobs would be created for about 1,000 workers.

8.7 TOURISM

The SRBDP report Potential for Tourism Development in SRB gives the essential information to determine the future contribution of organised tourism to the SRB economy. The report expects that that after five years of the investment activities proposed there will be a total of 3,000 jobs in tourism in SRB. On the assumption (from the UN World Tourism Organisation) that seven local visitors create three jobs, two international visitors create three jobs, and of all visitors 25% will be international, it may be deduced that about 1,000 visitors will be international and 3,500 local visitors will be taking part in organised tourism activities from about 2022. This is about 30% of the 15,000 people crossing the border each year: not all will be lured to the tourist attractions of SRB.

The Potential for Tourism Development report gives an indication of the facilities envisaged and their approximate cost. Some simple assumptions match estimated demand with supply of facilities. It would seem the eco-lodges may have a capacity of about 10 chalets. The Lower Dam and the Nyakusya village facilities might be smaller. Construction of each facility would cost in the region of US$ 50,000 per chalet, which is expensive. Note that it is easy to locate each facility and associate it with an administrative

[28] Profit Efficiency of Small and Medium Scale Maize Milling Enterprises in South Africa, Abu and Kirsten 2006

[29] Trends in Maize Grain, Roller and Breakfast Meal Prices in Zambia, Kuteya and Jayne, Food Security Research Project 2011

area. This is important when attributing RGDP geographically within the basin. The scope of tourist attractions in the SRB is given in Table 8-13.

Table 8-13: Scoping of SRB Tourist Accommodation

	Number of visitors visiting		Nights	Total nights	Occupancy	People per night	Number per room	Number of rooms needed	Investment Cost, US$	Construction cost US$ per room
	International	Local	per visit	stayed						
Lower Dam Tourist Facilities	50%	80%	1	3,300	80%	11.46	2	6	300,000	52,364
Nyakusya Cultural Village Development	80%	50%	1	2,550	80%	8.85	2	4	250,000	56,471
Eco-Lodge Development, Misuku Hills	80%	50%	2	5,100	80%	17.71	2	9	500,000	56,471
Eco-Lodge Itale Forest	80%	50%	2	5,100	80%	17.71	2	9	500,000	56,471
Border Post Hospitality Facilities	90%	90%	0	-	80%	-	2	-	250,000	

It is then possible to estimate the expenditure that these tourists may make and disaggregate it to be comparable with the SRB RGDP. See Table 8-14. Simple assumptions of the allocation of services demanded to nights at each facility are made and a small allowance for the purchase of souvenirs has been made. Services are given an approximate cost. Based on the size of each facility, staff days per annum are estimated. Gross value of production is the cost of services multiplied by the total nights stayed multiplied by the percentage take-up of services.

Intermediate costs are then estimated: these are non-labour costs; of raw material, vehicles and fuel, foodstuffs etc. It is not easy to calculate intermediate costs without a manufacturing budget. Crop budgets are of course familiar, but the cost of materials for a cultural show can be no more than an estimate. The intermediate costs are deducted from gross value of production to calculate value added. Value added in the return to labour, so return per labour day is easy to calculate.

Tourism gives a very satisfactory return to labour (hence its popularity in developing economies where return to labour in most economic activities is low) except for the border post hospitality services, which is no more than a restaurant. The biggest proportion of value added comes from room charges. Hence it is worth constructing a good quality chalet for US$ 50,000 that can be charged out at US$ 90 per night or more: the outlay could be covered in two years. The return to labour at the eco-lodges is comparable to the return to labour for hydropower generation (US$ 400 per labour day).

At US$ 2.6 million per annum the value added from even a modest tourism campaign in SRB is reasonably attractive but it will require a determined approach to attracting visitors, and at the prices assumed the visitors will have to be affluent and the services offered must be high-quality.

Table 8-14: Contribution to SRB RGDP Tourism

	Lower Dam Tourist Facilities	Nyakusya Cultural Village Development	Eco-Lodge Development, Misuku Hills	Eco-Lodge Itale Forest	Border Post Hospitality Facilities	Approximate cost, US$
Services, % of nights stayed						
Accommodation	100%	100%	100%	100%		90
Breakfast	100%	100%	100%	100%	33%	10
Lunch	50%	100%	50%	50%	33%	20
Dinner	50%	50%	100%	100%	33%	25
Show		100%				50
Safari	100%					50
Guided tour			100%	100%		30
Incidental	25%	50%	25%	25%	50%	20
Staffing, person days	2,200	3,300	2,640	2,640	4,400	15,180
Gross Value of Production, US$						
Accommodation	297,000	229,500	459,000	459,000	-	1,444,500
Breakfast	33,000	25,500	51,000	51,000	13,365	173,865
Lunch	33,000	51,000	51,000	51,000	26,730	212,730
Dinner	41,250	31,875	127,500	127,500	33,413	361,538
Show	-	127,500	-	-	-	127,500
Safari	165,000	-	-	-	-	165,000
Guided tour	-	-	153,000	153,000	-	306,000
Incidental	16,500	25,500	25,500	25,500	40,500	133,500
Intermediate inputs (US$)						
Accommodation	29,700	22,950	45,900	45,900	-	144,450
Breakfast	660	510	1,020	1,020	267	3,477
Lunch	1,650	2,550	2,550	2,550	1,337	10,637
Dinner	4,125	3,188	12,750	12,750	3,341	36,154
Show	-	6,375	-	-	-	6,375
Safari	41,250	-	-	-	-	41,250
Guided tour	-	-	7,650	7,650	-	15,300
Incidental	4,125	6,375	6,375	6,375	10,125	33,375
Value Added, US$						
Accommodation	267,300	206,550	413,100	413,100	-	1,300,050
Breakfast	32,340	24,990	49,980	49,980	13,098	170,388
Lunch	31,350	48,450	48,450	48,450	25,394	202,094
Dinner	37,125	28,688	114,750	114,750	30,071	325,384
Show	-	121,125	-	-	-	121,125
Safari	123,750	-	-	-	-	123,750
Guided tour	-	-	145,350	145,350	-	290,700
Incidental	12,375	19,125	19,125	19,125	30,375	100,125
Total	504,240	448,928	790,755	790,755	98,937	2,633,615
Return to labour	229	136	300	300	22	173

8.8 NATURAL RESOURCES AND LAND USE MANAGEMENT

8.8.1 RIVER BANK STABILISATION

The course of the Lower Songwe River is unstable and the river is prone to flooding. The international border is therefore not adequately fixed and floods cause agricultural losses and sometimes damage to property. SRBC will therefore promote a Community Forestry for Stabilisation of the Lower Songwe River Project, for implementation as soon as possible. The need for any engineering structures to supplement these biological control measures in the event of the Lower Dam failing to stabilise the river's course will be assessed within five years after dam commissioning.

The area in which community forestry will be undertaken is in the lowest 23 km reach. Legally defined buffer zones of 60m wide exist on each bank. Property and agriculture will be removed from the zones. Three nurseries will be established, in years 1, 3 and 4 of the project at a cost of about US$ 36,000 each and a capacity to produce about 620,000 seedlings each within 10 years. An area of 620 ha will then be planted up progressively between years 3 and 9 to indigenous and economically useful tree and shrub species at an estimated cost of US$ 800 per ha. Project recurrent costs build up (following the area planted) to a maximum of US$ 50,000 per annum in year 10. Using this budget it is straightforward to prepare a simple financial cost:benefit analysis which shows that benefits incurred five years after planting would have to gradually increasewith the planted area to a maximum of US$ 113 per ha (in project year 13) in order to achieve a project internal rate of return of 5% over 30 years. The low discount rate is chosen to reflect the environmental benefits. This "package" of benefits would include avoided flood damage, the benefit of a fixed international border, the enhanced environmental value of the flood plain and the market value of forest products collected in the buffer zone. Over the project life, about 2,050 labour years of work would be created for the local community (assuming 25% of nursery costs and 80% of planting costs are for wage labour).

The contribution to the RGDP at full development in project year 13 (2028) would be an annual net value added of US$ 107,500 with intermediate costs of US$ 12,500 and a return to labour of about US$ 8.60 per day.

8.8.2 PRODUCTIVITY OF RAINFED AGRICULTURE

8.8.2.1 PROBLEM DEFINITION

Without significant increases in agricultural productivity the outlook for economic growth in SRB is poor after 2021, when all land suitable for rainfed cultivation will probably be committed. A decline in RGDP per capita, increased rural population density per cultivated area and an expansion of cultivation into marginal land is envisaged (see Sections 6.2 and 6.3.2.1.) For SRBC, this is a scenario that should be avoided. Deterioration in SRB catchment condition is likely to accelerate just as the Lower Dam becomes operational.

Two strategies to mitigate catchment deterioration are evident. One is to instigate soil and water conservation (SWC) measures on sensitive land in the hope of pre-empting the worst of catchment deterioration in the future. The other is to improve the productivity of rainfed crop production to secure both an adequate level of growth in RGDP per capita and slow the expansion of the cultivated area onto marginal land. Pursued together the strategies are complementary, as well as important in paving the way for sustainable farming in the basin. The scope of each strategy is considered in turn.

8.8.2.2 SOIL AND WATER CONSERVATION

SWC requirements in 2022 can be approximately assessed by superimposing the predicted 2022 cultivated area by administrative area on the land available in different slope classes. This is shown on Table 8-15. Slope mostly determines the requirement for investment per unit area in SWC for arable land. Allowance has been made for the expected irrigated area by administrative area that is assumed to be located on land with slope less than 3%.

Table 8-15: Predicted Cultivated Area by Slope Class, 2022

District	Ward/T/A	Basin ha	Predicted cultivated area in 2022	Cultivation on land less than 3%, ha	Cultivation on land more than 3% and less than 4.5%, ha	Cultivation on land more than 4.5% and less than 7.5%, ha	Cultivation on land more than 7.5% and less than 10.5%, ha	Cultivation on land more than 10.5% and less than 13.5%, ha	Cultivation on land more than 13.5% ha
Mbeya Rural	Iwiji	15,176	6,128	1,057	1,614	1,530	1,680	247	0
Mbeya Rural	Masoko	552	362	27	70	80	66	70	49
Kyela	Ikolo	2,066	2,221	1,956	84	181			0
Kyela	Katumba Songwe	3,545	3,525	3,045	351	39	27	20	43
Kyela	Ngana	6,731	4,286	3,381	575	330			0
Kyela	Nkonga	2,803	3,188	2,794	394				0
Kyela	Rimba	2,401	2,856	2,383	4	469			0
Kyela	Itope	738	719	626	81	13			0
Ileje	Itumba	10,138	4,964	603	885	910	1,150	1,413	0
Ileje	Mlale	11,221	4,025	1,641	1,968	416			0
Ileje	Itale	9,812	2,431	419	757	907	348		0
Ileje	Ibaba	14,971	3,043	1,010	1,860	172			0
Ileje	Ndola	13,576	3,027	972	1,786	268			0
Ileje	Ikinga	11,471	2,526	244	617	921	746		0
Ileje	Kafule	5,302	2,199	84	258	358	495	658	346
Ileje	Malangali	15,071	4,098	293	607	756	1,063	1,379	0
Ileje	Kalembo	4,167	1,435	41	131	215	277	445	327
Ileje	Bupigu	20,251	2,393	733	1,469	191			0
Ileje	Isongole	5,855	3,303	1,460	1,560	283			0
Ileje	Chitete	8,811	3,207	1,109	1,605	493			0
Ileje	Mbebe	12,878	9,391	5,716	2,429	927	318		0
Mbozi	Iyula	6,044	5,929	697	813	762	882	914	1,860
Mbozi	Nyimbili	32,971	12,974	4,852	5,598	2,524			0
Mbozi	Vwawa	1,093	772	50	87	106	150	156	223
Mbozi	Isandula	7,788	4,564	3,095	1,208	261			0
Momba	Chiwezi	4,051	4,315	3,191	729	124	21	10	241
Tunduma	Tunduma	3,760	1,822	519	1,021	281			0
Chitipa	TA Mwabulambya	82,079	58,542	38,901	16,525	3,116			0
Chitipa	TA Mwenemisuku	32,800	5,040	664	1,602	1,982	793		0
Chitipa	TA Kameme	43,316	18,803	10,975	7,153	675			0
Chitipa	Chitipa Boma	850	930	716	104	30	79		0
Karonga	TA Kilupula	8,386	4,656	3,626	905	225			0
Karonga	SC Mwakaboko	24,757	11,372	5,522	3,173	2,372	305		0
Total		425,420	199,045	102,304	58,027	21,916	8,399	6,312	3,088

About 50% of cultivated land is expected to be on land with less than 3% slope, which will require minimal SWC measures. Only 5% of cultivated land is expected to be on slopes greater than 10.5% on which SWC is expected to be significantly more expensive. In order to cost the SWC measures satisfactorily, surveys are required by a SWC specialist of structures and conservation methods appropriate to the various farming systems in SRB. But estimating using indicative costs of US$ 100-200 per ha based on slope class, an order of magnitude of US$ 11 million might be expected. At about 3 million

labour days, the labour required would be significant, but not disproportionate to labour use in the rainfed crop sector, which is expected to be about 26 million days per annum in 2022. Benefits from SWC measures in SRB are not quantifiable without better and more detailed data, but an estimate of how closely present crop production reaches its potential level is a good start, and also important to quantify the impact of the second strategy, improvement of crop production.

8.8.2.3 CROP PRODUCTIVITY

The focus on improvement in crop production must be on maize and inputs for maize cultivation. Maize accounted for about 34% of the value added of rainfed crops in 2012 and in order to make a significant impact on sector productivity this crop cannot be ignored. Sections 3.1 and 5.2 note that although the application rates of crop nutrients was higher than expected in SRB, the environmental costs of nutrient mining and the efficiency costs of poor fertiliser distribution amount to well over 5% per annum of the value added of the rainfed crop sector. Furthermore, maize yields are below generally accepted target yields in 90% of the basin area. Overall maize yields in SRB are 3.1 tons per ha. If target yields were achieved they would be in the order of 4.1 tons per ha, boosting production by 24% to 219,000 tons per annum compared with the reported production in 2012 of 166,000 tons. The situation by administrative area is shown in Table 8-16.

Table 8-16: Maize Production Statistics 2012 and Target Production

District	Ward/TA	Maize area 2012, ha	Maize production, 2012, tons	Maize yields, tons per ha	Target yield, tons per ha	Potential production minus actual production, tons
Mbeya Rural	Iwiji	3,840	4,848	1.26	4.50	12,432
Mbeya Rural	Masoko	227	312	1.38	4.50	709
Kyela	Ikolo	69	365	5.29	3.50	-124
Kyela	Katumba Songwe	350	805	2.30	3.50	420
Kyela	Ngana	438	1,008	2.30	3.50	526
Kyela	Ngonga	556	588	1.06	3.50	1,358
Kyela	Ikimba	301	645	2.14	3.50	410
Kyela	Itope	31	65	2.14	3.50	42
Ileje	Itumba	3,431	13,724	4.00	4.00	0
Ileje	Mlale	1,271	4,862	3.83	4.50	858
Ileje	Itale	1,618	6,472	4.00	4.50	809
Ileje	Ibaba	1,649	6,597	4.00	4.50	825
Ileje	Ndola	1,645	6,580	4.00	4.50	822
Ileje	Ikinga	1,629	6,518	4.00	4.00	0
Ileje	Kafule	1,350	5,402	4.00	4.00	0
Ileje	Malangali	2,949	8,196	2.78	4.00	3,600
Ileje	Kalembo	918	3,513	3.83	4.50	620
Ileje	Bupigu	1,541	6,163	4.00	4.00	0
Ileje	Isongole	2,224	8,895	4.00	4.00	0
Ileje	Chitete	1,641	6,562	4.00	4.00	0
Ileje	Mbebe	2,320	9,280	4.00	4.00	0
Mbozi	Iyula	1,792	3,847	2.15	4.50	4,216
Mbozi	Nyimbili	3,651	7,839	2.15	4.50	8,589
Mbozi	Vwawa	183	394	2.15	4.50	431
Mbozi	Isandula	991	2,128	2.15	4.00	1,836
Momba	Chiwezi	380	1,320	3.48	4.00	198
Tunduma	Tunduma	185	390	2.11	4.50	441
Chitipa	TA Mwabulambya	4,118	12,880	3.13	4.00	3,593
Chitipa	TA Mwenemisuku	1,502	4,260	2.84	4.00	1,748
Chitipa	TA Kameme	4,425	15,133	3.42	4.00	2,567
Chitipa	Chitipa Boma	140	449	3.21	4.00	111
Karonga	TA Kilupula	914	1,946	2.13	3.50	1,253
Karonga	SC Mwakaboko	5,372	14,131	2.63	3.50	4,671
	Overall	53,651	166,117	3.10	4.08	52,962

There are significant productivity gains to be made in maize cultivation at apparently little incremental cost. Recommended nutrient applications appropriate to rainfall and altitude vary quite widely in SRB, see Table 8-17. Following the recommendations, the fertiliser requirement for 2012 can be calculated assuming basal fertiliser is applied as DAP (20% N and 50% P_2O_5) and top dressing (comprising 66% of the requirement for N) is applied as urea (36% N). The dosage of DAP also satisfies the requirement for P_2O_5.

Table 8-17: Maize Inputs 2012: Recommended and Supplied

District	Ward/TA	Altitude, m	Recommended N kg/ha	Recommended P2O5 kg/ha	Recommended Tons Basal as DAP 20% N	Recommended Tons P2O5 applied as DAP, 50% P2O5	Recommended Tons Top Dressing as urea, 46% N	Recommended Improved Seed, kg	Basal Fertiliser Supplied Tons	Top Dressings upplied Tons	Improved Maize Seed Supplied Kg
Mbeya Rural	Iwiji	1,885	50	40	317	158	367	57,999	159	134	29,127
Mbeya Rural	Mawalo	2,105	50	40	19	9	21	3,403	-	-	-
Kyela	Ikolo	480	20	20	2	1	3	1,035	75	75	11,000
Kyela	Katumbasongwe	486	20	20	12	6	13	5,250	92	92	16,370
Kyela	Ngana	642	20	20	14	7	16	6,576	68	68	9,896
Kyela	Ngonga	482	20	20	18	9	21	8,340	75	66	11,000
Kyela	Ikimba	460	20	20	10	5	11	4,522	-	-	-
Kyela	Itope	522	20	20	1	1	1	459	-	-	-
Ileje	Itumba	1,454	100	40	566	283	639	51,464	884	884	88,000
Ileje	Mlale	1,562	50	40	105	52	118	19,087	-	-	-
Ileje	Itale	1,861	50	40	133	67	151	24,299	579	579	57,420
Ileje	Ibaba	1,898	50	40	136	68	153	24,743	590	590	59,400
Ileje	Ndola	1,585	50	40	136	68	153	24,674	589	589	58,500
Ileje	Ilenga	1,044	100	40	269	134	303	24,441	584	584	58,560
Ileje	Kafule	1,451	100	40	223	111	251	20,256	483	483	48,720
Ileje	Malangali	1,232	100	40	487	243	549	44,237	557	557	56,000
Ileje	Katembo	1,839	50	40	76	38	85	13,776	-	-	-
Ileje	Isoliga	1,419	100	40	254	127	287	23,112	551	551	55,000
Ileje	Isongole	1,311	100	40	367	183	414	33,357	885	885	88,000
Ileje	Chitete	1,369	100	40	271	135	305	24,809	724	724	72,500
Ileje	Mbebe	1,443	100	40	383	191	432	34,890	996	996	99,430
Mbozi	Iyula	1,892	50	40	148	74	167	26,877	301	301	47,721
Mbozi	Nyimbili	1,578	50	40	301	151	340	54,758	451	451	102,895
Mbozi	Vwawa	1,589	50	40	15	8	17	2,749	-	-	-
Mbozi	Isandula	1,455	100	40	164	82	184	14,868	188	188	58,392
Mombei	Chiwezi	1,392	100	40	63	31	71	5,660	3	3	275
Tunduma	Tunduma	1,549	50	40	15	8	17	2,766	11	11	1,088
Chitipa	TA Mwabulambya	1,939	100	40	680	340	766	61,774	371	385	40,946
Chitipa	TA Mwenemisuku	1,243	100	40	248	124	280	22,530	276	273	11,683
Chitipa	TA Kameme	1,461	100	40	730	365	824	66,375	261	248	14,735
Chitipa	Chitipa Boma	1,275	100	40	23	12	26	2,101	-	-	-
Karonga	TA Kilupula	669	20	20	30	15	34	13,710	35	96	3,625
Karonga	SC Mwakaboko	648	20	20	177	89	200	80,080	102	196	26,400
Total	Totals				6,382		7,209	804,799	9,907	9,925	1,186,781

Recommended inputs to achieve target yields are obtained from Adoption of Maize Production Technologies in Central Tanzania, Kaliba et al, 1998. Central Tanzania is generally lower and more arid than SRB and the recommendations are dated: improved varieties with different input requirements may now be available. Nevertheless, it seems that more than sufficient fertiliser and improved seed are being supplied to many areas in SRB (though it must be noted that fertiliser supplied to peripheral administrative areas may also be supplied to farmers outside the basin). It also appears that over-supply is more a characteristic of Tanzania than Malawi, where inputs, particularly seed, do not meet recommended requirements. And yet despite a tendency to over-supply inputs, maize yields fall short of targets.

It is interesting to quantify the economic impact of this shortfall. The loss of value added overall as a result of not reaching target yields in 2012 was about US$ 11 million. Value added to all rainfed crops could have risen by about 10%, from US$ 101 million to US$ 113 million. Value added specifically to maize could have risen 33%, from US$ 34 million to US$ 45 million. These are significant increases considering that the total basin RGDP was only about US$ 145 million in 2013. An additional question is whether or not attaining target yields in the basin by 2022 would reverse the expected decline in RGDP per capita, the expansion of the basin cultivated area onto marginal land and a decrease in catchment quality.

Measures need to be taken to improve maize yields through better use of inputs and, very possibly, more attention to in-field SWC. It is quite possible that soil water stress may be limiting maize yields even where inputs are applied according to recommendations. If so, there would be significant returns to the relatively inexpensive SWC programme outlined above, though this assertion cannot be made without more data.

The annual yield increases required from 2013 to achieve target yields by 2022 can be substituted into Table 6-8 (see Section 6.3.2.1) to estimate the impact on annual RGDP. See Table 8-18. Crop value added would increase by about 2.5% per annum and, according to the input-output relationships assumed, substantial increases in use of inputs and labour would be required. Multiplying by the number of years to achieve target yields, the value of intermediate inputs and labour required are approximately equal to the estimated costs of the SWC programme (US$ 11 million and 4 million labour days). The increase in value added in the crop sector is sufficient to ensure a trajectory of growth of RGDP to prevent RGDP per capita from declining in the period post 2022. The growth of cereal yields of 0.25% per annum assumed in Table 6-8 is insufficient to achieve this, as shown in Figure 6-4.

Table 8-18: Relationship of Target Yield, Value Added, Input and Labour Use

District	Annual Yield Increase (kg/ha)	Incremental Value Added, US$	Total Value Added, US$	% Increased Value Added	Assumed yield response to one unit of		Increase in use, units per ha		Cost of input	Incremental use		Required to raise yield to target levels by 2022	
					Input, kg of cereal	Labour, kg of cereal	Input, units	Labour, units	US$ per unit input	Total cost of incremental inputs, US$	Total incremental labour, days	Increase in cost of intermediate inputs	increase in labour days
Mbeya Rural	85.35	138,183	4,582,750	3.1%	10	20	8.54	4.27	1,072	58,203	27,136	11.3%	6.4%
Kyela	73.47	199,875	14,659,102	1.4%	5	15	14.69	4.90	916	129,125	46,971	7.7%	6.5%
Ileje	10.00	91,802	26,859,206	0.3%	10	20	1.00	0.50	537	17,322	16,140	0.4%	0.8%
Mbozi	128.36	384,798	4,479,095	9.4%	10	20	12.84	6.42	1,072	212,191	99,008	7.5%	8.2%
Momba	94.78	23,820	707,875	3.5%	10	20	9.48	4.74	2,529	31,227	6,174	24.4%	8.0%
Chitipa	94.78	1,262,250	25,613,190	5.2%	10	20	9.48	4.74	1,456	326,789	112,200	3.9%	6.4%
Karonga	43.73	472,237	14,918,116	3.3%	5	15	8.75	2.92	1,507	182,217	40,298	5.5%	3.5%
Total		2,572,964	91,819,333							957,074	347,926		

The elaboration of the relationship between SWC initiatives, yields, value added and the use of inputs and labour is beyond the resources of this study. But on the assumption that SWC will deliver a long term increase in RGDP (as well as improved catchment quality) through improved rainfed cropping productivity, then the level of response required to SWC which will “turn around” rainfed cropping to be an engine of growth for the basin after all surplus suitable cultivable land is taken up in the early 2020s is shown in Table 8-18. It is a challenging prospect.

8.8.2.4 PROJECT INTERVENTIONS TO INCREASE RAINFED CROP PRODUCTIVITY

The challenge can be made more manageable by considering SWC and incremental crop input requirements at village level. There are about 212 village areas defined in the GIS with an average area of about 2,000 ha. Land distribution by slope class was calculated for each using the GIS. The projected crop area by administrative area for 2022 (see Table 8-15) was then distributed by village, proportional to the area of each village within its administrative unit and further distributed by village-level slope class. The results are not similar to Table 8-15: some villages have large areas of land below 3% slope that are not predicted to be cultivated by 2022 because the village population is very small and is not predicted to increase much, so only 85% of the land in this slope class will be taken up for cultivation, not 100% as predicted in Table 8-15. Naturally, this increases the cost of the total SWC effort required; applying the same unit costs described in Section 8.8.2.2, an estimate of US$ 13 million is estimated, including about 3.6 million labour days. What is not known is the areas by village that have already received SWC treatment by the District Authorities, which would be deducted from this estimate.

But not all villages need to be included in a project for SWC. Villages can be prioritised, focussing on larger villages with apparently adequate labour resources and a relatively large proportion of their cultivated area on land requiring SWC measures. Table 8-19 shows the scope of a SWC project that would focus on a total of 32 villages. SWC works would be directed to about 18% of the area predicted to be under cultivation in 2022. The total cost (including farmers' labour at a notional cost of US$ 2 per day) would be about US$ 4.5 million. The works would be scheduled between 2015-2022 so the scope of activity is manageable with District technical resources.

Table 8-19: Indicative Project of SWC Works, 2015-2022

District	Administrative Unit	Number of villages	Number of villages selected	Area for treatment, ha	Cost of SWC US$	Labourdays required by farmers
Mbeya Rural	Iwiji	6	6	5,071	293,617	183,775
Mbeya Rural	Masoko	3	-	-	-	-
Kyela	Ikolo	3	-	-	-	-
Kyela	Katumba Songwe	6	-	-	-	-
Kyela	Ngana	4	1	1,515	85,723	51,460
Kyela	Ngonga	5	-	-	-	-
Kyela	Ikimba	3	-	-	-	-
Kyela	Itope	1	-	-	-	-
Ileje	Itumba	2	1	3,141	182,423	113,429
Ileje	Mlale	3	-	-	-	-
Ileje	Itale	4	1	1,157	64,523	37,683
Ileje	Ibaba	5	1	672	34,704	18,196
Ileje	Ndola	4	1	762	40,322	21,832
Ileje	Ikinga	6	1	643	36,470	21,794
Ileje	Kafule	4	1	717	-	25,252
Ileje	Malangali	4	-	-	-	-
Ileje	Kalembo	2	2	1,394	43,822	62,474
Ileje	Bupigu	4	1	572	29,616	15,555
Ileje	Isongole	3	1	1,038	53,707	28,201
Ileje	Chitete	4	2	1,208	63,047	33,528
Ileje	Mbebe	4	1	1,054	56,357	31,093
Mbozi	Iyula	3	2	5,172	329,101	233,980
Mbozi	Nyimbili	7	3	5,508	289,093	155,027
Mbozi	Vwawa	1	1	722	45,951	32,569
Mbozi	Isandula	4	1	860	50,058	31,160
Momba	Chiwezi	2	-	-	-	-
Tunduma	Tunduma	2	-	-	-	-
Chitipa	Mwabulambya	39	2	2,314	125,665	71,598
Chitipa	Mwenemisuku	23	1	676	35,338	18,807
Chitipa	Kameme	14	1	1,157	62,287	34,710
Chitipa	Chitipa Boma	5	-	-	-	-
Karonga	Kilupula	15	-	-	-	-
Karonga	Mwakaboko	17	1	904	49,036	27,593
Tanzania		99	27	31,206	1,698,535	1,097,006
Malawi		113	5	5,051	272,326	152,707
Total		212	32	36,257	1,970,861	1,249,713

The same village database was used to estimate a project to assist in the balancing of input use between villages, by calculating the required tonnage of basal fertiliser, top dressing and improved seed to achieve target yields of maize in the 2012 cropping season and comparing it with known input use during that year. This was a much more speculative calculation. The cropped area, including the proportion of maize grown in 2012 is reasonably well known by administrative area. This area was distributed *pro rata* to the village population within the administrative unit. The tonnage of inputs delivered, which is known (or at least estimated) by administrative area also has to be distributed by village in the same way. Then the proportion of inputs used on the maize crop has to be estimated (on the basis of the known cropping pattern for the administrative area). Clearly the result, input requirement versus input available by village for the maize crop in 2012, should be treated with caution. Nevertheless the results are interesting. Many villages would not obtain a sufficiently attractive ratio between the cost of incremental inputs required to achieve target maize yields and the value of incremental maize production attained as a result. Prioritising villages with an input : production ratio of over 2.0 and targeting villages which would be expected to achieve at least US$ 100,000 worth of incremental maize production results in the selection of about 35 villages, see Table 8-20.

Table 8-20: Indicative Project of Input Supply, 2015-2022

District	Administrative Unit	Number of villages selected	Incremental maize tons	Incremtnal maize value, US$	Cost of input supply, US$	Input:production ratio	Number of Villages: SWC=Input supply
Mbeya Rural	Iwiji	6	12,432	3,729,510	554,435	6.73	6
Mbeya Rural	Masoko	1	547	164,245	37,349	4.40	-
Kyela	Ikolo	-	-	-	-	-	-
Kyela	Katumba Songwe	-	-	-	-	-	-
Kyela	Ngana	1	368	110,392	20,126	5.49	1
Kyela	Ngonga	2	683	204,862	2,787	73.51	-
Kyela	Ikimba	-	-	-	-	-	-
Kyela	Itope	-	-	-	-	-	-
Ileje	Itumba	-	-	-	-	-	-
Ileje	Mlale	-	-	-	-	-	-
Ileje	Itale	-	-	-	-	-	-
Ileje	Ibaba	-	-	-	-	-	-
Ileje	Ndola	-	-	-	-	-	-
Ileje	Ikinga	-	-	-	-	-	-
Ileje	Kafule	-	-	-	-	-	-
Ileje	Malangali	4	3,600	1,080,120	6,284	171.90	-
Ileje	Kalembo	-	-	-	-	-	-
Ileje	Bupigu	-	-	-	-	-	-
Ileje	Isongole	-	-	-	-	-	-
Ileje	Chitete	-	-	-	-	-	-
Ileje	Mbebe	-	-	-	-	-	-
Mbozi	Iyula	2	4,172	1,251,727	91,254	13.72	2
Mbozi	Nyimbili	7	8,589	2,576,654	166,406	15.48	3
Mbozi	Vwawa	1	431	129,371	41,128	3.15	1
Mbozi	Isandula	3	1,632	489,676	122,579	3.99	1
Momba	Chiwezi	-	-	-	-	-	-
Tunduma	Tunduma	1	438	131,487	34,945	3.76	-
Chitipa	Mwabulambya	-	-	-	-	-	-
Chitipa	Mwenemisuku	-	-	-	-	-	-
Chitipa	Kameme	-	-	-	-	-	-
Chitipa	Chitipa Boma	-	-	-	-	-	-
Karonga	Kilupula	1	395	118,500	25,807	4.59	-
Karonga	Mwakaboko	6	3,165	949,404	191,573	4.96	1
Tanzania		28	32,893	9,868,043	1,077,291	9.16	14
Malawi		7	3,560	1,067,904	217,380	4.91	1
Total		35	36,453	10,935,947	1,294,671	14	15

Note that if the criterion of at least US$ 100,000 in value of incremental production is changed to at least US$ 10,000, then 55 additional villages are selected with an incremental value of production of only US$ 1.8 million: by selecting the larger value benefits of scale are obtained.

The villages selected for SWC and input supply are shown in Table 8-21. The Table includes present and projected population and cropping statistics. It should be emphasised that crop area data is disaggregated from data collected by administrative area and projections are only as good as the underlying assumptions and the quality of the data. Direct data collection, survey and participative planning with the community at village level will be essential for project preparation. Villages can be added or deleted from the list by changing selection criteria. The scope of work generated by the list should be manageable both financially and administratively. However, it is important to keep basin impact high. At project review, one weakness of the Songwe River Trans-boundary

Catchment Management Project (SRCTMP) was identified as over-concentration on only a few villages.

The original proposition for this project was that both investment in SWC and provision of sufficient inputs would lead to the achievement of target maize yields. This assumption can now be tested; see the final column of Table 8-20. There is some correspondence, but only 15 villages (out of the 30-35 villages selected for each project) qualify for inclusion in both the SWC and Input Supply projects. This suggests that those villages most needing SWC works are not necessarily short of inputs, and the converse. Of course, we do not know in which villages SWC measures have already been introduced and we also aware that factors other than technical requirement direct the distribution of inputs.

Note that about one third of the villages are selected from the administrative areas identified in Table 6-6 which are expected to be high growth areas in respect of the expansion of the cultivated area in the period 2012-2022.

Table 8-21: Selected Villages for SWC and Input Supply

DISTRICT	WARD_TA	VILLAGE	Area SRB ha	HH AT CENSUS	PROJECTED HH 2022	Cropped area of village 2012	cropped land less than 3%, ha	cropped land more than 3% and less than 4.5%, ha	cropped land more than 4.5% and less than 7.5%, ha	cropped land more than 7.5% and less than 10.5%, ha	cropped land more than 10.5% and less than 13.5%, ha	cropped land more than 13.5% ha	Estimated Total cropped 2022	Estimated cost of SWC works, US$	Estimated cost of incremental inputs, US$	Estimated Labour days for SWC work	Rainfall mm pa	Altitude, m	Selected for SWC	Selected for input supply
Mbozi	Isandula	Ludewa	1,571	234	231	742	68	176	222	282	181	-	928	80,058	28,029	31,360	1,113	1,465	1	1
Mbeya Rural	Iwiji	Izumbwe II	2,092	644	635	832	159	338	287	55	-	-	848	36,553	78,757	39,874	1,493	1,885	1	1
Mbeya Rural	Iwiji	Izyira	1,989	521	514	791	263	297	246	6	-	-	887	28,462	72,970	35,170	1,066	1,885	1	1
Mbeya Rural	Iwiji	Iwiji	3,233	652	644	1,286	407	533	371	-	-	-	1,311	47,057	118,638	54,920	1,228	1,885	1	1
Mbeya Rural	Iwiji	Isanda	2,918	514	507	1,157	88	186	312	245	280	196	1,180	66,059	106,760	44,980	1,201	1,885	1	1
Mbeya Rural	Iwiji	Masoye	2,488	339	335	589	108	194	194	218	234	42	1,068	53,513	91,204	34,374	1,122	1,885	1	1
Mbeya Rural	Iwiji	Mbogo	2,401	-	-	955	34	66	161	175	261	336	934	61,986	88,105	46,220	1,231	1,885	1	1
Mbozi	Iyula	Idweli	2,164	1,169	1,671	2,445	388	350	287	316	276	490	2,180	106,716	32,056	73,583	1,212	1,892	1	1
Mbozi	Iyula	Ilomba	3,883	1,255	1,793	4,387	316	457	467	556	625	1,347	3,768	222,375	58,596	168,477	1,213	1,960	1	1
Karonga	Mwakaloko	Kaivezi	2,423	230	250	1,332	218	367	327	220	-	-	1,134	49,036	17,891	27,583	1,339	648	1	1
Kyela	Ngonga	Ngana	4,731	472	466	1,001	1,481	500	383	396	236	-	2,996	85,723	20,126	51,460	1,025	642	1	1
Mbozi	Nyimbili	Nyimbili	5,618	1,868	1,854	1,799	428	733	832	231	-	-	2,217	96,915	28,430	53,386	1,078	1,578	1	1
Mbozi	Nyimbili	Mpanda	7,651	882	792	2,400	828	1,335	860	-	-	-	3,014	114,016	38,665	68,229	1,106	1,578	1	1
Mbozi	Nyimbili	Hoopa	5,862	579	572	1,839	792	998	599	-	-	-	2,389	78,689	29,671	41,432	1,029	1,578	1	1
Mbozi	Vwawa	Vwawa	1,077	816	-	594	50	87	186	198	156	223	772	46,951	41,128	32,569	1,113	1,588	1	1
Leje	Bujagu	Mabuda	6,632	274	271	748	231	373	199	-	-	-	784	29,618	-	13,555	1,001	1,419	1	0
Leje	Chibata	Ibumbilo	2,477	780	691	715	204	397	210	-	-	-	982	31,405	-	16,586	1,088	1,360	1	0
Leje	Chibata	Ntembo	3,335	145	143	634	258	306	272	22	-	-	850	31,612	-	17,091	1,013	1,360	1	0
Leje	Ibabe	Shayo	4,543	387	362	730	247	447	225	-	-	-	919	34,704	-	18,196	1,526	1,898	1	0
Leje	Ilenga	Bwiya	3,206	287	304	681	63	125	198	320	-	-	765	36,470	-	21,794	1,628	1,044	1	0
Leje	Ilongalo	Izuba	2,441	529	522	1,303	338	679	359	-	-	-	1,377	53,707	-	28,231	1,012	1,311	1	0
Leje	Ilale	Ilale	5,215	677	668	1,319	133	319	484	443	-	-	1,240	64,523	-	37,683	1,398	1,861	1	0
Leje	Ilumba	Ilumba	7,538	1,777	2,561	1,556	551	765	748	678	752	-	3,681	182,423	-	113,429	938	1,454	1	0
Leje	Kafule	Kapelekeno	1,865	686	998	725	49	156	182	268	98	-	746		-	25,252	1,380	1,463	1	0
Leje	Kalembo	Kalembo/Msangala	2,003	423	418	667	12	58	85	111	188	253	698		33,598	32,804	1,331	1,809	1	0
Leje	Kalembo	Kalesa/Ibondi	2,158	241	208	705	39	81	130	166	260	72	739	43,913	181,337	29,660	1,261	1,809	1	0
Chitipa	Kamoma	Solomon Mwambeko	3,312	297	387	682	281	526	299	227	-	-	1,438	62,287	189,422	34,730	1,112	1,461	1	0
Leje	Mbebe	Mapogoro	1,975	363	358	682	386	518	357	179	-	-	1,440	66,267	-	31,240	1,112	1,440	1	0
Chitipa	Mwabulambya	Mwanchenga	1,745	238	336	240	307	308	220	174	137	96	1,243	54,189	31,418	33,927	1,212	1,308	1	0
Chitipa	Mwabulambya	Kalosa	2,054	287	374	420	767	900	451	27	-	-	1,375	71,405	54,996	37,670	1,098	1,308	1	0
Chitipa	Mwenemsuka	Mwanguluka	5,549	283	264	644	179	373	383	-	-	-	881	35,538	30,144	28,887	1,549	1,248	1	0
Leje	Ndola	Igumila	4,138	345	340	736	158	346	395	21	-	-	920	40,322	-	21,832	938	1,585	1	0
Mbozi	Isanjilo	Chinyenbi	2,064	320	306	975	613	441	169	-	-	-	1,279	31,167	36,851	16,171	1,112	1,455	0	1
Mbozi	Isandula	Ukaale	5,234	622	614	1,528	1,903	-	-	-	-	-	1,903	-	57,717	-	1,113	1,455	0	1
Karonga	Kilyenda	Mwenekumbilo	2,678	135	169	998	201	258	243	336	374	93	1,468	74,998	25,837	47,952	1,848	669	0	1
Leje	Malangali	Malangali	1,981	518	511	523	13	28	53	71	103	259	539	35,004	826	20,260	1,520	1,232	0	1
Leje	Malangali	Ilondo	1,714	261	257	453	28	72	61	82	98	128	466	27,628	715	14,364	1,297	1,232	0	1
Leje	Malangali	Bulenga	1,656	280	197	437	80	108	196	102	45	-	450	20,413	690	12,284	1,278	1,232	0	1
Leje	Malangali	Chembe	6,721	159	315	1,568	161	388	535	808	246	-	2,643	147,535	4,053	94,535	1,233	1,232	0	1
Mbeya Rural	Masoko	Ibalazya	411	361	356	274	25	67	74	59	55	-	280	14,611	37,349	8,050	1,689	2,105	0	1
Karonga	Mwakaloko	Timothy Chibwana	2,364	175	219	1,876	179	319	389	264	148	-	1,698	51,469	77,040	31,972	2,405	648	0	1
Karonga	Mwakaloko	Alick Mpanda	3,268	289	261	1,482	535	765	208	-	-	-	1,498	50,268	37,253	25,553	2,163	648	0	1
Karonga	Mwakaloko	Lifodi	2,458	139	174	1,118	708	262	239	266	6	-	1,130	42,664	28,090	24,698	1,828	648	0	1
Karonga	Mwakaloko	Ighamba	2,359	34	42	1,672	62	173	218	305	277	-	1,084	60,498	26,957	38,581	1,820	648	0	2
Karonga	Mwakaloko	Alick Mpanda	3,898	53	261	1,772	535	765	511	-	-	-	1,791	66,390	44,541	35,113	2,163	648	0	1
Kyela	Ngonga	Ibeke	783	482	397	553	708	99	-	-	-	-	799	4,944	1,389	2,472	2,265	482	0	1
Kyela	Ngonga	Lugombo	787	341	385	556	707	92	-	-	-	-	884	4,810	1,348	2,405	2,276	482	0	1
Mbozi	Nyimbili	Hasaka	4,428	782	692	1,386	1,093	669	-	-	-	-	1,741	33,457	22,136	16,713	1,133	1,578	0	1
Mbozi	Nyimbili	Hasiwaya	2,152	325	321	675	266	481	71	-	-	-	848	27,976	10,874	14,253	1,112	1,578	0	1
Mbozi	Nyimbili	Mwamba I	3,178	464	458	979	865	364	-	-	-	-	1,229	18,203	15,798	9,180	1,112	1,578	0	1
Mbozi	Nyimbili	Nanwanguwa	4,089	235	220	1,280	388	729	380	-	-	-	1,615	32,053	20,512	27,083	1,025	1,578	0	1
Tunduma	Tunduma	Mpanda	1,717	68	67	556	519	1,016	272	-	-	-	1,812	66,047	34,945	34,062	1,113	1,549	0	1

Note that two village areas in Table 8-21, Chembe and Mwanguluka, are partly within the area that will be inundated by the Lower Dam. As such they have been designated for additional SWC and agricultural support under the ESIA/RAP.

An assessment of the impact of implementing both projects can now be made, by assuming that target maize yields are achieved in the selected villages by 2022 as a result of SWC and improved input supply. Comparison with a base case is difficult because the improvement in yield during the period without the projects is not known. As discussed in Section 6.1 there is no evidence for increases in maize yields in the period 2010-2012. For want of better data, 2012 maize yields calculated by administrative area were used in the village level calculations described here. Table 8-22 shows that with SWC and Input Supply, maize production might be about 347,000 tons in 2022, compared with only 303,000 tons without the interventions and assuming yields remain static. SRB maize production might increase by 13%. At an estimated 2013 farm gate price of maize of US$ 300 per ton, this might add about US$ 13 million to the RGDP. The cost of achieving this might be in the order of US$ 4.5 million for capital expenditure in SWC (including a notional cost for farm labour) and incremental expenditure on inputs that would probably not exceed US$ 1.3 million per annum.

Table 8-22: Comparison of Projected Maize Production Statistics, 2022

	Maize cultivation with SWC + inputsin selected villages in 2022			Without project, no improvement in 2012 maize yields			Without project, but 0.25% per annum increase on 2010 cereal yields		
	Maize tons per ha 2022	Maize area ha 2022	Maize Production tons 2022	Maize, tons per ha 2012	Maize area ha 2022	Maize Production tons 2022	Maize, tons per ha 2022	Maize area ha 2022	Maize Production tons 2022
Mbeya Rural	3.96	10,751	42,611	2.93	10,751	31,490	3.40	10,751	36,603
Kyela	3.58	8,559	30,640	3.27	8,559	28,012	2.52	8,559	21,598
Ileje	3.87	23,626	91,519	3.57	23,626	84,306	4.12	23,626	97,403
Mbozi	4.31	7,561	32,582	2.19	7,561	16,564	2.37	7,561	17,912
Momba	3.33	1,588	5,283	2.33	1,588	3,704	2.66	1,588	4,230
Chitipa	3.33	37,664	125,407	3.25	37,664	122,229	2.66	37,664	100,324
Karonga	2.97	6,445	19,130	2.59	6,445	16,677	3.00	6,445	19,359
Total	3.61	96,195	347,170	3.15	96,195	302,981	3.09	96,195	297,429

The projection of RGDP made in Figure 6-3 and RGDP per capita shown in Figure 6-4 (which is the “without SRBDP” scenario of economic growth) included the assumption of annual cereal yield increases of 0.25% from 2010. Although there is no evidence for such growth from 2010-2012 production statistics, Table 8-22 also compares the expected production with SWC and input supply to selected villages with this scenario. Again, maize production is significantly greater with the interventions proposed.

The question remains, what impact will this small and relatively cheap project, focussing only on SWC and maize productivity, have on the SRB economy? Calculating the value added to incremental production (i.e. the gross value of production minus the cost of intermediate inputs) suggests an annual increase of value added of about US$ 11.9 million. By 2022, the contribution of rainfed crops to RGDP is projected to be U$ 153.5 million, so the project may increase it to US$ 165.5 million, contribute about 7% to the total value added of the sector and mitigate the fall in RGDP per capita predicted post 2022 by when most easily accessible rainfed land in the basin is predicted to be under cultivation.

SWC has been estimated for the entire cultivated area of each village, not just the maize lands. This is because a piecemeal approach to SWC on agricultural land can do more damage than good. So because maize typically occupies about 50% of the cropped area, SWC should contribute to productivity of other rainfed crops as well, but it is unwise to try to estimate benefits crop by crop without empirical data.

Therefore on the grounds of estimated benefits from incremental maize production alone, the project is worth preparing in more detail. At the same time, the contribution of SWC to improved catchment condition and the long-term operation of the Lower Dam may also be considered.

8.8.3 COMMUNITY AND CONSERVATION FORESTRY

Rural fuel wood consumption in SRB was estimated at about 286,000 tons per annum in 2010 (Section 3.3) and predicted to rise 390,000 tons per annum in 2025 (Section 6.3.2.4) due to the growth of population, though the increase will be mitigated by urban drift and use of alternative energy sources. Woody biomass reserves in SRB were estimated to be about 2 million tons with a mean annual increment of about 100,000 tons. Continued reliance on the natural vegetation biomass to meet rural energy demand is clearly unsustainable. Table 6-11 summarises the results of modelling to introduce woodlots into the basin economy that would satisfy half of projected annual fuel wood demand by 2025. Though little information was available on economic production from woodlots and plantations in the period 2010-2012, the area of community and private woodlots is now growing rapidly, as noted in the NR&LUM Sub-programme report.

Unfortunately, the impact of failure in informal fuel wood markets will linger on. Even with the optimistic target of half of rural fuel wood demand being produced from woodlots in 2025, the residual demand is still twice the estimated Mean Annual Increment of woody biomass even as estimated in 2010 (as capital stock is removed, the MAI will decline). This will result in progressive catchment deterioration in SRB, which will accelerate in the early 2020s when hydropower production from the Lower Dam is scheduled.

The NRLUM Sub-programme Report therefore emphasises the importance of SRBC interventions to support forestry development, in particular through support to participative forestry management committees, training of technical staff and improving management of forest reserves. Therefore SRBC will provide direct support to both communities and District authorities to facilitate their current activities. By setting locational priorities for funding, SRBC would probably chose to focus forestry development on areas that will have the greatest impact on catchment quality for management of the Lower Dam. The NR&LUM Sub-programme goes some way to define these focal areas (see Figure 4-5 in that report).

However, these initiatives will not in themselves create economic growth. Theoretically, growth is created by a strategy for increasing demand, increasing supply, or reducing production costs so that prices fall and therefore demand is increased. The SRBC interventions planned in the NRLUM Sub-programme Report will do none of these, but they will reduce environmental depreciation of the natural woody biomass resource.

8.8.4 AQUACULTURE AND FISHERIES

The following initiatives are recommended for the development of aquaculture and fisheries in the context of the SRBDP:

- 50 ha of large scale aquaculture
- A hatchery to produce 2.5 million fingerlings per annum
- A feed mill to produce 1,000 tons of fish feed per annum

The economics of large-scale aquaculture have been reviewed and an enterprise gross margin has been prepared. The hatchery would be vertically integrated into the aquaculture enterprise and will produce fingerlings at about MWK 11.8 each, compared with a commercial unit price of MWK 20. The feed mill, also vertically integrated, will produce pelleted feed at about MWK 137 per kg, compared with a commercial price of about MWK 300 per kg.

The gross margin for the aquaculture enterprise is not presented here, but it suggests that the gross value of production will be in the order of US$ 1.43 million per annum with intermediate costs of US$ 358,500 per annum and the value added of fish production will therefore be about US$ 1,070,000 (US$ 21,400 per ha). With around 25,000 labour days required each year the return to labour is about US$ 42 per labour day. The contribution of aquaculture to the basin economy will therefore be small but significant. The enterprise will produce about 400 tons of fish annually, or about 20% of the estimated 2,000 tons per annum consumption of the SRB population (though in all likelihood the marketing strategy for this tonnage of fish would be to direct it to main centres of population). The location of large-scale aquaculture must ideally be close to the feeder canals below counter-weir to avoid any issues of water supply. Obviously pumping costs should be avoided.

8.9 COMMUNITY DEVELOPMENT

8.9.1 HEALTH

The Community Development Sub-programme recommends the construction of eight new health centres and 55 dispensaries in the SRB, and up-grade some dispensaries to health centres. The sub-programme notes that these interventions are already included in the budgets of District administrations and prioritises the construction of four new health centres (Chisansu, Ngerenge, Ngana and Isuto), the rehabilitation of a rural hospital (Kaporo) and nice new dispensaries in Ileje. The total health programme is valued at US$ 2.3 million.

The approach taken to valuing the economic impact of the proposed programme was to estimate the incremental labour requirements of the facilities planned and multiply by the return to labour estimated for SRB health workers (about US$ 20 per day, see section 4.4 and equivalent to value added). The value added of the proposed health services is about US$ 0.32 million per annum. See Table 8-15. Note this is not an “economic” measure: the economic value of health services takes into account the consumer surplus (related to willingness by the person receiving treatment to pay for the service received)

and the incremental value of production that person is able to achieve through being healthy rather than sick. Noting that the occupancy rate of labour is about 0.4 in SRB as a whole in 2013, this value is likely to be small.

Table 8-23: Contribution to SRB RGDP Health Services

District	Ward/T/A	New and upgraded Health centres	New Rural Hospital	New Dispensaries	Proposed Investment, US$ '000	Estimated gross value of production, US$'000	Estimated Value Added, US$ '000	Estimated Intermediate costs, US$'000
Mbeya Rural	Iwiji	1			850	152	25	127
Mbeya Rural	Masoko				0	-	-	-
Kyela	Ikolo				0	-	-	-
Kyela	Katumba Songwe				0	-	-	-
Kyela	Ngana	1			850	152	25	127
Kyela	Ngonga				0	-	-	-
Kyela	Ikimba				0	-	-	-
Kyela	Itope				0	-	-	-
Ileje	Itumba				0	-	-	-
Ileje	Mlale				0	-	-	-
Ileje	Itale				0	-	-	-
Ileje	Ibaba			1	255	53	15	38
Ileje	Ndola			1	255	53	15	38
Ileje	Ikinga			1	255	53	15	38
Ileje	Kafule			1	255	53	15	38
Ileje	Malangali			1	255	53	15	38
Ileje	Kalembo			1	255	53	15	38
Ileje	Bupigu			1	255	53	15	38
Ileje	Isongole			1	255	53	15	38
Ileje	Chitete			1	255	53	15	38
Ileje	Mbebe				0	-	-	-
Mbozi	Iyula				0	-	-	-
Mbozi	Nyimbili				0	-	-	-
Mbozi	Vwawa				0	-	-	-
Mbozi	Isandula				0	-	-	-
Momba	Chiwezi				0	-	-	-
Tunduma	Tunduma				0	-	-	-
Chitipa	TA Mwabulambya				0	-	-	-
Chitipa	TA Mwenemisuku	1			850	151	23	127
Chitipa	TA Kameme				0	-	-	-
Chitipa	Chitipa Boma				0	-	-	-
Karonga	TA Kilupula	1			850	151	23	127
Karonga	SC Mwakaboko		1		425	157	93	64
Totals		4	1	9	6,117	1,241	323	917

The incremental value added can be compared to the projected incremental value added of health services in SRB in the period 2013-2022. This averages at about US$ 100,000 per annum, so the incremental value added of the health programme proposed accounts for about three years growth. This is small, but sufficiently significant to include as an incremental economic benefit to SRBD. Similarly, incremental intermediate costs of the programme would be about US$ 90,000 per annum: the projected incremental annual intermediate costs for SRB basin health services 2013-2022 are only US$ 30,000. This represents an increase in the SRB government health budget that will not be funded easily. It was concluded therefore the economic value of the proposed programme is measurable and should be added to the basin RGDP accounts.

8.9.2 EDUCATION

The Community Development Sub-programme observes that educational targets are generally met in SRB, at least in respect of access and pupil:teacher ratios despite the remoteness and rough terrain of both Ileje and Chipita Districts which comprise about 71% of the basin area. The Sub-programme emphasises the importance of increasing the density of rural roads to mitigate this problem. Water supply at schools is also concluded to be important. An improvement in both these services will mean that teachers are more encouraged to take up posts in what is seen as a disadvantaged area. Sections 8.9.4 and 8.9.3 describe some of the significant improvements intended for roads and water supply in the basin, which will also assist the expansion of the education sector. Nevertheless, with the assistance of the District authorities, bottlenecks have been identified in educational infrastructure. These mostly relate to school capacity, though teaching staff housing also has to be planned for.

The Community Development Sub-programme recommends the construction of five new primary schools and three new secondary schools. At existing schools it plans the construction of 58 primary school classrooms and eight secondary school classrooms. 100 houses are recommended for teachers' accommodation. The total investment planned is US14.1 million in 2013 prices. Very roughly it would provide additional education capacity equivalent to about 9% of the SRB population of 60,000 under 18's.

The approach taken to valuing the economic impact of the proposed programme was to estimate the incremental labour requirements of the facilities planned and multiply by the return to labour estimated for SRB teachers (about US$ 20 per day, see Section 4.4 and equivalent to value added). The calculation is summarised in Table 8-24. The value added of the proposed education services is about US$ 1.02 million per annum. Note this is not an "economic" measure: the economic value of education services takes into account the incremental value of production that person is able to achieve through being educated rather than illiterate. This is very important to allow structural change in the economy and an increase in the return to labour, and hence the RGDP.

Table 8-24: Contribution to SRB RGDP Educational Facilities

District	Ward/T/A	New Primary Schools	Class-rooms	Staff houses	New Secondary schools	Secondary school classrooms	Total investment proposed, US$'000	Estimated Labour days for operation	Value added, US$ '000	Intermediate goods, US$ '000	Gross value of production, US$ '000
Mbeya Rural	Iwiji						-	-	-	-	-
Mbeya Rural	Masoko						-	-	-	-	-
Kyela	Ikolo				1		1,311	2,640	-	197	197
Kyela	Katumba Songwe						-	-	-	-	-
Kyela	Ngana						-	-	-	-	-
Kyela	Ngonga						-	-	-	-	-
Kyela	Ikimba						-	-	-	-	-
Kyela	Ilopa	1					1,262	1,320	25	189	214
Ileje	Itumba					4	39	1,056	20	6	26
Ileje	Mlale						-	-	-	-	-
Ileje	Itale	1					1,262	1,320	25	189	214
Ileje	Ibaba						-	-	-	-	-
Ileje	Ndola						-	-	-	-	-
Ileje	Ikinga						-	-	-	-	-
Ileje	Kafule					4	39	1,056	20	6	26
Ileje	Malangali						-	-	-	-	-
Ileje	Kalembo						-	-	-	-	-
Ileje	Bupigu						-	-	-	-	-
Ileje	Isongole						-	-	-	-	-
Ileje	Chitete						-	-	-	-	-
Ileje	Mbebe	1					1,262	1,320	25	189	214
Mbozi	Iyula		6	13			450	4,884	92	68	160
Mbozi	Nyimbili		6	13			450	4,884	92	68	160
Mbozi	Vwawa		6	13			450	4,884	92	68	160
Mbozi	Isandula	1	6	13	1		3,023	8,844	167	453	620
Momba	Chiwezi						-	-	-	-	-
Tunduma	Tunduma						-	-	-	-	-
Chitipa	TA Mwabulambya		6	8			333	3,696	65	50	115
Chitipa	TA Mwenemisuku		6	8			333	3,696	65	50	115
Chitipa	TA Kameme		6	8	1		1,643	6,336	111	246	358
Chitipa	Chitipa Boma		6	8			333	3,696	65	50	115
Karonga	TA Kilupula		6	8			333	3,696	65	50	115
Karonga	SC Mwakaboko	1	6	8			1,595	5,016	88	239	327
Totals		5	58	100	3	8	14,117	58,344	1,016	2,117	3,134

The incremental value added can be compared to the projected incremental value added of education services in SRB in the period 2013-2022. This averages at about US$ 221,000 per annum, so the incremental value added of the education programme proposed accounts for over four years growth. This is a very significant contribution to the SRBD RGDP that could not be achieved in the confines of the existing pattern of budgetary expenditure.

8.9.3 WATER SUPPLY AND SANITATION

The pressure of meeting rural water supply and sanitation targets in Government policy papers is acute in the SRB but, as noted in the Community Development Sub-programme, insufficient funding is available from local budgets. Therefore District authorities are seeking alternative sources of finance. The sub-programme suggests that an overarching objective for water supply in the basin would be that every household has access to potable water within 400-500 metres (depending on national targets) of the dwelling place; an aspiration which was articulated in the discussion leading to the SRBDP Shared Vision Statement. The sub-programme presents statistics to show that at the very best, no more than 60% of the population have this level of access – and a high proportion that do, only have access to non-functioning supply. In this context the sub-programme notes that SRBC, closely connected with the management of the Lower

Dam, will be expected to contribute significantly. As a priority water supply and sanitation investment is required in the border towns, in particular Kasumulu and Songwe.

The proposals for water supply support by SRBDP, articulated in the SRBDP report Water Related Social Infrastructure for Water Supply, are summarised in Table 8-25 by administrative area. The investment required will total US$ 12.3 million and will mostly be directed to the creation of water service areas supplied by groundwater. About 267,000 people may benefit, or over 65% of the population of SRB.

Table 8-25: Contribution to SRB RGDP Water Supply Schemes

District	Ward/TA	Boreholes, no.	Pumps, no.	Storage volume, m3	Pipework, m	Cost estimate, US$		POPULATION
						Investment cost US$	Recurrent US$ pa	
Mbeya Rural	Iwiji	6	6	6	200	626,680	41,759	17696
Mbeya Rural	Masoko	1	1	1	35	76,240	4,327	2390
Kyela	Ikolo	-	-	-	-	-	-	0
Kyela	Katumba Songwe	-	-	-	-	-	-	0
Kyela	Ngana	-	-	-	-	-	-	0
Kyela	Ngonga	-	-	-	-	-	-	0
Kyela	Ikimba	-	-	-	-	-	-	0
Kyela	Itope	-	-	-	-	-	-	0
Ileje	Itumba	3	3	1	400	484,251	47,910	11778
Ileje	Mlale	1	1	1	60	254,612	9,728	5381
Ileje	Isoko	3	3	3	150	330,576	11,824	6541
Ileje	Ibaba	2	2	2	120	296,464	11,346	6275
Ileje	Ndola	4	5	4	100	470,920	16,341	9039
Ileje	Ikinga	3	3	3	110	237,212	11,966	6619
Ileje	Kafule	3	3	3	125	286,700	15,613	8636
Ileje	Malangali	-	-	-	-	-	-	0
Ileje	Kalembo	-	-	-	-	-	-	0
Ileje	Bupigu	4	4	4	50	234,760	10,607	5867
Ileje	Isongole	2	2	2	125	221,764	17,371	9609
Ileje	Chitete	2	2	2	70	208,508	8,847	4893
Ileje	Mbebe	2	2	2	90	288,496	12,740	7047
Mbozi	Iyula	3	3	3	110	435,660	29,035	16060
Mbozi	Nyimbili	9	9	9	260	1,130,408	50,043	27680
Mbozi	Vwawa	-	-	-	-	-	-	0
Mbozi	Isandula	3	3	3	105	326,928	13,974	7729
Momba	Chiwezi	1	1	1	50	164,968	6,570	3634
Tunduma	Tunduma	-	-	-	-	-	-	0
Chitipa	Mwabulambya	26	26	840	210,903	3,402,836	74,455	61829
Chitipa	Mwenemisuku	8	8	210	36,142	677,704	17,934	14893
Chitipa	Kameme	10	10	320	98,295	1,507,540	26,152	21716
Chitipa	Chitipa Boma	3	3	400	25,300	679,790	31,459	11617
Karonga	Kiliputa	-	-	-	-	-	-	0
Karonga	Mwakaboko	-	-	-	-	-	-	0
	Tanzania	52	53	50	2,160	6,075,167	320,000	110,055
	Malawi	47	47	1,770	370,640	6,267,870	150,000	156,877
	Total	99	100	1,820	372,800	12,343,037	470,000	266,932

The calculation of value added, intermediate costs and return to labour was calculated, see Table 8-26. The gross value of production of water is the opportunity cost in time of collecting it, plus the cost of intermediate products (spare parts, fuel etc.) for operation and maintenance, plus the labour costs of operation, management and maintenance. Value added is in the order of US$ 1.9 million per annum (in constant 2013 US$), equivalent mostly to the cost of the large but inexpensive labour force required to collect

water from the target distance from dwelling places, but also including the scheme management costs.

Table 8-26 Estimate of Value Added and Return to Labour of Village Water Supply

District	Ward/TA	Investment cost of water supply, US$	Renovated water supply and boreholes, US$ '000	Estimated people served	Gross value of water, US$ '000 pa	Value added of water, US$ '000 pa	Intermediate Products, US$ '000 pa	Labour days pa	Return to labour, US$/labour day
Mbeya Rural	Iwiji	626,680	-	17,696	176	138	38	155,443	0.89
Mbeya Rural	Masoko	76,240	-	2,393	23	18	5	20,360	0.88
Kyela	Ikolo	-	-	-	-	-	-	-	
Kyela	Katumba Songwe	-	-	-	-	-	-	-	
Kyela	Ngana	-	-	-	-	-	-	-	
Kyela	Ngonga	-	-	-	-	-	-	-	
Kyela	Ikimba	-	-	-	-	-	-	-	
Kyela	Itope	-	-	-	-	-	-	-	
Ileje	Itumba	484,251	-	11,778	137	102	36	113,517	0.90
Ileje	Mlale	254,612	-	5,381	51	41	10	45,782	0.88
Ileje	Itale	330,576	-	6,541	62	49	12	55,651	0.88
Ileje	Ibaba	296,464	-	6,275	59	47	12	53,389	0.88
Ileje	Ndola	470,920	-	9,039	85	68	17	76,904	0.88
Ileje	Ikinga	237,212	-	6,619	62	50	12	56,315	0.88
Ileje	Kafule	286,700	-	8,636	81	65	16	73,476	0.88
Ileje	Malangali	-	-	-	-	-	-	-	
Ileje	Kalembo	-	-	-	-	-	-	-	
Ileje	Bupigu	234,760	-	5,867	55	44	11	49,917	0.88
Ileje	Isongole	221,784	-	9,609	90	72	18	81,754	0.88
Ileje	Chilete	208,508	-	4,893	46	37	9	41,631	0.88
Ileje	Mbebe	288,496	-	7,047	66	53	13	59,957	0.88
Mbozi	Iyula	435,660	-	16,060	151	121	30	136,640	0.88
Mbozi	Nyimbili	1,130,408	-	27,680	261	208	52	235,505	0.88
Mbozi	Vwawa	-	-	-	-	-	-	-	
Mbozi	Isandula	326,928	-	7,729	73	58	15	65,759	0.88
Momba	Chiwezi	164,968	-	3,634	34	27	7	30,919	0.88
Tunduma	Tunduma	-	-	-	-	-	-	-	
Chitipa	TA Mwabulambya	3,402,836	583	61,829	545	414	131	507,386	0.82
Chitipa	TA Mwenemisuku	677,704	583	14,893	131	100	32	122,216	0.82
Chitipa	TA Kameme	1,507,540	583	21,716	191	145	46	178,208	0.82
Chitipa	Chitipa Boma	679,790	-	11,617	120	86	33	104,067	0.83
Karonga	TA Kilupula	-	500	-	-	-	-	-	
Karonga	SC Mwakaboko	-	500	-	-	-	-	-	
Totals		12,343,037	2,748	266,932	2,500	1,944	556	2,264,795	0.86

The incremental value of the proposed new and rehabilitated water supply would augment the value added of the sector by about 22% from the predicted US$ 5 million per annum in 2013. Intermediate costs of operation and maintenance would rise by 10%. The proposed water supply programme is therefore a significant addition to the SRB RGDP.

8.9.4 ROADS

The Community Development Sub-programme identifies new roads and roads for upgrading in the SRB. These are shown by route, approximate distance and administrative area in Table 8-27. New roads are all recommended to be bituminised (the Lower Songwe Dam access roads and the Tunduma-Itumba road, totalling 79.2 km), roads to be up-graded are all recommended for gravelling (137.2 km), at least initially. The total cost of the road programme is estimated to be US$ 75 million. Access roads to the Lower Dam have already been aligned and designed. The purpose of these roads is to service the dam. Other road interventions were chosen (with District administration consultation) to improve connectivity within SRB. Their routes are between important

locations; they are not intended as feeder or rural roads to provide access to remote or inaccessible areas. However, it is necessary to investigate the contribution these roads may make to the basin economy.

Table 8-27: Proposed New and Upgraded Road Network

District	Ward/TA	Basin ha	Dam Access Roads, Lower, km	Chitipa-Isongole, km	Tunduma-Itumba, km	Isongole-Ikinga km	Total new roads km	Total upgraded roads km
Mbeya Rural	Iwiji	15,176					0	0
Mbeya Rural	Masoko	552					0	0
Kyela	Ikolo	2,056					0	0
Kyela	Katumba Songwe	3,545					0	0
Kyela	Ngana	6,731				15	0	15
Kyela	Ngonga	2,803					0	0
Kyela	Ikimba	2,401					0	0
Kyela	Itope	738					0	0
Ileje	Itumba	10,138			9		9	0
Ileje	Mlale	11,221					0	0
Ileje	Itale	9,812					0	0
Ileje	Ibaba	14,971					0	0
Ileje	Ndola	13,576					0	0
Ileje	Ikinga	11,471	13.6			18	13.6	18
Ileje	Kafule	5,302				14	0	14
Ileje	Malangali	15,071				18	0	18
Ileje	Kalembo	4,167					0	0
Ileje	Bupigu	20,251				40	0	40
Ileje	Isongole	5,855		4		7	0	11
Ileje	Chitete	8,811			13		13	0
Ileje	Mbebe	12,878			12		12	0
Mbozi	Iyula	6,044					0	0
Mbozi	Nyimbili	32,971					0	0
Mbozi	Vwawa	1,093					0	0
Mbozi	Isandula	7,788					0	0
Momba	Chiwezi	4,051			7		7	0
Tunduma	Tunduma	3,760					0	0
Chitipa	Mwabulambya	82,079		21.7			0	21.7
Chitipa	Mwenemisuku	32,800					0	0
Chitipa	Kameme	43,316					0	0
Chitipa	Chitipa Boma	850					0	0
Karonga	Kilupula	8,386					0	0
Karonga	Mwakaboko	24,757	24.42				24.42	0

The first step was to identify the existing road network by administrative area. GIS data provided the data shown in Table 8-28. 65% of roads are just tracks, which may be impassable to road transport for part or even all of the year. A further 18% are “other roads”. Classified roads (tertiary, secondary and primary roads) have a maintenance budget assigned and comprise only 17% of the total road network. The basin road density is 0.68 km per km^2 but overall there are only 0.12 km per km^2 of classified roads.

Table 8-28: SRB Road Density by Road Type and Administrative Area, km

		Basin ha	Primary road	Secondary road	Tertiary Road	Other road	Track	Total	km/km²
Mbeya Rural	Iwiji	15,176	-	5	-	9	73	88	0.58
Mbeya Rural	Masoko	552	-	1	-	-	-	1	0.25
Kyela	Ikolo	2,056	-	-	-	20	-	20	0.99
Kyela	Katumba Songwe	3,545	-	-	-	37	4	41	1.16
Kyela	Ngana	6,731	-	9	-	0	18	27	0.40
Kyela	Ngonga	2,803	-	-	-	34	-	34	1.20
Kyela	Ikimba	2,401	-	-	-	19	4	23	0.95
Kyela	Itope	738	2	2	-	6	-	10	1.40
Ileje	Itumba	10,138	-	17	-	10	48	76	0.75
Ileje	Mlale	11,221	-	12	-	14	25	51	0.46
Ileje	Itale	9,812	-	10	-	16	40	66	0.67
Ileje	Ibaba	14,971	-	12	8	-	62	82	0.55
Ileje	Ndola	13,576	-	17	-	0	78	96	0.70
Ileje	Ikinga	11,471	-	19	-	0	33	52	0.46
Ileje	Kafule	5,302	-	12	3	-	37	53	1.00
Ileje	Malangali	15,071	-	11	-	-	81	93	0.61
Ileje	Kalembo	4,167	-	11	4	3	23	41	0.97
Ileje	Bupigu	20,251	-	31	1	7	93	132	0.65
Ileje	Isongole	5,855	13	7	-	3	31	55	0.93
Ileje	Chitete	8,811	14	-	-	10	66	90	1.03
Ileje	Mbebe	12,878	13	-	-	31	44	89	0.69
Mbozi	Iyula	6,044	-	2	-	11	30	44	0.72
Mbozi	Nyimbili	32,971	-	29	-	31	156	215	0.65
Mbozi	Vwawa	1,093	-	-	-	1	3	4	0.34
Mbozi	Isandula	7,788	-	-	-	13	28	41	0.52
Momba	Chiwezi	4,051	8	-	-	-	20	28	0.69
Tunduma	Tunduma	3,760	-	-	0	2	14	16	0.42
Chitipa	Mwabulambya	82,079	65	1	44	93	442	645	0.79
Chitipa	Mwenemisuku	32,800	2	13	9	27	140	191	0.58
Chitipa	Kameme	43,316	32	-	22	65	196	315	0.73
Chitipa	Chitipa Boma	850	5	-	-	-	8	13	1.56
Karonga	Kilupula	8,386	4	-	-	28	24	56	0.67
Karonga	Mwakaboko	24,757	17	25	-	32	85	159	0.64
Total		425,420	176	246	92	523	1,907	2,944	0.69

A simple regression analysis was carried out to identify a relationship between RGDP (predicted for 2013) by administrative area and road density. Relatively high road densities should be observed in areas with high RGDP. As expected, the correlation is positive: a 0.1 km/km^2 increase in road density leads to an increase in RGDP of US$ 153,000 per annum. The coefficient is significant at 99%. This is an indication of the benefit in increased RGDP of increasing road density. Unfortunately the statistic does not assist in estimating the benefit of upgrading an existing road alignment. To attempt an estimate of this benefit, coefficients were estimated for progressively increasing road density, estimating for the density of tracks alone, tracks plus other roads, etc. The hypothesis is that a greater proportion of RGDP would be explained by the addition of lengths of progressively higher order roads. Interestingly, quite the opposite was observed. Increasing the density of other roads and tracks together by 0.1 km/km^2 leads to an increase in RGDP of US$ 209,000 per annum. Progressively adding the road density of classified roads leads to both a reduction in explanation of variability (as expressed by the R^2 statistic) and a reduction in the value of the coefficient.

One explanation may be is that the RGDP economy depends more on the interconnectivity of tracks and other roads to gain access to the classified road network than the classified road network itself, which connects a few locations within the basin to important locations outside. Thus an increase in the classified road network will not boost

the basin economy *per se*, but lead to an increase in the density of tracks and other roads which will. These unclassified roads incur small development costs, mostly being constructed and maintained by the populations they serve. Regressing the density of unclassified roads on classified roads by administrative area gave a result which supports this hypothesis: an increase of the classified road density of I km increases the unclassified network by 4.48 km. The coefficient is significant at 99% and R^2= 0.88.

Most of the proposed road improvements are directed to improving the classified road system. The exceptions are the Lower Dam access roads that would not be built without the necessity of servicing this important piece of infrastructure. But on the assumption that the access roads will contribute to improving road connectivity, along with the primary and secondary roads specifically planned to do so, the regression suggests an additional 216.22 km will increase the SRB unclassified road net work by 969 km. More importantly, these unclassified roads will allow an increase in economic activity equivalent to an increase in US$ 209,000 per annum for every 0.1 km/km^2 increase in unclassified road density achieved. Table 8-29 shows the outline of the calculation to estimate incremental RGDP. This is expected to be in the order of US$ 18 million per annum. The SRB road density is expected to grow from 0.68 km/km^2 now to 0.97 km/km^2.

The investment proposed for roads in SRB is similar in magnitude to irrigation (U$ 75 million and US$ 80 million respectively) but the benefits are expected to be greater (US$ 18 million and US$ 7 million respectively). Irrigation gives reasonably predictable benefits within a defined timescale. The benefits from investment in roads may take many years to realise, because they depend on the capacity of the economy they serve to grow and exploit them. The sight of virtually unused “class A” roads passing through the sparsely populated regions that those very roads were constructed to develop is familiar. However, economic development is likely to be rapid in SRB and it may be that the predicted value of development of the roads programme may be realised as early as 2030.

Table 8-29: Contribution to SRB RGDP Proposed Road Development

District	Ward/TA	Basin ha	Existing classified road length, km	Existing classified road density, Km/km2	Existing non classified road length, km	Existing non classified road density, Km/km2	All existing roads, km	All existing road density, km/km2	Total new and upgraded classified roads km	Expected incremental unclassified road network	Expected incremental unclassified road density, km/km2	All future road density, km/km2	Projected Increase in RGDP per annum, US$ '000 2013
Mbeya Rural	Iwiji	15,176	5	0.04	82.58	0.54	87.96	0.58	0	0.00	0.00	0.58	-
Mbeya Rural	Maloko	552	1	0.25	0.00	0.00	1.37	0.25	0	0.00	0.00	0.25	-
Kyela	Ikolo	2,056	0	0.00	20.30	0.99	20.30	0.99	0	0.00	0.00	0.99	-
Kyela	Katumba Bongwe	3,545	0	0.00	41.16	1.16	41.16	1.16	0	0.00	0.00	1.16	-
Kyela	Ngana	6,731	9	0.13	18.28	0.27	26.95	0.40	15	67.22	1.00	1.62	2,091
Kyela	Ngonga	2,803	0	0.00	33.72	1.20	33.72	1.20	0	0.00	0.00	1.20	-
Kyela	Ikimba	2,401	0	0.00	22.72	0.95	22.72	0.95	0	0.00	0.00	0.95	-
Kyela	Itope	738	5	0.61	5.86	0.79	10.36	1.40	0	0.00	0.00	1.40	-
Ileje	Itumba	10,138	17	0.17	58.62	0.58	76.11	0.75	9	40.33	0.40	1.24	833
Ileje	Mlale	11,221	12	0.11	39.40	0.35	51.47	0.46	0	0.00	0.00	0.46	-
Ileje	Itale	9,812	10	0.10	55.90	0.57	65.73	0.67	0	0.00	0.00	0.67	-
Ileje	Ibaba	14,971	20	0.13	61.81	0.41	81.76	0.55	0	0.00	0.00	0.55	-
Ileje	Ndola	13,576	17	0.13	78.38	0.58	95.50	0.70	0	0.00	0.00	0.70	-
Ileje	Ikinga	11,471	19	0.16	33.66	0.29	52.38	0.46	31.6	141.62	1.23	1.97	2,585
Ileje	Kafule	5,302	16	0.30	37.12	0.70	52.96	1.00	14	62.74	1.18	2.45	2,477
Ileje	Malangali	15,071	11	0.07	81.42	0.54	92.52	0.61	18	80.67	0.54	1.27	1,121
Ileje	Kalembo	4,167	15	0.35	25.79	0.62	40.50	0.97	0	0.00	0.00	0.97	-
Ileje	Bupigu	20,251	32	0.16	99.72	0.49	131.54	0.65	40	179.28	0.89	1.73	1,853
Ileje	Isongole	5,855	20	0.34	34.40	0.59	54.50	0.93	11	49.30	0.84	1.96	1,763
Ileje	Chitete	8,811	14	0.16	76.35	0.87	90.41	1.03	13	58.26	0.66	1.83	1,384
Ileje	Mbebe	12,878	13	0.10	75.13	0.58	88.58	0.69	12	53.78	0.42	1.20	874
Mbozi	Iyula	6,044	2	0.04	41.38	0.68	43.64	0.72	0	0.00	0.00	0.72	-
Mbozi	Nyimbili	32,971	29	0.09	186.54	0.57	215.29	0.65	0	0.00	0.00	0.65	-
Mbozi	Vwawa	1,093	0	0.00	3.70	0.34	3.70	0.34	0	0.00	0.00	0.34	-
Mbozi	Isendula	7,798	0	0.00	40.59	0.52	40.59	0.52	0	0.00	0.00	0.52	-
Momba	Chiweuzi	4,051	8	0.19	20.15	0.50	28.02	0.69	7	31.37	0.77	1.64	1,821
Tunduma	Tunduma	3,760	0	0.01	15.38	0.41	15.72	0.42	0	0.00	0.00	0.42	-
Chitipa	Mwabulambya	82,079	109	0.13	535.13	0.65	644.52	0.79	21.7	97.25	0.12	0.93	248
Chitipa	Mwenemsuku	32,800	24	0.07	167.41	0.51	191.37	0.58	0	0.00	0.00	0.58	-
Chitipa	Kameme	43,316	54	0.12	261.06	0.60	315.10	0.73	0	0.00	0.00	0.73	-
Chitipa	Chitipa Boma	860	5	0.63	7.92	0.93	13.25	1.56	0	0.00	0.00	1.56	-
Karonga	Kilupula	8,386	4	0.05	51.86	0.62	55.79	0.67	0	0.00	0.00	0.67	-
Karonga	Mwakaboko	24,757	42	0.17	116.72	0.47	158.50	0.64	24.42	109.44	0.44	1.18	920
Totals		425,420	514	0.12	2,430	0.57	2,944	0.69	217	971	0.23	0.97	17,777

9 SUMMARY OF THE EDSP

9.1 IMPACT OF SRBDP ON REGIONAL ACCOUNTS

The estimates and calculations contained in the preceding sections can be collated to make a summary of the EDSP and an assessment of the economic impact of the SRBDP. See Figure 9-1.

Black highlighting on the graph identifies the new elements in the economic classification stimulated by SRBDP. These are Soil and Water Conservation (SWC, discussed in Section 8.8.2), major irrigation schemes (Section 8.3), fish and aquaculture (Section 8.8.4), new water supply (Sections 8.4 and 8.9.3), roads (Section 8.9.4), education (Section 8.9.2), health (Section 8.9.1), SRB rural electrification (Section 8.2), tourism (Section 8.7) and hydropower exports (Section 8.1). The graph also shows (on the secondary vertical axis) the estimated RGDP per capita, assuming a population growth rate of about 2.6% per annum, which is on the pessimistic side. SRBDP initiatives are highlighted.

The projection suggests that the SRB economy will grow rapidly at around 7% per annum up to 2024 as a result of SRBDP initiatives. Compare this projection with Figure 6-3 that shows the expected projection if the economy develops without the SRBDP investment scenario: RGDP growth falters after 2022 and barely achieves US$ 230 million by 2030. The projection in Figure 9-1 shows strong growth, particularly after 2022 when the Lower Dam will be commissioned, and the value of RGDP is expected to approach US$ 350 million by 2030.

The projection of RGDP per capita also shows a strong improvement compared to the projection shown in Figure 6-3, increasing significantly up to 2022. Note that the RGDP per capita excludes value added on hydropower sales: this is a basin export but no benefit would accrue directly to the population. Basin RGDP per capita also tends to falter after 2024. This should not be a cause of concern: accumulation of value added will probably come slower than predicted for SWC, roads and rural electrification and the growth in RGDP will be sustained for a longer period. Further, the population growth rate used is 2.7% post 2024: this is high. Figure 9-2 is similar to Figure 9-1 but segregates SRBDP initiatives at the top of the graph: significant growth in the economy is expected to begin in 2016, accelerating rapidly from 2022 when the Lower Dam is commissioned and operational. The value added estimated from the SRBDC initiatives mentioned above is expected to contribute about 30% of the RGDP after 2022.

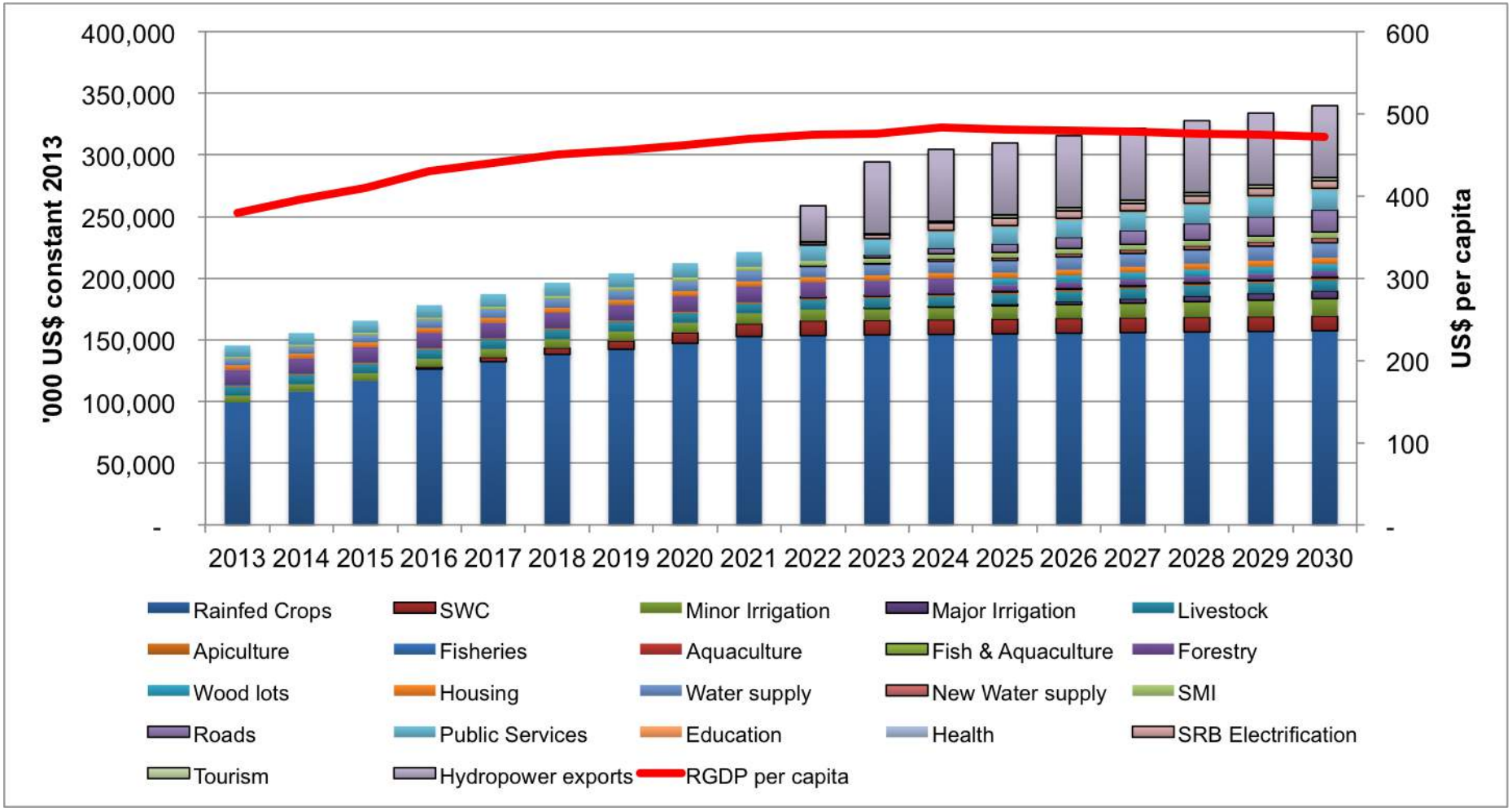


Figure 9-1: Projected SRB RGDP with Highlighted SRDP Initiatives

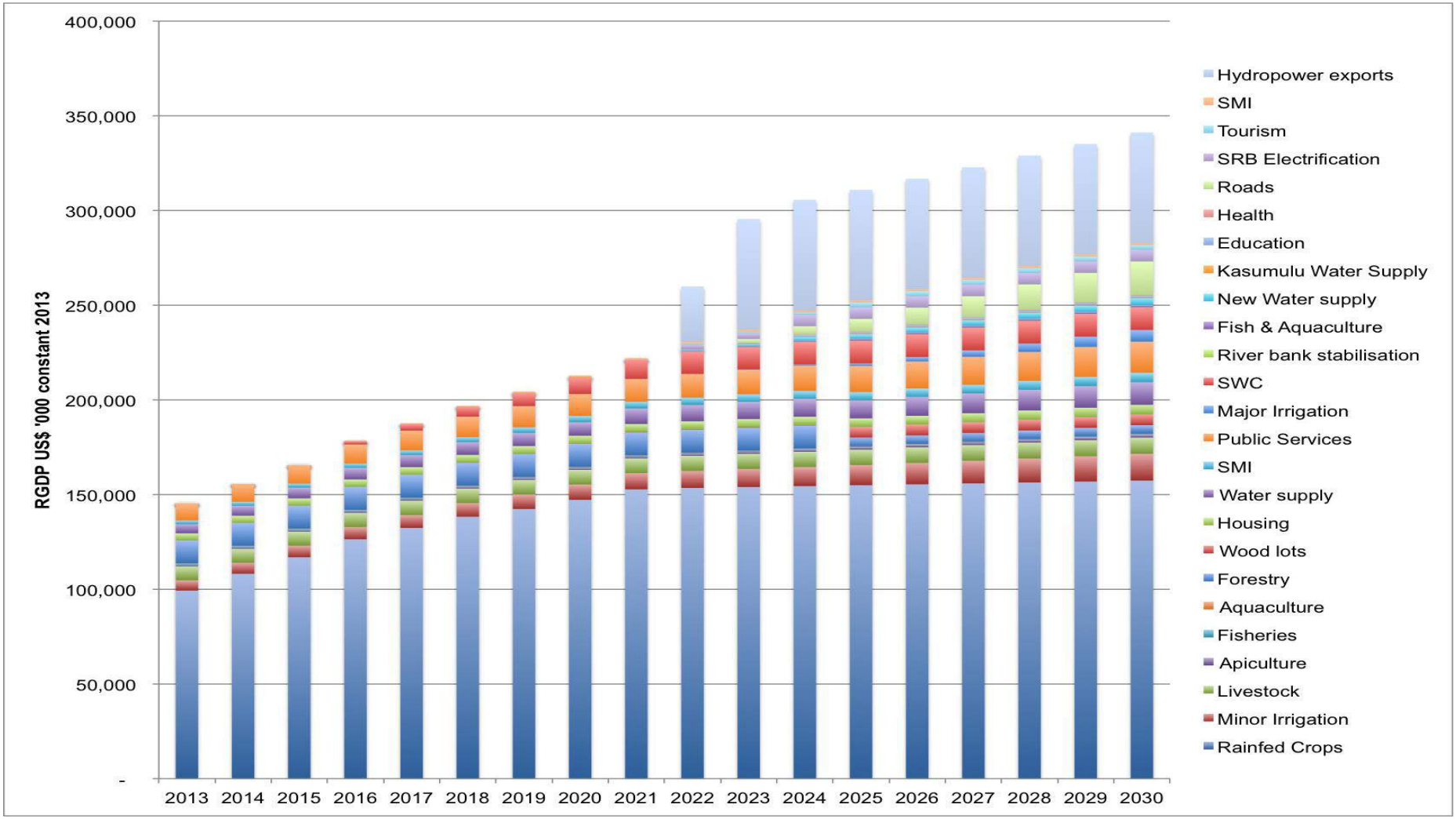


Figure 9-2: Projected RGDP with Segregated SRBDP Initiatives

9.2 EDSP INVESTMENT

The proposed investment to fuel economic growth is summarised in Figure 9-3. Total investment in the EDSP is estimated to be US$ 714.33 million. This is not the total investment proposed under SRBDP: investment and operational costs of SRBC are excluded, as are a number of studies. The full SRBDP investment programme is given in Table 10-1 and totals US$ 726.7 million.

The investment for hydropower accounts for 66% followed by major irrigation (12%), rural electrification (5%) roads (9%) and water supply (3%) Note that the investment cost of the full SRB electrification programme is not included, only the SRBC Electrification Plan described in section 8.2.2. However, value added for the investment proposed by TANESCO and ESCOM is included in the RGDP projection (Figure 9-1). Other investment heads are small in comparison.

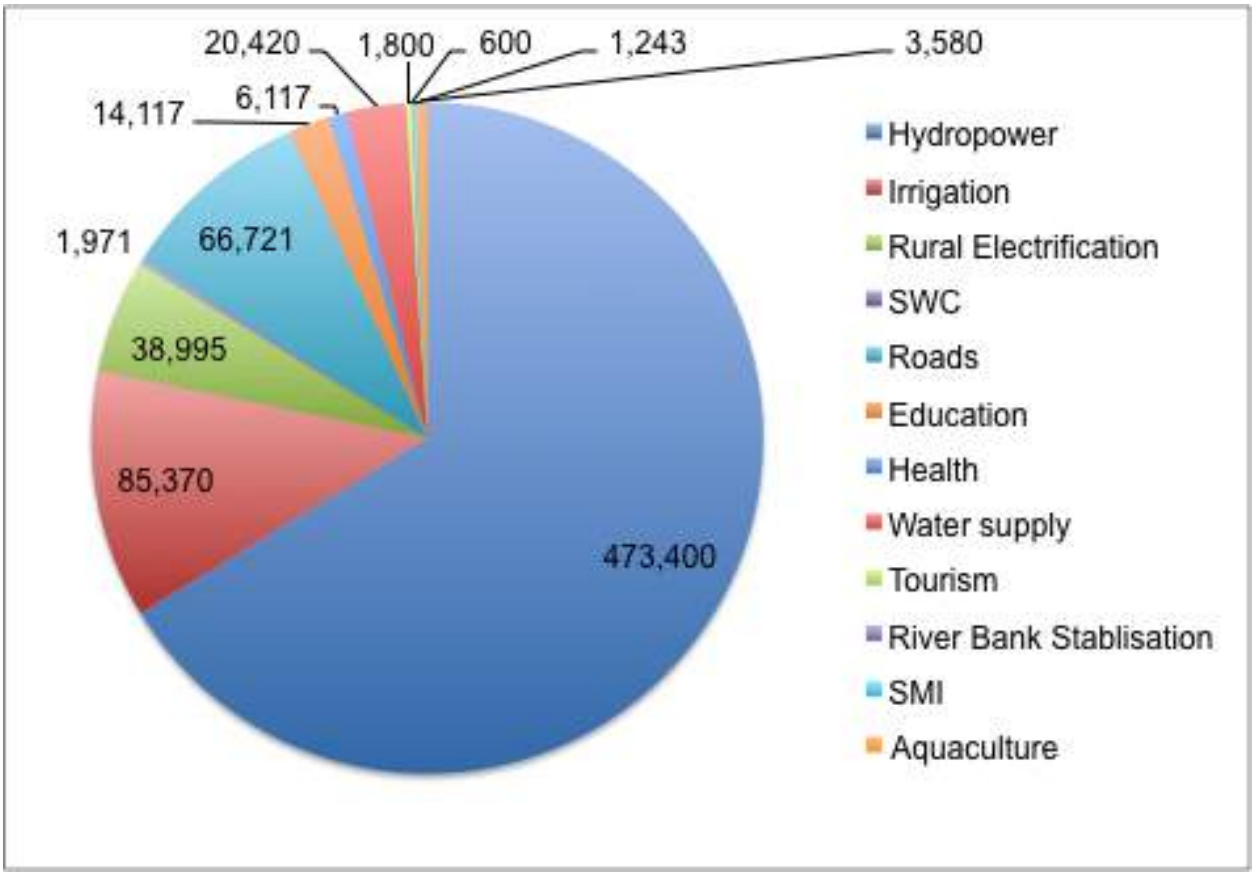


Figure 9-3: Proposed EDSP Investment in the SRB Economy, US$ '000

Of the total investment plan of US$ 699.16 million, 52% will be directed towards Tanzania and 48% to Malawi.

The distribution of investment can be shown by administrative area, as shown in Figure 9-4. The investment in the Lower Dam is not included in the graph. The proportion of hydropower sold in bulk will not benefit the basin population (other than through SRB investment subsidised by bulk sales), so it is better to exclude it. However, investment for power transmission and connection within the basin is included. Of course, the larger

administrative areas tend to attract more investment. Of interest is the type of investment proposed for administrative areas. It is preferable that there be a good mix in each area and the type of investments should be complementary. It is good to see investment in rural electrification associated with other types of investment (e.g. Mwakaboko, which is associated with nine of the ten of the investment heads proposed). Only five administrative areas have only two types of investment proposed, two have only one type, and Tunduma has no investment proposed at all, but this is a tiny proportion of the basin in terms of both area and population.

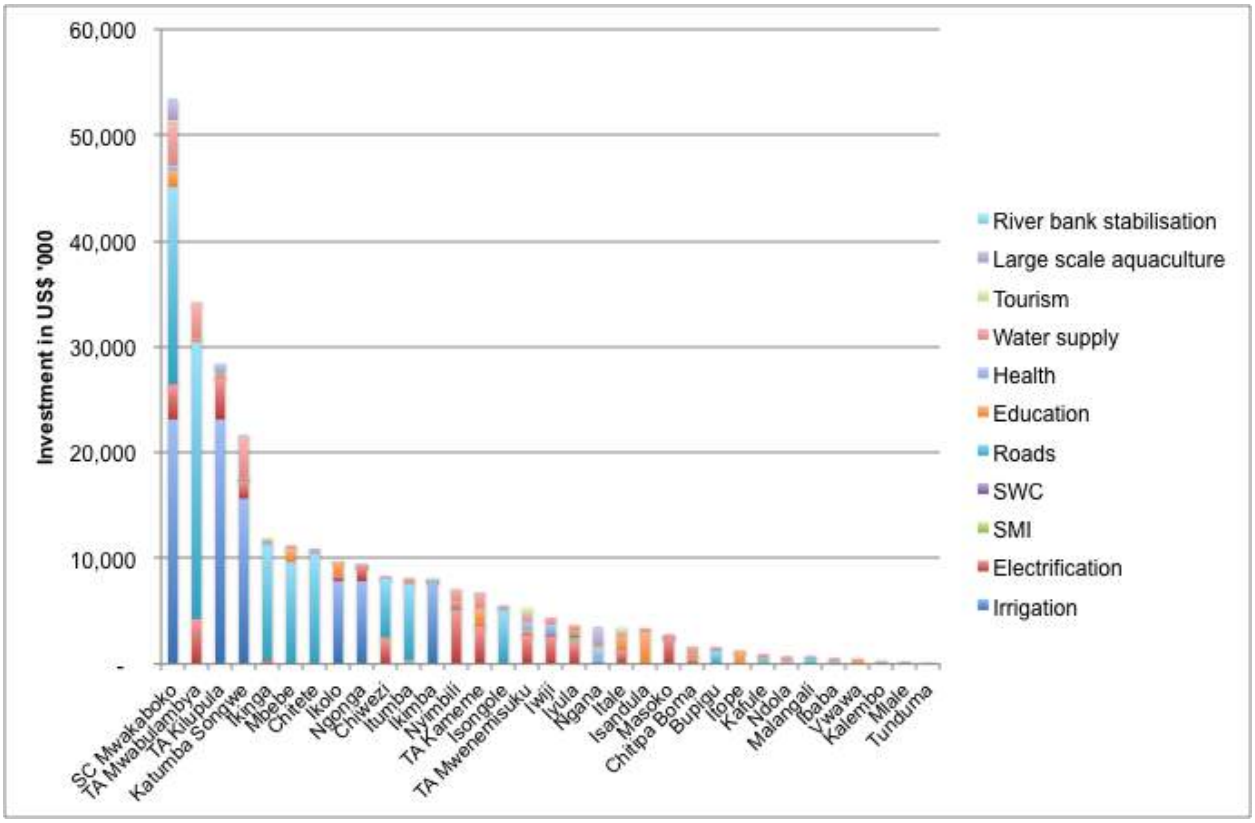


Figure 9-4: Proposed SRBDP Investment by Administrative Area

The distribution of investment in US$ per basin area can also be estimated, as shown in Figure 9-5. Small administrative areas with high population density downstream of the Lower Dam are clear winners as recipients of investment, followed by administrative areas upstream that will benefit from roads and rural electrification and followed again by administrative areas benefitting from investment in health, education and water supply.

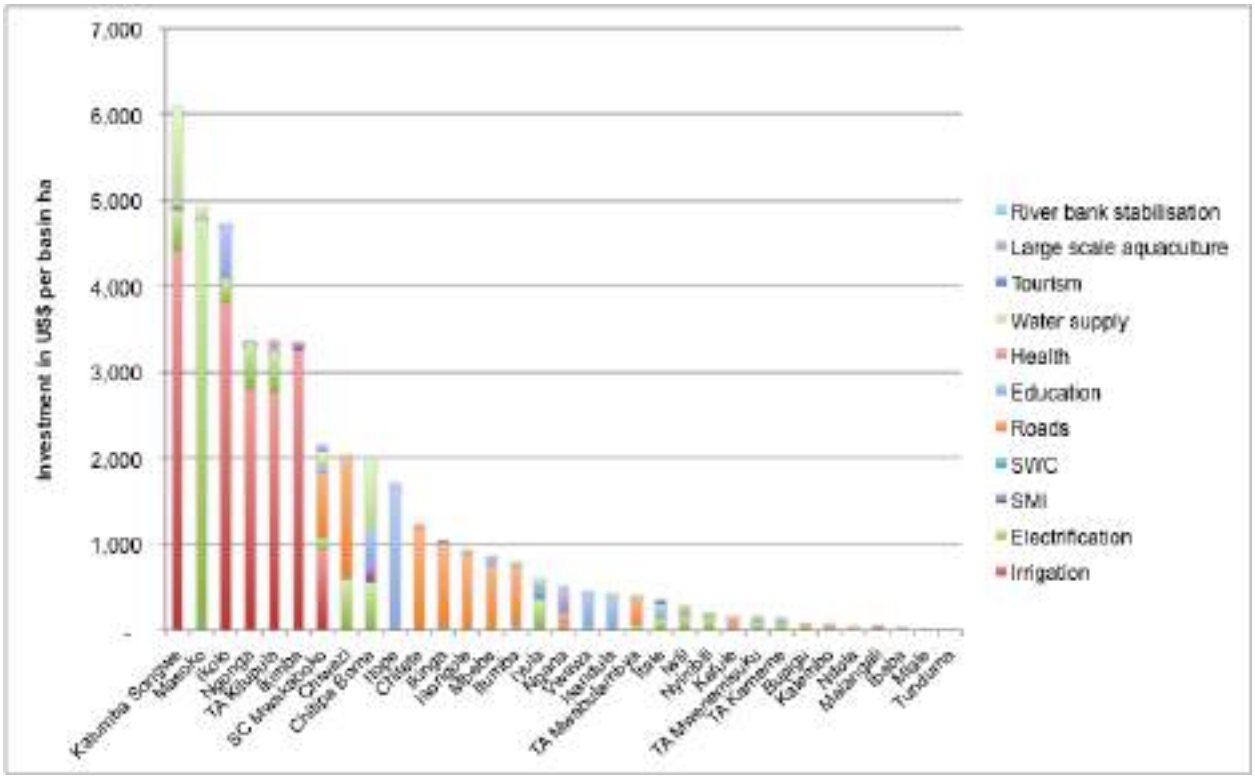


Figure 9-5: Proposed SRBDP Investment by Basin (ha)

The distribution of planned investment can also be shown in US$ per capita, as shown in Figure 9-6. The ranking is rather different; administrative areas with lower population but strategically situated in relation to new roads and with smaller semi-urban areas that are scheduled for electricity supply tend to benefit most.

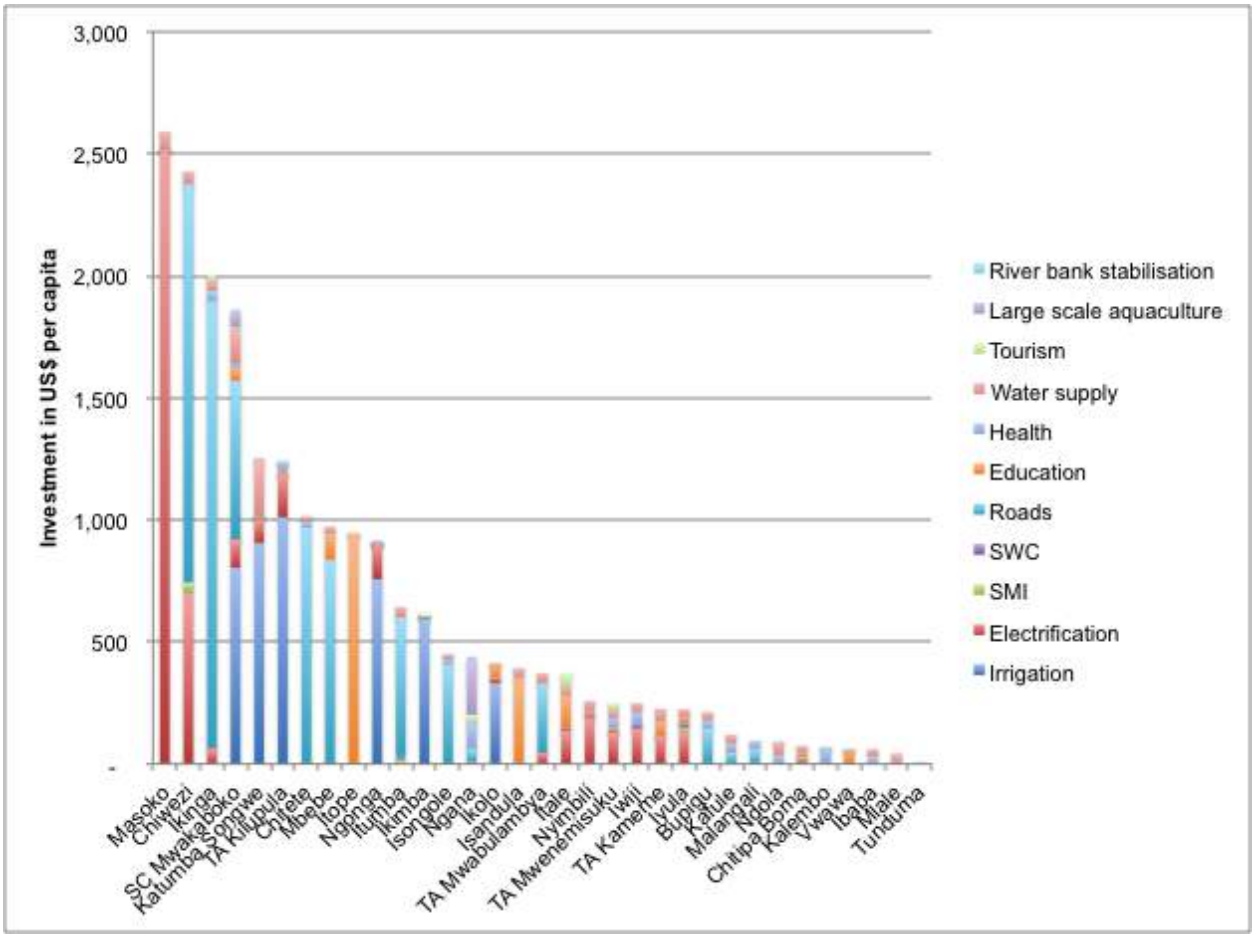


Figure 9-6: Proposed SRBDP Investment per Capita

An indicative ranking system can be complied using the three measures of investment intensity and summing them, as shown in Table 9-1. Overall, Kyela and Karonga Districts are high investment areas: this is inevitable because they are high population areas downstream from the dam and targeted for initiatives that require water control (irrigation, water supply etc.). Neither Ileje nor Chitipa Districts are targeted for high levels of investment: these areas have low population, low urbanisation and, being upstream from the Lower Dam, fewer opportunities for initiatives requiring water control. Generally, more remote areas with low population are targeted for lower investment initiatives.

Higher investment areas include 30% of the SRB population and 19% of the basin area. Moderate investment areas include both 48% of the population and 48% of the basin area. Lower investment areas include 22% of the SRB population and 33% of the basin area. The classification suggests that administrative areas with high population densities are favoured for investment, but unusually so.

Table 9-1: Qualitative Ranking of SRBC Investment

District	Administrative Area	Ranking by US$/per capita	Ranking by US$ per ha	Ranking by Total US$	Total	Qualatitive Ranking
Mbeya Rural	Iwiji	29	24	23	76	lower investment
Mbeya Rural	Masoko	7	8	31	46	moderate investment
Kyela	Ikolo	16	2	9	27	higher investment
Kyela	Katumba Songwe	4	1	3	8	higher investment
Kyela	Ngana	13	17	16	46	moderate investment
Kyela	Ngonga	10	5	11	26	higher investment
Kyela	Ikimba	11	3	8	22	higher investment
Kyela	Itope	9	10	30	49	moderate investment
Ileje	Itumba	12	13	10	35	moderate investment
Ileje	Mlale	23	28	28	79	lower investment
Ileje	Itale	17	21	18	56	moderate investment
Ileje	Ibaba	24	25	25	74	lower investment
Ileje	Ndola	25	29	27	81	lower investment
Ileje	Ikinga	2	12	5	19	higher investment
Ileje	Kafule	20	19	24	63	moderate investment
Ileje	Malangali	22	26	26	74	lower investment
Ileje	Kalembo	18	22	29	69	moderate investment
Ileje	Bupigu	15	27	21	63	moderate investment
Ileje	Isongole	19	16	17	52	moderate investment
Ileje	Chitete	6	11	6	23	higher investment
Ileje	Mbebe	8	14	7	29	higher investment
Mbozi	Iyula	21	15	14	50	moderate investment
Mbozi	Nyimbili	30	32	20	82	lower investment
Mbozi	Vwawa	33	20	32	85	lower investment
Mbozi	Isandula	14	18	15	47	moderate investment
Momba	Chiwezi	1	7	12	20	higher investment
Tunduma	Tunduma	32	33	33	98	lower investment
Chitipa	TA Mwabulambya	28	23	4	55	moderate investment
Chitipa	TA Mwenemisuku	27	31	19	77	lower investment
Chitipa	TA Kameme	26	30	13	69	moderate investment
Chitipa	Chitipa Boma	31	4	22	57	moderate investment
Karonga	TA Kilupula	5	6	2	13	higher investment
Karonga	SC Mwakaboko	3	9	1	13	higher investment

10 FINANCIAL PLANNING FOR SRBDP

10.1 IMPLEMENTATION RESPONSIBILITY

Section 9 describes the impact of the EDSP on the RGDP and quantifies the distribution of the EDSP investment proposed according to administration area, land and population. This section considers how these capital (and recurrent) costs may be mobilised in terms of funding sources and implementation schedule. Table 10-1 summaries the project costs included both in the EDSP (described in Chapters 8 and 9) and the SRBDP as a whole. Note that the projects additional to EDSP projects (highlighted in yellow) are nearly all studies. As such they are relatively small, time-bound, have little or no recurrent costs and are not expected to contribute measurably to SRB RGDP. A notable exception is an item described as Institutional Development Support and Capacity Building for SRBC, for which US$ 7.0 million has been estimated over the first seven years of SRBC operation until revenue from bulk power sales is secured.

Table 10-1: Summary of Investment and Recurrent Costs of SRBC Projects

SRBDP Project Name	TOTAL, US$	TANZANIA, US$	MALAWI, US$	TANZANIA %	MALAWI %	Estimate of recurrent costs in US$ per annum	Proposed Implementation schedule
Lower Songwe Dam and Hydropower Plant	473,400,000	236,700,000	236,700,000	50%	50%	6,154,222	2017-2022
Rural Electrification	38,995,000	20,518,754	18,476,246	53%	47%	1,481,178	2020-2028
Detailed Design for Middle Songwe Dam and HPP	2,000,000	1,000,000	1,000,000	50%	50%		2019
LSRT Irrigation and Drainage Scheme	39,120,000	39,120,000		100%	0%	1,222,216	2019-2022
LSRM Irrigation and Drainage Scheme	46,250,000		46,250,000	0%	100%	1,150,670	2019-2022
Land Tenure Formalization in Irrigation Schemes	513,200	256,600	256,600	50%	50%		2017-2020
Studies on Rain Water Harvesting and Assessment of Irrigation Schemes	146,200	73,100	73,100	50%	50%		2020-2021
Village Water Supply	12,343,037	6,075,167	6,267,870	49%	51%	302,982	2015-2025
Urban Water Supply Kasumulu Town	5,652,040	5,652,040		100%	0%	407,344	2022 – 2023
Urban Water Supply Songwe Town	1,436,815		1,436,815	0%	100%	407,344	2022 – 2023
Community Forestry for the Stabilization of the Lower Songwe River	600,000	300,000	300,000	50%	50%	38,393	2015-2018
Integrated SWC and Fertility Management for Rainfed Maize production	1,970,861	1,698,535	272,326	86%	14%	1,011,461	2015 – 2022
Upper Catchment Area Protection Project	569,800	284,900	284,900	50%	50%	8,914	2018-2020
Improved Forestry Management	513,200	256,600	256,600	50%	50%		2015-2018
Rehabilitation and Construction of New Schools	14,116,574	9,548,580	4,567,994	68%	32%	1,835,745	2015 – 2018
Rehabilitation of existing and construction of new Health Facilities	6,116,506	3,992,719	2,123,787	65%	35%	727,117	2015 – 2018
Rehabilitation and upgrading of existing Roads	66,720,713	40,673,114	26,047,599	61%	39%	500,405	2016 – 2030
Institutional Development, Support and Capacity Building for SRBC [1/]	7,000,000	3,500,000	3,500,000	50%	50%		2016-2022
Lower Songwe Floodplain Early Warning and Response System	770,000	385,000	385,000	50%	50%		2016-2021
Hydrometeorological Monitoring System	425,000	212,500	212,500	50%	50%		2015-2018
Small and Medium Industry (SMI) Development Facility	1,242,500	621,250	621,250	50%	50%		2018 – 2022
Trial stocking of Lower Songwe Dam reservoir	250,000	125,000	125,000	50%	50%		2022- 2024
Development of Fish Ponds in Lower Songwe Basin	3,580,043	1,790,021	1,790,021	50%	50%	550,445	2023- 2026
Promotion of Tourism in SRB	47,000	23,500	23,500	50%	50%		2018-2020
Tourism Development - Tanzania and Malawi	1,800,000	900,000	900,000	50%	50%	606,464	2022-2025
Training for Tourism	130,000	65,000	65,000	50%	50%		2020-2022
Total	725,708,489	372,158,840	354,537,793	51%	49%		

Item 6.1.2 of the Consultant's terms of reference requires that "a basis for the establishment of a financial plan" be prepared, distinguished by the identification of foreign and local costs, an implementation schedule and allocation of contingencies. The financial plan could be improved by distinguishing investment and recurrent costs and financing source.

As recognised by the ToR, the basis of the financing plan is the business plan for electricity production and sales from the Lower Dam, which is already described in Section 8.2.5. This, along with other water management initiatives, including the Irrigation and Drainage Schemes downstream, will comprise the core business of SRBC. It is convenient to pursue the logic further and divide all SRBDP projects listed in Table 10-1 between:

- SRBC core business; i.e. including projects for which SRBC incurs costs and revenue
- SRBC peripheral business; including projects for which SRBC is no more than a conduit for funding i.e. SRBC receives investment funds, or possibly even generates investment funds (post 2022) and passes them on to an implementing agency which then itself incurs costs and revenues in project execution
- Non SRBC business; where (for example) agencies fund SRBDP/EDSP projects directly, by making investment capital available to an appropriate government institution (e.g. a donor partly funds a road construction programme implemented by TANROADS or Malawi's National Roads Authority) or a private investor establishes and operates a business (e.g. aquaculture or tourism).

Such an allocation of SRBDP projects investment costs is suggested in Figure 10-1. SRBC core business will be a substantial proportion of the SRBDP while peripheral business is rather small, as it should be. Projects excluded from the SRBC Business Accounts include the large investments required for road infrastructure in SRB, aquaculture and tourism projects that may best be implemented by private investors and private investors, and a number of studies which may be funded by donors. It is stressed that this division is only indicative.

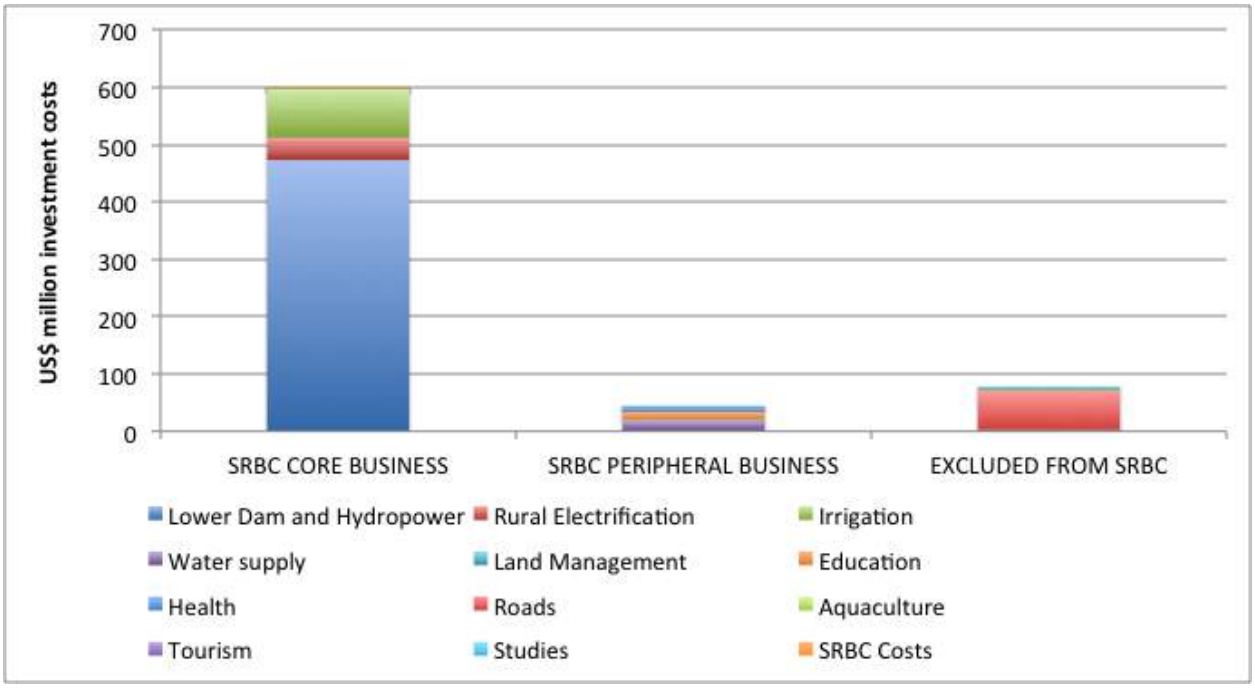


Figure 10-1 Proposed SRBC Responsibility for SRBDP Implementation

10.2 LOAN FINANCING

A key feature of both the SRBC Business Accounts and the SRBDP Financing Plan will be accounting for the obligation to service investment financing. This financing will probably include:

- The Lower Dam
- The Irrigation and Drainage Schemes
- Financing for SRBC investment and operation costs before bulk power sales are realised from 2022.

The terms of this financing are not yet known, so standard ADF terms have been assumed for all three financing packages in respect of grace period (10 years) and repayment period (50 years), service charge on outstanding balance (0.75%) and commitment fee on undisbursed funds (0.5%). It is assumed that SRBC will undertake all financing obligations in respect of the implementation of SRBDP. The financial charges and repayments will pass through the SRBC Bank Account.

10.3 INVESTMENT SCHEDULING

The proposed phasing of SRBDP initiatives are shown in Table 10-1 and can mostly be defined by common sense:

- The Lower Dam construction schedule is fixed: 2017-2022

- The SRBC Electrification Plan will rely on an operational surplus from dam operation; TANESCO and ESCOM may pursue their own investment plans in the meantime: 2020-2028
- SWC and input supply needs to be implemented in the period 2015-2022; it is a relatively small project and therefore not dependent on subsidy from bulk power sales, it needs to be done as soon as possible to avoid an anticipated crisis in land resource availability and early implementation will maximise environmental benefits in time for the commissioning of the Lower Dam
- River Bank Stabilisation (2015 onwards) is also a small project and will raise awareness of the future impact of the Lower Dam in advance of its construction; spending small sums on biological protection now may avoid unnecessary expenditure on structures, especially if the Lower Dam attenuates destructive flows as expected; the value of the environmental flow from the Lower Dam will be enhanced if there is a good downstream environment to conserve
- Large scale aquaculture (2023-2026) cannot take place without reliable water supply from the feeder canals which will not be available before 2022; nevertheless some trials of the feasibility of the project could be done beforehand in areas with water supply
- Large Scale irrigation is obviously time bound by the construction of the Lower Dam: 2019-2022
- SMI support is a small project and need not be dependent on subsidy from bulk electricity sales, particularly with interest from financial partners: 2018-2022
- Tourism development will to some extent depend on there being a dam to visit (though the Lower Dam will be a structure with an unappealing hydrological regime) so it has been scheduled post 2022
- Road development will be a large scale public investment with good but long term benefits; so road construction can start early and finish late: 2016-2030
- It is important to bring tangible benefits from SRBDP to the SRB population as early as possible, so health and education investment is scheduled 2015-2018
- Scheduling of new investment in water supply is conjectural: many areas will require groundwater development and this will need trial boreholes; it is scheduled 2015-2025 for semi-urban and village supply, but the Kasumulu and Songwe water supply schemes (which will be supplied from the irrigation feeder canals) are scheduled for 2022-2023.

Table 10-1 shows the possible scheduling for other, smaller interventions.

10.4 FOREIGN AND LOCAL COSTS

Investment costs for the Lower Dam and Irrigation and Drainage Schemes can be sub-divided into foreign and local costs using the BoQ prepared in the detailed design calculations. The final BoQ are not yet available, but a working estimate of the division for the Lower Dam was established in the Update of the Feasibility Study as 49% foreign exchange cost and the balance as local costs. The foreign exchange costs of the Irrigation and Drainage Schemes will be lower: concrete and reinforcing bar are the main costs and these can be purchased locally: an estimate of about 30% foreign exchange costs is reasonable. Investment costs for SRBC have been prepared in detail: the proportion of foreign costs is 48%. Detailed costs have not been prepared for any other SRBC project, but costs of the Lower Dam, Irrigation and Drainage Schemes and SRBC investment

costs comprise 80% of SRBDB investment costs (US$ 566 million) and it can be estimated with reasonable confidence that foreign exchange costs will be about 46% of that 80%, of which 84% of the 46% will be incurred at the Lower Dam site.

10.5 CONTINGENCIES

Contingency estimates usually narrow as cost estimates are progressively refined through pre-feasibility, feasibility and detailed design studies. Physical contingencies were included as 10% of estimated direct costs (excluding mitigation and detailed design) at feasibility study stage for the Lower Dam and Irrigation and Drainage Schemes. BoQ resulting from detailed design of these investments are not yet available and though it is likely that contingencies will be reduced at that stage, it may be expected that the total cost estimates will also change depending on the incremental data that support the detailed studies. Therefore any contingencies applied for SRBDP projects would be based on feasibility cost estimates and not the more detailed costs that are expected to be available shortly. In short it is not recommended that uncertain allowances for contingencies are applied to cost estimates that will soon be out of date.

There is a second consideration militating against the application of contingencies to the SRBDP cost estimate. Though the costs of the smaller projects and studies in the SRBDP have been prepared at scoping or pre-feasibility level and consequently any contingencies applied to them would be high, in fact this does not matter much because of the very high weighting of the Lower Dam in the SRBDP cost estimate. Even applying very high contingencies to allow for severe over-runs on scoped costs of smaller projects will have little impact in raising the total SRBDP contingency estimate above 10%.

10.6 FINANCIAL ANALYSIS

10.6.1 THE SRBC CORE BUSINESS

As apparent from Figure 10-1, the performance of the SRBC core business is critical to the successful implementation of SRBDP: it will carry 83% of investment costs. To evaluate this performance, the best approach is to prepare outline business accounts for SRBC, which include bank account, profit and loss and balance sheet which summarise the financial performance of the core activities: bulk electricity supply, tariffed sales of electricity within SRB and the costs of river bank stabilisation.

Table 10-2 shows a schedule of operational and investment costs for SRBC estimated for the period 2015-2030. The costs are based on staffing levels at full development specified in the Business Plan; in short SRBC will comprise about 18 professional staff and 45 support staff. Salaries have been costed accordingly and projected to rise to 100% of requirements at 2018. A social cost element (taxes, social security etc.) of 30% has been added.

The requirement of office facilities appropriate for such an organisation and its activities is suggested in the bottom section of Table 10-2. At full development SRBC is expected to be operating nine vehicles from five fully equipped site offices. Training and workshops

are budgeted to account for about 12% of operational costs. Assets are calculated on the basis of investment and replacement costs and depreciation (using Excel's DL function) is deducted annually based on asset age before replacement.

The Table has several lines to be carried into SRBC's business accounts: annual operating and investment expenditure and depreciated value of assets. In addition SRBC will require funding for the first seven years of operation, before bulk electricity sales can be made. It has been assumed that financing of US$ 7.0 million will be available on the terms described in section 10.2 above. The loan instrument assumed is not exactly appropriate for purpose (for example, operational and investment costs total US$ 6.5 million in the first seven years) but financing costs are directly comparable with financing required for other investments. These costs are introduced directly into the business accounts: loan servicing is made from the Bank Account and the loan (the principal of which does not begin to diminish until 2030) is a liability on SRBC's Balance Sheet.

Table 10-2 Estimated SRBC Operational and Investment Costs

	2015	2016	2017	2018	2019	2020	2030
TOTAL OPERATING COSTS							
Salaries and Social costs	167,700	419,250	628,875	838,500	838,500	838,500	838,500
Vehicle operational costs	13,500	13,500	27,000	27,000	40,500	40,500	49,500
Board expenses	8,385	20,963	31,444	41,925	41,925	41,925	41,925
Training	20,790	51,975	77,963	103,950	103,950	103,950	103,950
Workshops	31,500	31,500	31,500	31,500	31,500	31,500	31,500
TOTAL	241,875	537,188	796,781	1,042,875	1,056,375	1,056,375	1,065,375
TOTAL INVESTMENT COSTS							
Vehicles	54,000	-	54,000	-	54,000	-	-
Computers	5,000	-	4,000	4,000	4,000	5,000	5,000
Office equipment	31,250	31,250	31,250	31,250	-	-	-
Site Offices	210,000	-	140,000	-	-	-	-
TOTAL	300,250	31,250	229,250	35,250	58,000	5,000	5,000
Unadjusted office asset value	300,250	331,500	560,750	596,000	654,000	654,000	690,000
Depreciation of office assets	-	27,701	26,260	46,581	43,459	51,871	44,964
Value of office assets	300,250	303,799	534,490	549,419	610,541	602,129	645,036
Stock on hand							
Staff days per annum	2,772	6,930	10,395	13,860	13,860	13,860	13,860
Vehicles	3	3	6	6	9	9	11
Computers	10	10	18	26	34	34	34
Office equipment	0.25	0.5	0.75	1	1	1	1
Site Offices	3	3	5	5	5	5	5
Training days	208	520	780	1,040	1,040	1,040	1,040
Workshops	7	7	7	7	7	7	7

Table 10-3 summarises the activities within the core business of SRBC. Bulk sales of electricity, at over US$ 60 million per annum obviously exceed the operational costs of the Lower Dam (US$ 6.2 million per annum) by a substantial amount, but this is not forecast to happen until 2023. In the meantime there is the period during which the Lower Dam must be constructed during which financing charges and SRBC operating costs are being incurred.

Note also that no income is expected from river bank stabilisation, though a small sum in operational costs is incurred from this activity.

AfDB have already noted that in practice SRBC would not be involved in the retailing of electricity in SRB – this would be done by TANESCO and ESCOM. However, the outline accounts presented here assume that SRBC would fund the operational costs of managing the extension of low tension distribution and connection in SRB that is envisaged to raise rural and urban connections in the basin to the levels specified in section 8.2.2, and would also collect the tariff revenue. The operating costs of rural electrification in SRB actually exceed the tariff revenue; consequently the net benefit stream for the rural electrification business is negative. The reason for this is fully explained in section 8.2.4.3: TANESCO tariffs do not cover operating costs. This business loss should be identified in the SRBDP financial analysis presented in the next section. Rather than introduce additional accounts to demonstrate the business loss to TANESCO and ESCOM, which would be confusing, it is preferred to internalise the transactions in the SRBC business accounts.

Finally, note that the operational costs of the Irrigation and Drainage Schemes exactly equal the expected income from water charges. There may be latitude to operate these gravity irrigation schemes at a profit (for example to cover the costs of river bank stabilisation) because the cost of water to users will be relatively low compared with other forms of irrigation. But it is inescapable that such a strategy is impossible until 2022 when the irrigation schemes begin operation.

Table 10-4 shows SRBC's capital investment, depreciation costs and liabilities and assets. Capital costs obviously include the construction of major engineering structures: the Lower Dam and the Irrigation and Drainage Schemes, as well as smaller investments to provide low tension transmission and connections in SRB. In addition there are relatively small annual sums for river bank stabilisation and investment expenditure for the SRBC office.

Depreciation is not incurred until the major structures are completed, though there are small sums to be allocated to depreciation of SRBC assets (vehicles, office equipment, offices etc.) in the early stages of SRBC operation. SRBC assets are clearly the full value of major structures, less depreciation progressively incurred after their construction. Note though that SRBC assets are very small in value until these structures are actually constructed.

Not so small are SRBC liabilities, which are the full value of the loans taken out for construction until repayment of the principle begins after the ten-year grace period. Note though that no loan needs to be taken out for the extension of transmission and connections in SRB: this can be financed directly from revenue from bulk sales.

Table 10-3 SRBC Sales and Operation Accounts

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2030
SALES										
Bulk electricity sales									68.25	66.52
Tariffed electricity sales									0.48	2.86
Water sales to LSRT Irrigation and Drainage Scheme								0.14	0.27	0.59
Water sales to LSRM Irrigation and Drainage Scheme								0.16	0.32	0.69
OPERATING COSTS										
Lower Dam									6.15	6.15
LSRT Irrigation and Drainage Scheme								0.14	0.27	0.59
LSRM Irrigation and Drainage Scheme								0.16	0.32	0.69
Transmission and connection in SRB										2.93
Stabilisation of the Lower Songwe River			0.00	0.01	0.02	0.03	0.04	0.05	0.05	0.05
SRBC operating costs	0.24	0.54	0.80	1.04	1.06	1.06	1.07	1.07	1.07	1.07
FINANCING COSTS										
Lower Dam										
Commitment fee			2.27	1.73	1.02	0.38				
Repayment of principle										9.47
Service charge										3.27
LSRT Irrigation and Drainage Scheme										
Commitment fee					0.15	0.10	0.06			
Repayment of principle										0.78
Service charge										0.28
LSRM Irrigation and Drainage Scheme										
Commitment fee					0.18	0.13	0.07			
Repayment of principle										0.93
Service charge										0.33
Institutional Development, Support and Capacity Building for SRBC										
Commitment fee		0.03	0.03	0.02	0.02	0.01	0.01			
Repayment of principle										0.14
Service charge										0.05

Table 10-4 SRBC Assets and Liabilities

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
CAPITAL INVESTMENT										
Construction of Lower Dam			18.94	108.88	142.02	127.82	75.74			
LSRT Irrigation and Drainage Scheme					9.11	9.11	9.11	11.78		
LSRM Irrigation and Drainage Scheme					10.55	10.55	10.55	14.60		
Transmission and connection in SRB									6.50	
Stabilisation of the Lower Songwe River	0.03		0.06	0.08	0.10	0.10	0.10	0.07	0.05	
SRBC Offices and equipment	0.30	0.03	0.23	0.04	0.06	0.01	0.04	0.06	0.00	0.01
DEPRECIATION										
Lower Dam									10.41	8.91
LSRT Irrigation and Drainage Scheme									3.44	1.81
LSRM Irrigation and Drainage Scheme									4.07	2.14
Transmission and connection in SRB										0.62
SRBC Offices and equipment		0.03	0.03	0.05	0.04	0.05	0.04	0.04	0.05	0.04
LIABILITIES										
ADF for Lower Dam		473.40	473.40	473.40	473.40	473.40	473.40	473.40	473.40	435.53
ADF for LSRT Irrigation and Drainage Scheme				39.12	39.12	39.12	39.12	39.12	39.12	37.56
ADF for LSRM Irrigation and Drainage Scheme				46.25	46.25	46.25	46.25	46.25	46.25	44.40
ADF for transmission and connection in SRB										
ADF Institutional Development, Support and Capacity Building for SRBC	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.86
ASSETS ADJUSTED FOR DEPRECIATION										
Lower Dam								473.40	462.99	396.22
LSRT Irrigation and Drainage Scheme								39.12	35.68	18.72
LSRM Irrigation and Drainage Scheme								46.25	42.18	22.13
Transmission and connection in SRB									6.50	36.11
SRBC Offices and equipment	0.30	0.30	0.53	0.55	0.61	0.60	0.65	0.65	0.64	0.65

Table 10-5 shows the SRBC Bank Account. The beginning of the year obviously accumulates the balance of the preceding year. Cash in is comprised of the principals of the loans taken out by SRBC for construction of major structures and SRBC operation and investments, plus income from power and water sales. Cash out are disbursements for investments, operating costs and loan servicing payments. Shaded out are any payments for peripheral activities: if any were incurred they would draw down the Bank Account. Note the Bank Account is almost constantly in credit except for one year; 2022. Even if all peripheral activities were funded (see Figure 10-1) the Bank Account would still be positive up to 2022, though in that year an overdraft would have to be sought for over US$ 35 million instead of the US$ 7.5 million overdrawn balance incurred with core activities only.

The Bank Account is handled poorly in this representation of SRBC business activities. A financial manager would obviously seek to schedule the receipt of loans with forecast expenditures much more rigorously to avoid massive cash surpluses.

Table 10-6 shows the Profit and Loss Account and Balance Sheet. Both show annual, not cumulative balances. The Profit and Loss account demonstrates the very long gestation of profits from the SRBC core business. On the other hand it promises substantial future profit when the Lower Dam is built. Note that the Profit and Loss account is devoid of entries related to peripheral activities: it summarises what SRBC actually does: build and operate water infrastructure and take in revenue from the sales of power and water. The Profit and Loss account demonstrates SRBC does this well, if the long period of comparatively small net losses from operations required to get the Lower Dam and Irrigation and Drainage Schemes built can be withstood.

The Balance Sheet lists annual assets (less depreciation) and liabilities (the value of loans taken out for accumulating those assets). It makes uncomfortable reading during the construction period – but the deficits could be substantially reduced with more attention to loan scheduling. The impact of peripheral activities on the Balance Sheet is actually very small compared with the magnitude of the annual difference between assets and liabilities of the core business, as shown in Figure 10-2.

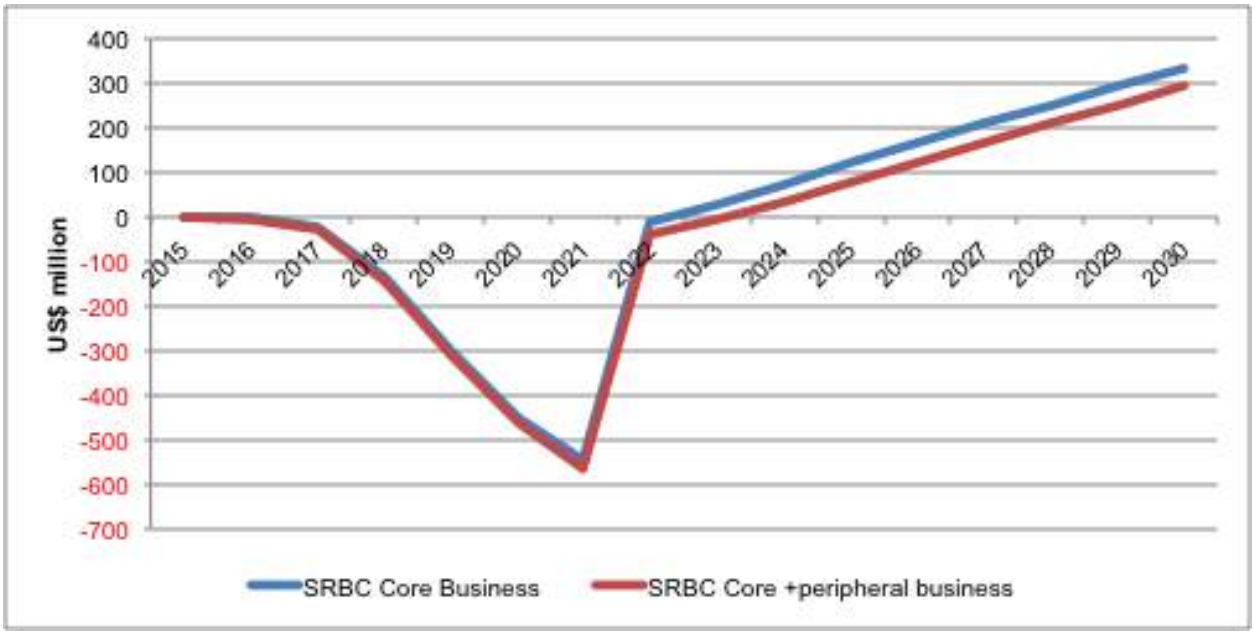
Table 10-5 SRBC Bank Account

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
BANK ACCOUNT										
Cash in										
Fund in for Institutional Development, Support and Capacity Building for SRBC	7.00									
Fund in for Lower Dam		473.40								
Fund in for LSRT Irrigation and Drainage Scheme				39.12						
Fund in for LSRT Irrigation and Drainage Scheme				46.25						
Receipts from power and water sales								0.29	69.32	70.66
Cash out										
Disbursments for capital investment	0.33	0.03	19.22	109.00	161.84	147.59	95.54	26.51	6.55	0.01
Disbursements for operating costs	0.24	0.54	0.80	1.05	1.07	1.08	1.10	1.41	7.86	11.48
Disbursements for loan servicing		0.03	2.30	1.75	1.36	0.62	0.14			15.24
Support operational costs to Peripheral Activities										
Support investment costs to Peripheral Activities										
Cash on hand, year end	6.42	479.22	456.90	430.47	266.19	116.90	20.11	-7.51	47.40	382.92

Table 10-6 SRBC Profit and Loss and Balance Sheet

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2030*
PROFIT AND LOSS ACCOUNT										
Sales								0.29	69.32	70.66
Production costs			0.00	0.01	0.02	0.03	0.04	0.34	6.79	10.42
Gross profit			-0.00	-0.01	-0.02	-0.03	-0.04	-0.05	62.53	60.24
SRBC operating costs	0.24	0.54	0.80	1.04	1.06	1.06	1.07	1.07	1.07	1.07
Net profit before interest and tax	-0.24	-0.54	-0.80	-1.05	-1.07	-1.08	-1.10	-1.11	61.46	59.17
BALANCE SHEET										
Assets										
Cash at bank	6.42	479.22	456.90	430.47	266.19	116.90	20.11	-7.51	47.40	382.92
Fixed assets less depreciation	0.30	0.30	0.53	0.55	0.61	0.60	0.65	559.42	547.98	473.84
Total assets	6.72	479.53	457.44	431.02	266.80	117.50	20.76	551.91	595.38	856.76
Liabilities										
Loans	7.00	480.40	480.40	565.77	565.77	565.77	565.77	565.77	565.77	524.34
Assets less liabilities	-0.28	-0.87	-22.96	-134.75	-298.97	-448.27	-545.01	-13.86	29.61	332.41

Figure 10-2 SRBC Balance Sheet: Projected Assets Minus Liabilities



10.6.2 FINANCIAL ANALYSIS OF SRBDP

10.6.2.1 FINANCIAL ANALYSIS

This section presents a financial analysis to determine the viability of projects included in the SRBDP. The analysis is based not on all SRBDP projects, but (following the requirements of the ToR) only those projects directly connected with the operation of the Lower Dam. The analysis therefore includes:

- the Lower Dam and hydropower plant
- SRB rural electrification
- LSRT and LSRM Irrigation and Drainage projects
- Urban Water Supply to Kasumulu and Songwe
- Development of Fish Ponds
- Proposed studies associated with the management of the Lower Dam, connected with land tenure, rain water harvesting, early warning, hydro-meteorological monitoring and detailed design for the Middle Dam (which at present is considered economically viable)
- The investment and operational costs of SRBC.

All these projects are dependent on the construction of the Lower Dam for implementation. Those SRBDP projects that are not dependent on the operation of the Lower Dam (health, education, village water supply (which is expected to be supplied from groundwater), agricultural productivity, catchment protection and tourism) are not included in this analysis. Several of these are “public good” projects and would not be expected to generate a revenue stream (health, education and roads): they would be appropriate for an economic rather than a financial analysis.

Bearing in mind that the construction and operation (for electricity production) of the Lower Dam and hydropower plant accounts for 81% of investment costs, 24% of operational costs and 83% of expected benefits it is expected that he performance of this project will dominate the results of the analysis. But the Lower Dam serves multiple purposes and it is appropriate to measure the impact of these. See Table 10-7 for a summary of the results and Table 10-9 and Table 10-10 for the scheduling of investment and recurrent costs and expected benefits of the constituent projects.

Table 10-7 Financial Indicators for Lower Dam Projects

	Financial NPV @ 5%, US$ m	FIRR %
Lower Songwe Dam and Hydropower Plant	341.65	9.6%
Rural Electrification	-19.63	
LSRT Irrigation and Drainage Scheme	16.82	8.4%
LSRM Irrigation and Drainage Scheme	33.60	10.7%
Community Forestry for the Stabilization of the Lower Songwe River	0.03	5.4%
Urban Water Supply to Kasumulu and Songwe	4.71	14.2%
Development of Fish Ponds in Lower Songwe Basin	5.20	18.1%
Overall Performance of Multipurpose Lower Dam	206.94	7.6%

The financial analysis indicates which projects are acceptable for inclusion. The decision criterion is simple – if the financial Net Present Value (NPV) of a constituent project is greater than zero then its inclusion will enhance the NPV of the multipurpose project.

The analysis suggests overall poor financial performance of the investment: this is to be expected. The Lower Songwe Dam and Hydropower Plant economic analysis valued electricity at its long run marginal cost of production of about US$ 0.10 per kWh. Economic adjustments allowed small reductions in the financial cost of construction and the economic IRR was calculated at about 11%. The results of the financial analysis values the unit price of bulk power sales as US$ 0.10 per kWh. The estimated financial cost of construction is unaltered so clearly the FIRR will be lower than 11%: the financial analysis returns 9.6%.

It has already been demonstrated that TANESCO's present tariffs do not cover operational costs of rural electrification. The net benefit stream is therefore always negative, an IRR cannot be calculated and the NPV is negative.

The financial indicators to the Irrigation and Drainage Schemes are expected to be low. Even during the commodity boom (now passed) very few (if any) public irrigation schemes under construction could demonstrate full investment cost recovery. A financial analysis would be expected to return NPVs well below the bank rate.

Community Forestry for the Stabilization of the Lower Songwe River is not intended to be a financially viable project: its main purpose is stabilisation of the international frontier. It does however have significant environmental (and therefore economic) value.

Urban water supply would be expected to generate financial benefits: water tariffs that achieve full cost recovery would be affordable to urban populations.

A private sector investor is expected to implement development of Fish Ponds in Lower Songwe Basin; the expected financial rate of return is commensurate with that expectation.

The overall financial performance is much worse than the performance of the constituent projects, with an IRR of only 7.6%. This is because the investment and operational costs of SRBC are introduced, together with financing charges for loans to construct the Lower Dam and Irrigation and Drainage Schemes.

10.6.2.2 SENSITIVITY ANALYSIS

Realistically, there is only one strategy to improve the financial performance of the programme to an acceptable level and that is to raise the supply price of bulk electricity. A supplementary tactic would be to raise TANESCO's tariffs, say to the level of ESCOM's, to improve the financial performance of the rural electrification enterprise. The results of this sensitivity analysis is summarised in Table 10-8.

Table 10-8 Financial Indicators for Lower Dam Projects: Sensitivity Analysis

	Financial NPV @ 10%[1/], US$ m	FIRR %
Lower Songwe Dam and Hydropower Plant [2/]	78.80	12.2%
Rural Electrification [3/]	-8.92	-5.3%
LSRT Irrigation and Drainage Scheme	-3.67	8.4%
LSRM Irrigation and Drainage Scheme	1.91	10.7%
Community Forestry for the Stabilization of the Lower Songwe River	-0.19	5.4%
Urban Water Supply to Kasumulu and Songwe	0.98	14.2%
Development of Fish Ponds in Lower Songwe Basin	1.48	18.1%
Overall Performance of Multipurpose Lower Dam	4.20	10.1%

[1/] The discount rate is raised from 5% to 10%

[2/] The supply price of bulk power is raised from US$0.10 to US$ 0.13 per kWh

[3/] The TANESCO tariff is raised to recover the same level of operational costs as the ESCOM tariff

In order to achieve a financial return equal to the discount rate (increased from 5% to a more acceptable 10%), the bulk supply price of electricity must be raised from US$ 0.10 per kWh to US$ 0.13 per kWh. The strategy of increasing the TANESCO tariff to cover operational costs to the same level as the ESCOM tariff (to generate an operating surplus of 17% over operating costs) does not work. To achieve this, the TANESCO tariff would have to increase by 153% but NPV and IRR remain negative. A greater increase in the tariff would be unaffordable – it has already been demonstrated that the ESCOM tariff is already on the boundary of affordability – so there is no sense in modelling it.

So the key recommendation from the sensitivity analysis is that the bulk supply price of electricity must rise to secure an adequate level of financial performance of the Lower Dam. Minor changes may occur to reduce the required increase: the capital cost of the Lower Dam and irrigation schemes may reduce at detail design and/or tender for example. But even if the cost of the Lower Dam and both irrigation schemes was reduced by an overall 10%, which is optimistic, the bulk supply price would still have to be US$ 0.12 per kWh to achieve an internal rate of return of 10.2%.

Table 10-9 Financial Analysis of SRBDP Projects Dependent on the Lower Dam

	Lower Songwe Dam and Hydropower Plant			Rural Electrification			LSRT Irrigation and Drainage Scheme			LSRM Irrigation and Drainage Scheme			Community Forestry for the Stabilization of the Lower Songwe River			Urban Water Supply to Kasumulu and Songwe			Development of Fish Ponds in Lower Songwe Basin		
	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m
2015	-	-	-	-	-	-	-	-	-	-	-	-	0.035	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	18.938	-	-	-	-	-	-	-	-	-	-	-	0.059	0.003	-	-	-	-	-	-	-
2018	108.882	-	-	-	-	-	-	-	-	-	-	-	0.084	0.008	-	-	-	-	-	-	-
2019	142.020	-	-	-	-	-	9.113	-	-	10.551	-	-	0.069	0.018	-	-	-	-	-	-	-
2020	127.818	-	-	-	-	-	9.113	0.217	0.209	10.551	0.256	0.340	0.069	0.028	-	-	-	-	-	-	-
2021	75.744	-	-	-	-	-	9.113	0.486	0.588	10.551	0.537	0.870	0.069	0.038	0.006	-	-	-	-	-	-
2022		-	-	-	-	-	11.782	0.851	1.213	14.096	0.924	1.765	0.074	0.045	0.018	4.039	-	0.783	3.880	-	-
2023		6.154	66.255	0.499	-	0.476		1.328	2.078		1.410	2.937	0.050	0.050	0.042	4.039	0.283	1.526		0.550	-
2024		6.154	66.184	0.499	0.480	0.952		1.696	3.075		1.771	4.327		0.050	0.066		0.565	1.526		0.550	1.429
2025		6.154	66.080	0.499	0.587	1.428		2.091	4.139		2.149	5.799		0.050	0.090		0.565	1.526		0.550	1.429
2026		6.154	67.907	0.499	0.733	1.904		2.514	5.201		2.567	7.138		0.050	0.108		0.565	1.526		0.550	1.429
2027		6.154	67.580	0.499	0.978	2.381		2.968	6.554		3.005	8.582		0.050	0.120		0.565	1.526		0.550	1.429
2028		6.154	66.520	0.499	1.467	2.857		3.378	7.180		3.366	9.651		0.050	0.120		0.565	1.526		0.550	1.429
2029		6.154	66.520		2.934	2.857		3.747	7.957		3.700	10.533		0.050	0.120		0.565	1.526		0.550	1.429
2030		6.154	66.520		2.934	2.857		4.085	8.553		3.913	11.152		0.050	0.120		0.565	1.526		0.550	1.429
2031		6.154	66.520		2.934	2.857		4.215	9.075		4.097	11.709		0.050	0.120		0.565	1.526		0.550	1.429
2032		6.154	66.520		2.934	2.857		4.257	9.331		4.097	11.874		0.050	0.120		0.565	1.526		0.550	1.429
2033		6.154	66.520		2.934	2.857		4.299	9.587		4.097	12.038		0.050	0.120		0.565	1.526		0.550	1.429
2034		6.154	66.520		2.934	2.857		4.341	9.843		4.097	12.202		0.050	0.120		0.565	1.526		0.550	1.429
2035		6.154	66.520		2.934	2.857		4.383	10.100		4.097	12.367		0.050	0.120		0.565	1.526		0.550	1.429
2036		6.154	66.520		2.934	2.857		4.425	10.356		4.097	12.531		0.050	0.120		0.565	1.526		0.550	1.429
2037		6.154	66.520		2.934	2.857		4.467	10.612		4.097	12.696		0.050	0.120		0.565	1.526		0.550	1.429
2038		6.154	66.520		2.934	2.857		4.509	10.868		4.097	12.860		0.050	0.120		0.565	1.526		0.550	1.429
2039		6.154	66.520		2.934	2.857		4.549	11.106		4.097	13.024		0.050	0.120		0.565	1.526		0.550	1.429
2040		6.154	66.520		2.934	2.857		4.561	11.332		4.097	13.189		0.050	0.120		0.565	1.526		0.550	1.429
2041		6.154	66.520		2.934	2.857		4.572	11.495		4.097	13.315		0.050	0.120		0.565	1.526		0.550	1.429
2042		6.154	66.520		2.934	2.857		4.570	11.592		4.097	13.405		0.050	0.120		0.565	1.526		0.550	1.429
2043		6.154	66.520		2.934	2.857		4.567	11.640		4.097	13.457		0.050	0.120		0.565	1.526		0.550	1.429
2044		6.154	66.520		2.934	2.857		4.564	11.641		4.097	13.457		0.050	0.120		0.565	1.526		0.550	1.429
2045	140.880	6.154	66.520		2.934	2.857		4.562	11.637		4.097	13.457		0.050	0.120		0.565	1.526		0.550	1.429
2046		6.154	66.520					4.559	11.633		4.097	13.457		0.050	0.120						
2047		6.154	66.520					4.556	11.628		4.097	13.457		0.050	0.120						
2048		6.154	66.520					4.554	11.624		4.097	13.457		0.050	0.120						
2049		6.154	66.520					-	-		-	-									
2050		6.154	66.520																		
2051		6.154	66.520																		
2052		6.154	66.520																		
2053		6.154	66.520																		
2054		6.154	66.520																		
2055		6.154	66.520																		
2056		6.154	66.520																		
2057		6.154	66.520																		
2058		6.154	66.520																		
2059		6.154	66.520																		
2060		6.154	66.520																		
2061		6.154	66.520																		
2062		6.154	66.520																		
2063		6.154	66.520																		
2064		6.154	66.520																		
2065		6.154	66.520																		
2066		6.154	66.520																		
2067		6.154	66.520																		
2068		6.154	66.520																		
2069		6.154	66.520																		

Table 10-10 Consolidated Financial Analysis of SRBDP Projects Dependent on the Lower Dam

	Land Tenure Formalization in Irrigation Schemes	Studies on Rain Water Harvesting and Assessment of Irrigation Schemes	Lower Songwe Floodplain Early Warning and Response System	Hydro-met Monitoring System	Detailed Design for Middle Songwe Dam and HPP	Institutional Development, Support and Capacity Building for SRBC			Summary			
	Investment costs, US$m	Investment costs, US$m	Investment costs, US$m	Investment costs, US$m	Investment costs, US$m	Investment costs, US$m	Recurrent, US$m	Financing Costs, US$m	Investment costs, US$m	Recurrent, US$m	Financial benefit US$m	Net Benefit
2015	-	-	-	0.108	-	0.300	0.242	-	0.441	0.242	-	- 0.683
2016	-	-	0.128	0.108	-	0.231	0.537	0.030	0.266	0.568	-	- 0.833
2017	0.128	-	0.128	0.108	-	0.229	0.797	2.298	19.649	3.098	-	- 22.695
2018	0.128	-	0.128	0.108	-	0.035	1.043	1.750	109.364	2.850	-	- 112.164
2019	0.128	-	0.128	-	0.456	0.006	1.059	1.394	162.498	2.437	-	- 164.935
2020	0.128	0.073	0.128	-	1.200	0.005	1.058	0.622	149.116	2.179	0.549	- 150.746
2021	-	0.073	0.128	-	0.400	0.036	1.065	0.141	99.145	2.266	1.464	- 99.947
2022	-	-	-	-	-	0.056	1.065	-	34.129	2.885	2.966	- 34.017
2023	-	-	-	-	-	0.004	1.065	-	10.501	10.841	74.069	52.637
2024	-	-	-	-	-	0.056	1.065	-	6.507	12.342	76.590	59.089
2025	-	-	-	-	-	0.005	1.065	0.191	8.504	13.403	81.501	61.994
2026	-	-	-	-	-	0.062	1.065	0.190	0.599	14.280	84.312	63.337
2027	-	-	-	-	-	0.035	1.065	13.137	8.534	28.471	86.871	51.866
2028	-	-	-	-	-	0.071	1.065	13.065	8.570	29.657	88.322	53.094
2029	-	-	-	-	-	0.089	1.065	15.328	0.089	34.094	89.980	55.796
2030	-	-	-	-	-	0.005	1.065	15.243	0.005	34.480	91.185	56.710
2031	-	-	-	-	-	0.005	1.065	15.158	0.005	34.783	92.274	57.486
2032						0.005	1.065	15.073	0.005	34.746	92.885	57.934
2033						0.005	1.065	14.988	0.005	34.703	93.116	58.407
2034						0.005	1.065	14.903	0.005	34.661	93.536	58.871
2035						0.005	1.065	14.818	0.005	34.618	93.957	59.334
2036						0.005	1.065	14.734	0.005	34.575	94.377	59.798
2037						0.005	1.065	14.649	0.005	34.532	94.798	60.261
2038						0.005	1.065	14.564	0.005	34.489	95.219	60.725
2039						0.005	1.065	14.479	0.005	34.430	95.623	61.192
2040						0.005	1.065	14.394	0.005	34.372	96.011	61.634
2041						0.005	1.065	14.309	0.005	34.298	96.300	61.997
2042						0.005	1.065	14.224	0.005	34.210	96.487	62.272
2043						0.005	1.065	14.139	0.005	34.123	96.682	62.564
2044						0.005	1.065	14.055	0.005	34.035	96.588	62.547
2045						0.006	1.065	13.970	180.695	33.948	96.864	- 77.919
2046						0.005	1.065	13.885	0.005	29.811	91.729	61.913
2047						0.005	1.065	13.800	0.005	29.723	91.725	61.997
2048						0.005	1.065	13.715	0.005	29.636	91.721	62.080
2049						0.005	1.065	13.630	0.005	20.850	66.520	45.665
2050						0.005	1.065	13.545	0.005	20.765	66.520	45.750
2051						0.005	1.065	13.461	0.005	20.680	66.520	45.835
2052						0.005	1.065	13.376	0.005	20.595	66.520	45.919
2053						0.005	1.065	13.291	0.005	20.510	66.520	46.004
2054						0.005	1.065	13.206	0.005	20.426	66.520	46.089
2055						0.005	1.065	13.121	0.005	20.341	66.520	46.174
2056						0.006	1.065	13.036	0.005	20.256	66.520	46.259
2057						0.005	1.065	12.951	0.005	20.171	66.520	46.344
2058						0.005	1.065	12.866	0.005	20.086	66.520	46.429
2059						0.005	1.065	12.782	0.005	20.001	66.520	46.513
2060						0.005	1.065	12.697	0.005	19.916	66.520	46.598
2061						0.005	1.065	12.612	0.005	19.831	66.520	46.683
2062						0.005	1.065	12.527	0.005	19.747	66.520	46.768
2063						0.005	1.065	12.442	0.005	19.662	66.520	46.853
2064						0.005	1.065	12.357	0.005	19.577	66.520	46.938
2065						0.005	1.065	12.272	0.005	19.492	66.520	47.023
2066						0.005	1.065	12.188	0.005	19.407	66.520	47.108
2067						0.005	1.065	12.103	0.005	19.322	66.520	47.192
2068						0.005	1.065	12.018	0.005	19.237	66.520	47.277
2069						0.005	1.065	11.933	0.005	19.153	66.520	47.362

APPENDIX A:

SONGWE RIVER BASIN

ESTIMATE OF REGIONAL GROSS DOMESTIC PRODUCT, COST OF INTERMEDIATE INPUTS, LABOUR DAYS AND RETURN TO LABOUR in 2010

US$ THOUSANDS IN CURRENT 2010 US$

REGIONAL GROSS DOMESTIC PRODUCT (1)

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from natural resources in US$ '000 current 2010									
					Rainfed	Irrigated	TLU	Rainfed Crops	Irrigated Crops	Livestock	Apiculture	Fisheries	Aquaculture	Forestry	Housing	Water supply	SWI	Total
1	Mbeya Rural	Iwiji	16,176	13,626	5,011	65	4,198	4,234.8	354.9	169.5	2.7	28.9	13.8	191.5	96.3	178.8	98.2	5,339.7
2	Mbeya Rural	Mwaka	692	835	348	4	177	209.8	21.0	9.1	0.2	1.7	0.8	12.1	6.4	9.7	4.0	265.8
3	Kyela	Ikolo	2,056	18,134	894	16	3,177	1,906.6	33.1	289.8	0.2	38.5	0.0	2,223.4	143.8	236.3	90.8	4,964.5
4	Kyela	Katumbe Songwe	3,545	13,237	3,144	12	5,455	2,343.3	24.2	706.0	0.2	28.1	0.0	1,629.1	102.5	114.1	78.4	5,025.7
5	Kyela	Ngana	5,731	8,054	1,434	5	1,339	3,868.2	11.0	150.0	0.1	12.8	0.0	847.8	50.5	76.1	30.3	5,046.9
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	3,530.6	14.4	505.5	0.1	107.0	0.0	970.7	61.3	103.4	51.7	5,344.8
7	Kyela	Ikimba	2,401	10,082	1,801	9	2,691	2,548.6	18.4	206.5	0.1	21.4	0.0	1,246.5	79.9	67.1	50.5	4,234.2
8	Kyela	Ibobe	738	1,024	183	1	94	258.9	1.9	5.6	0.0	2.2	0.0	130.1	8.1	5.3	5.1	417.2
9	Ileje	Itumba	10,136	9,704	4,474	102	4,538	3,596.3	225.7	165.3	58.6	20.6	9.5	174.0	76.9	40.0	48.6	4,417.0
10	Ileje	Mlale	11,221	4,664	1,867	49	2,587	1,416.0	106.5	178.2	28.2	9.9	0.0	87.5	36.1	60.9	23.3	1,948.7
11	Ileje	Ibale	9,812	7,176	2,134	75	1,998	1,587.2	166.9	118.6	43.4	15.2	7.0	149.9	55.6	93.7	35.9	2,273.5
12	Ileje	Ibeba	14,971	7,600	2,220	80	2,630	1,847.8	176.8	169.3	46.8	16.1	7.5	160.7	61.8	98.6	38.0	2,422.5
13	Ileje	Ndola	13,076	6,497	2,242	68	2,595	1,875.1	151.1	166.3	39.3	13.8	6.5	122.9	51.5	84.7	32.5	2,543.6
14	Ileje	Ilunga	11,471	4,547	2,243	48	1,747	1,373.6	105.8	96.1	27.5	9.6	4.5	68.5	40.0	53.7	22.8	2,401.9
15	Ileje	Kafule	5,302	6,175	1,923	65	2,447	1,762.4	143.6	160.7	37.3	13.1	6.0	112.3	52.8	78.2	30.9	2,427.3
16	Ileje	Malangali	15,071	6,178	2,861	65	3,103	2,629.7	143.7	195.1	37.3	13.1	0.0	101.3	54.3	79.5	30.9	3,285.1
17	Ileje	Kalembo	4,167	3,370	1,204	35	1,857	1,023.1	78.4	127.7	20.4	7.2	0.0	69.2	27.4	43.7	16.9	1,413.9
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,296	1,860.2	136.2	82.3	35.4	12.4	0.0	103.9	47.6	76.1	29.3	2,392.2
19	Ileje	Isongole	5,856	9,425	2,902	99	2,995	2,296.7	219.2	135.8	66.9	20.0	0.0	159.9	80.6	67.8	47.2	3,083.2
20	Ileje	Chilefe	8,831	8,293	2,350	86	3,577	1,834.8	192.2	136.6	49.8	17.5	0.0	143.1	66.9	107.0	53.5	2,603.3
21	Ileje	Mbebe	12,878	8,643	3,920	93	3,695	3,227.7	205.7	188.5	53.4	18.8	0.0	158.1	88.5	115.6	56.4	4,072.6
22	Mbozi	Iyula	6,044	12,611	5,318	194	4,103	1,413.6	196.0	232.7	1.5	26.8	3.4	177.6	97.6	23.0	63.1	2,234.3
23	Mbozi	Nyimbili	32,971	20,950	5,367	322	5,810	1,304.8	323.9	237.1	2.5	44.5	5.7	266.8	158.4	220.1	104.9	2,668.8
24	Mbozi	Ynuwa	1,093	6,431	430	99	346	113.5	99.4	17.6	0.8	13.6	0.0	82.2	49.8	16.2	32.2	424.3
25	Mbozi	Isendula	7,788	6,653	4,313	102	3,145	1,282.4	102.9	132.5	0.8	14.1	1.8	81.2	51.5	76.4	33.3	1,797.0
26	Momba	Chiwezi	4,051	2,626	783	106	1,612	274.3	109.5	74.3	0.9	5.6	0.0	31.3	20.3	3.3	13.1	532.1
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	409.7	106.5	68.4	2.6	4.3	0.0	25.8	309.7	27.3	10.2	966.6
28	Chitipa	TA Mwabulambya	62,079	63,732	10,203	85	8,647	7,958.0	615.1	345.4	36.1	158.4	4.5	694.4	725.8	1,003.7	319.0	11,862.4
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,456	20	5,099	6,802.5	63.8	171.5	8.8	39.6	0.9	156.1	205.8	186.1	73.8	7,705.9
30	Chitipa	TA Kameme	43,316	20,770	7,680	28	9,730	9,251.2	89.9	415.4	12.4	51.6	1.8	240.7	264.6	330.0	104.0	10,761.6
31	Chitipa	Chitipa Boma	890	15,866	335	21	579	339.2	49.3	44.6	9.5	39.4	0.9	170.5	132.3	74.8	460.5	1,320.8
32	Karonga	TA Kilupula	8,386	16,574	2,780	53	4,627	3,681.9	116.5	323.5	0.9	236.5	0.0	249.3	214.0	124.2	72.2	5,021.7
33	Karonga	SC Mwakaboko	24,707	20,820	10,044	66	16,916	10,764.0	162.8	1,041.5	0.8	51.7	1.8	359.5	341.1	314.5	90.0	13,107.7
	Total		425,420	363,032	102,448	2,225	119,289	89,246	4,569	7,849	516	1,714	76	11,350	3,844	4,170	2,172	124,207

REGIONAL GROSS DOMESTIC PRODUCT (2)

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from Administration and Social Services in US$ current 2010							
					Rainfed	Irrigated	TLU	Regional	District	Agriculture	Education	Health	Roads	Water	Total
1	Mbeya Rural	Iwiji	15,176	13,626	6,011	65	4,198	24.9	5.2	1.1	128.5	40.4	3.1	3.0	206
2	Mbeya Rural	Masoko	852	805	348	4	177	1.5	0.3	0.1	128.5	0.1	0.2	0.2	131
3	Kyela	Ikolo	2,056	18,134	894	16	3,177	31.6	4.1	1.7	0.0	37.2	2.2	2.4	79
4	Kyela	Kalumba Songwe	3,545	13,237	3,144	12	5,455	43.3	3.0	1.3	197.4	27.1	1.6	1.7	275
5	Kyela	Ngana	6,731	6,054	1,434	5	1,339	19.8	1.4	0.6	90.3	12.4	0.7	0.8	125
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	25.9	1.8	0.8	118.0	16.2	1.0	1.0	165
7	Kyela	Ikimba	2,401	10,082	1,801	9	2,691	33.0	2.3	1.0	150.3	20.7	1.2	1.3	210
8	Kyela	Itope	738	1,024	183	1	94	5.7	0.2	0.1	20.4	2.1	0.1	0.1	29
9	Ileje	Itumba	10,138	9,704	4,474	102	4,536	52.2	6.0	1.2	258.2	32.9	4.8	3.7	359
10	Ileje	Mlale	11,221	4,664	1,667	49	2,587	25.1	2.9	0.6	124.1	15.8	2.3	1.8	173
11	Ileje	Itale	9,812	7,176	2,134	75	1,998	38.6	4.5	0.9	191.0	24.3	3.5	2.8	265
12	Ileje	Ibaba	14,971	7,600	2,220	80	2,630	40.9	4.7	0.9	202.2	25.7	3.7	2.9	281
13	Ileje	Ndola	13,576	6,497	2,242	68	2,595	34.9	4.0	0.8	172.9	22.0	3.2	2.5	240
14	Ileje	Ikinga	11,471	4,547	2,243	48	1,747	24.4	2.8	0.5	121.0	15.4	2.2	1.8	168
15	Ileje	Kafule	5,302	5,175	1,923	65	2,447	33.2	3.8	0.7	164.3	20.9	3.0	2.4	228
16	Ileje	Malangali	15,071	6,178	2,661	65	3,103	33.2	3.8	0.7	164.4	20.9	3.0	2.4	229
17	Ileje	Kalembo	4,167	3,370	1,204	35	1,857	18.1	2.1	0.4	89.7	11.4	1.7	1.3	125
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,296	31.5	3.6	0.7	155.8	19.8	2.9	2.3	217
19	Ileje	Isongole	5,856	9,425	2,902	99	2,956	12.4	5.8	1.1	102.6	31.9	4.6	3.6	162
20	Ileje	Chitete	8,811	8,253	2,350	86	3,577	10.9	5.1	1.0	89.9	28.0	4.1	3.2	142
21	Ileje	Mbebe	12,878	8,843	3,920	93	3,695	11.7	5.5	1.1	96.2	29.9	4.4	3.4	152
22	Mbozi	Iyula	6,044	12,611	5,316	194	4,103	18.9	3.3	1.8	36.7	27.1	2.0	2.6	92
23	Mbozi	Nyimbili	32,971	20,950	5,367	322	5,810	31.5	5.5	3.0	61.0	45.0	3.3	4.3	154
24	Mbozi	Vwawa	1,093	6,431	430	99	346	9.7	1.7	0.9	222.5	13.8	1.0	1.3	251
25	Mbozi	Isandula	7,788	6,653	4,315	102	3,145	10.0	1.8	1.0	230.2	14.3	1.1	1.4	260
26	Momba	Chiwezi	4,051	2,626	763	108	1,612	0.2	0.7	0.4	256.2	13.2	0.4	0.5	272
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	0.1	0.5	0.3	0.1	10.3	0.3	0.4	12
28	Chitipa	TA Mwabulambya	82,079	63,732	10,203	85	8,647	42.2	28.2	98.0	0.0	409.3	28.4	32.1	638
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,458	20	5,099	9.8	6.5	22.7	424.9	109.3	6.6	7.4	587
30	Chitipa	TA Kameme	43,316	28,770	7,680	28	9,730	11.1	9.2	31.9	214.2	94.0	9.3	10.5	380
31	Chitipa	Chitipa Boma	850	15,866	335	21	579	6.5	7.0	24.4	566.4	818.5	7.1	8.0	1,440
32	Karonga	TA Kilupula	8,388	16,574	2,780	53	4,827	0.0	2.9	33.0	27.0	1,191.9	2.3	0.0	1,257
33	Karonga	SC Mwakaboko	24,757	20,820	11,044	66	16,916	0.0	3.6	41.4	378.2	239.2	2.8	0.0	665
	Total		*425,420*	*363,002*	*102,448*	*2,225*	*119,289*	*695*	*144*	*276*	*5,183*	*3,441*	*118*	*113*	*9,970*

REGIONAL GROSS DOMESTIC PRODUCT (3)

	Region	Ward/TA	Basin ha	Population 2010	Total cultivated ha		Livestock	Value added from Development Projects in US$ current 2010					Grand total	Total US$ pc
					Rainfed	Irrigated	TLU	Water Supply	Health	Roads	Education	Total		
1	Mbeya Rural	Iwiji	15,176	13,626	6,011	65	4,198	1.9	0.2	0.1	0.0	2.2	5,548	407
2	Mbeya Rural	Masoko	552	805	348	4	177	0.1	0.0	0.0	0.0	0.1	397	493
3	Kyela	Ikolo	2,056	18,134	894	16	3,177	1.4	0.1	0.1	0.0	1.5	5,045	278
4	Kyela	Katumba Songwe	3,545	13,237	3,144	12	5,455	1.0	0.1	0.0	0.0	1.1	5,302	401
5	Kyela	Ngana	6,731	6,054	1,434	5	1,339	0.5	0.0	0.0	0.0	0.5	5,173	854
6	Kyela	Ngonga	2,803	7,917	2,134	7	3,877	0.6	0.1	0.0	0.0	0.7	5,510	696
7	Kyela	Ikimba	2,401	10,082	1,801	9	2,691	0.8	0.1	0.0	0.0	0.9	4,445	441
8	Kyela	Itope	738	1,024	183	1	94	0.1	0.0	0.0	0.0	0.1	446	436
9	Ileje	Itumba	10,138	9,704	4,474	102	4,536	1.2	0.1	0.1	0.0	1.4	4,777	492
10	Ileje	Mlale	11,221	4,664	1,667	49	2,587	0.6	0.0	0.0	0.0	0.7	2,122	455
11	Ileje	Itale	9,812	7,176	2,134	75	1,998	0.9	0.1	0.0	0.0	1.0	2,540	354
12	Ileje	Itaba	14,971	7,600	2,220	80	2,630	1.0	0.1	0.0	0.0	1.1	2,705	356
13	Ileje	Ndola	13,576	6,497	2,242	68	2,596	0.8	0.1	0.0	0.0	0.9	2,785	429
14	Ileje	Ikinga	11,471	4,547	2,243	48	1,747	0.6	0.0	0.0	0.0	0.6	2,571	565
15	Ileje	Kafule	5,302	6,175	1,923	65	2,447	0.8	0.1	0.0	0.0	0.9	2,657	430
16	Ileje	Malangali	15,071	6,178	2,861	65	3,103	0.8	0.1	0.0	0.0	0.9	3,514	569
17	Ileje	Kalembo	4,167	3,370	1,204	35	1,857	0.4	0.0	0.0	0.0	0.5	1,539	457
18	Ileje	Bupigu	20,251	5,854	2,132	61	2,296	0.7	0.1	0.0	0.0	0.8	2,610	446
19	Ileje	Isongole	5,855	9,425	2,902	99	2,956	1.2	0.1	0.1	0.0	1.3	3,247	344
20	Ileje	Chitete	8,811	8,263	2,350	86	3,577	1.0	0.1	0.0	0.0	1.2	2,747	332
21	Ileje	Mbebe	12,878	8,843	3,920	93	3,695	1.1	0.1	0.1	0.0	1.3	4,226	478
22	Mbozi	Iyula	6,044	12,611	5,318	194	4,103	2.3	0.2	0.1	0.0	2.6	2,329	185
23	Mbozi	Nyimbili	32,971	20,960	5,367	322	5,810	3.9	0.3	0.2	0.0	4.4	2,827	135
24	Mbozi	Vwawa	1,093	6,431	430	99	346	1.2	0.1	0.1	0.0	1.3	677	105
25	Mbozi	Isandula	7,788	6,653	4,313	102	3,145	1.2	0.1	0.1	0.0	1.4	2,018	303
26	Momba	Chiwezi	4,051	2,626	763	108	1,612	0.5	0.0	0.0	0.0	0.6	804	306
27	Tunduma	Tunduma	3,760	2,046	539	84	1,643	0.4	0.0	0.0	0.0	0.4	979	479
28	Chitipa	TA Mwabulambya	82,079	63,732	10,203	85	8,647	0.1	0.0	0.0	0.0	0.1	12,501	196
29	Chitipa	TA Mwenemisuku	32,800	14,747	5,458	20	5,099	0.0	0.0	0.0	0.0	0.0	8,293	562
30	Chitipa	TA Kameme	43,316	20,770	7,680	28	9,730	0.0	0.0	0.0	0.0	0.0	11,142	536
31	Chitipa	Chitipa Boma	850	15,865	335	21	579	0.0	0.0	0.0	0.0	0.0	2,761	174
32	Karonga	TA Kilupula	8,385	16,574	2,780	53	4,627	0.0	0.0	0.0	0.0	0.0	6,279	379
33	Karonga	SC Mwakaboko	24,757	20,820	11,044	66	16,916	0.0	0.0	0.0	0.0	0.0	13,693	658
	Total		**425,420**	**363,002**	**102,448**	**2,225**	**119,289**	**27**	**2**	**1**	**0**	**31**	**134,208**	**370**

INTERMEDIATE COSTS (1)

	Region	Ward/TA	Intermediate inputs (excluding labour) to natural resources in US$ '000 current 2010										
			Rainfed Crops	Irrigated Crops	Livestock	Apiculture	Fisheries	Aquaculture	Forestry	Housing	Water supply	SMI	Total
1	Mbeya Rural	Iwiji	466.6	7.2	34.2	1.6	1.5	0.4	11.0	26.2	27.3	370.3	968.2
2	Mbeya Rural	Masoko	28.2	0.4	1.3	0.1	0.1	0.0	0.7	1.6	15.6	21.9	69.9
3	Kyela	Ikolo	165.0	2.9	59.7	0.2	2.0	0.0	19.5	35.2	38.7	492.7	816.0
4	Kyela	Katumba Songwe	564.4	2.1	124.0	0.1	1.5	0.0	14.2	25.1	27.6	393.4	1,152.3
5	Kyela	Ngana	214.0	1.0	27.4	0.1	0.7	0.0	6.7	12.4	17.0	164.5	443.6
6	Kyela	Ngonga	378.7	1.3	88.6	0.1	14.0	0.0	8.5	15.0	16.5	248.8	771.5
7	Kyela	Ikimba	312.6	1.6	45.8	0.1	1.1	0.0	10.8	19.6	21.5	274.0	687.1
8	Kyela	Itope	31.7	0.2	1.3	0.0	0.1	0.0	1.1	2.0	13.7	27.8	77.9
9	Ileje	Itumba	659.2	6.1	37.6	5.7	1.1	0.1	9.3	19.3	21.2	263.7	1,023.2
10	Ileje	Mlale	247.8	2.9	35.2	2.7	0.5	0.0	4.5	8.8	9.7	126.7	439.0
11	Ileje	Itale	317.8	4.5	20.5	4.2	0.8	0.1	7.3	13.6	15.1	195.0	578.9
12	Ileje	Ibaba	326.2	4.8	31.6	4.4	0.8	0.1	7.8	15.1	16.8	206.5	614.2
13	Ileje	Ndola	331.7	4.1	30.8	3.8	0.7	0.0	6.3	12.6	13.9	176.5	580.6
14	Ileje	Ikinga	323.0	2.9	15.2	2.7	0.5	0.0	4.1	9.8	17.6	123.5	499.3
15	Ileje	Kafule	271.3	3.9	30.5	3.6	0.7	0.0	5.9	12.9	16.4	167.8	513.1
16	Ileje	Malangali	407.0	3.9	35.6	3.6	0.7	0.0	5.7	13.3	14.6	167.9	652.4
17	Ileje	Kalembo	179.0	2.1	25.2	2.0	0.4	0.0	3.4	6.7	7.4	91.6	317.8
18	Ileje	Bupigu	308.5	3.7	19.5	3.4	0.7	0.0	5.6	11.7	12.8	159.1	524.9
19	Ileje	Isongole	434.1	6.0	27.4	5.5	1.1	0.0	8.8	19.7	21.7	256.1	780.4
20	Ileje	Chitete	346.8	5.2	36.4	4.8	0.9	0.0	7.8	16.9	18.6	258.2	695.5
21	Ileje	Mbebe	670.0	5.6	32.8	5.2	1.0	0.0	8.4	16.8	18.4	273.9	1,032.1
22	Mbozi	Iyula	1,025.7	44.4	42.1	1.2	1.4	0.0	10.2	23.9	61.1	342.7	1,552.7
23	Mbozi	Nyimbili	1,037.6	73.8	56.5	1.9	2.3	0.1	16.5	38.8	46.4	569.3	1,843.2
24	Mbozi	Vwawa	77.8	22.7	3.1	0.6	0.7	0.0	5.1	12.2	111.7	174.8	408.6
25	Mbozi	Isandula	676.8	23.4	26.6	0.6	0.7	0.0	5.2	12.6	28.9	180.8	955.7
26	Momba	Chiwezi	80.3	24.8	13.5	0.1	0.3	0.0	2.0	5.0	49.8	71.4	247.1
27	Tunduma	Tunduma	47.7	19.3	15.5	1.5	0.2	0.0	1.6	75.9	3.4	55.6	220.8
28	Chitipa	TA Mwabulambya	3,571.4	38.2	130.2	2.4	8.3	0.0	36.4	366.3	214.3	1,731.8	6,099.4
29	Chitipa	TA Mwenemisuku	1,934.2	8.8	74.1	0.6	1.9	0.0	8.3	103.8	103.3	400.7	2,635.9
30	Chitipa	TA Kameme	2,719.4	12.5	163.7	0.8	2.7	0.0	12.2	133.5	66.4	564.4	3,675.5
31	Chitipa	Chitipa Boma	117.7	9.5	13.0	0.6	2.1	0.0	9.0	66.8	33.2	2,499.9	2,751.7
32	Karonga	TA Kilupula	675.8	17.4	105.7	0.0	31.1	0.0	16.9	108.0	214.8	359.7	1,529.5
33	Karonga	SC Mwakaboko	2,629.5	21.9	365.0	0.1	2.7	0.0	21.2	172.2	85.6	217.4	3,515.5
	Total		***21,600***	***389***	***1,769***	***64***	***86***	***1***	***302***	***1,433***	***1,401***	***11,628***	***38,673***

INTERMEDIATE COSTS (2)

	Region	Ward/TA	Intermediate Inputs to Administration and Social Services in US$ current 2010							
			Regional	District	Agriculture	Education	Health	Roads	Water	Total
1	Mbeya Rural	Iwiji	16.0	3.3	0.3	14.3	11.4	0.9	0.8	47.1
2	Mbeya Rural	Masoko	0.9	0.2	0.0	14.3	0.0	0.1	0.1	15.6
3	Kyela	Ikolo	22.9	3.0	0.5	0.0	10.5	0.6	0.7	38.1
4	Kyela	Katumba Songwe	31.4	2.2	0.4	21.9	7.7	0.5	0.5	64.5
5	Kyela	Ngana	14.4	1.0	0.2	10.0	3.5	0.2	0.2	29.5
6	Kyela	Ngonga	18.8	1.3	0.2	13.1	4.6	0.3	0.3	38.5
7	Kyela	Ikimba	23.9	1.6	0.3	16.7	5.8	0.4	0.4	49.1
8	Kyela	Itope	4.2	0.2	0.0	2.3	0.6	0.0	0.0	7.3
9	Ileje	Itumba	41.4	4.8	0.3	28.7	9.3	1.3	1.1	86.8
10	Ileje	Mlale	19.9	2.3	0.2	13.8	4.5	0.6	0.5	41.7
11	Ileje	Itale	30.6	3.5	0.2	21.2	6.9	1.0	0.8	64.2
12	Ileje	Ibaba	32.4	3.7	0.3	22.5	7.3	1.1	0.8	68.0
13	Ileje	Ndola	27.7	3.2	0.2	19.2	6.2	0.9	0.7	58.1
14	Ileje	Ikinga	19.4	2.2	0.2	13.4	4.3	0.6	0.5	40.7
15	Ileje	Kafule	26.3	3.0	0.2	18.3	5.9	0.9	0.7	55.3
16	Ileje	Malangali	26.3	3.0	0.2	18.3	5.9	0.9	0.7	55.3
17	Ileje	Kalembo	14.4	1.7	0.1	10.0	3.2	0.5	0.4	30.2
18	Ileje	Bupigu	25.0	2.9	0.2	17.3	5.6	0.8	0.6	52.4
19	Ileje	Isongole	9.9	4.6	0.3	11.4	9.0	1.3	1.0	37.5
20	Ileje	Chitete	8.6	4.1	0.3	10.0	7.9	1.1	0.9	32.9
21	Ileje	Mbebe	9.2	4.3	0.3	10.7	8.4	1.2	1.0	35.2
22	Mbozi	Iyula	10.9	1.9	0.5	4.1	7.6	0.6	0.7	26.3
23	Mbozi	Nyimbili	18.1	3.2	0.9	6.8	12.7	0.9	1.2	43.7
24	Mbozi	Vwawa	5.5	1.0	0.3	24.7	3.9	0.3	0.4	36.1
25	Mbozi	Isandula	5.7	1.0	0.3	25.6	4.0	0.3	0.4	37.3
26	Momba	Chiwezi	0.1	0.4	0.1	28.5	3.7	0.1	0.2	33.1
27	Tunduma	Tunduma	0.1	0.3	0.1	0.0	2.9	0.1	0.1	3.6
28	Chitipa	TA Mwabulambya	18.1	12.1	27.7	0.0	115.4	8.0	9.0	190.3
29	Chitipa	TA Mwenemisuku	4.2	2.8	6.4	47.2	30.8	1.9	2.1	95.4
30	Chitipa	TA Kameme	4.8	3.9	9.0	23.8	26.5	2.6	2.9	73.6
31	Chitipa	Chitipa Boma	3.6	3.0	6.9	62.9	230.9	2.0	2.3	311.6
32	Karonga	TA Kilupula	0.0	1.2	9.3	3.0	336.2	0.6	0.0	350.4
33	Karonga	SC Mwakaboko	0.0	1.6	11.7	42.0	67.5	0.8	0.0	123.5
	Total		***495***	***89***	***78***	***576***	***971***	***33***	***32***	***2,273***

LABOUR DAYS (1)

	Region	Ward/TA	Labour days to natural resources										
			Rainfed Crops	Irrigated Crops	Livestock	Apiculture	Fisheries	Aquaculture	Forestry	Housing	Water supply	SMI	Total
1	Mbeya Rural	Iwiji	402,086	5,250	135,872	482	9,658	3,666	80,139	15,409	158,637	20,439	831,640
2	Mbeya Rural	Masoko	23,173	310	5,980	28	571	217	5,134	1,022	11,022	1,208	48,664
3	Kyela	Ikolo	72,911	1,271	113,105	48	12,853	0	49,296	23,009	211,399	27,201	511,094
4	Kyela	Katumba Songwe	257,740	928	210,077	35	9,382	0	36,110	16,393	108,018	21,356	660,039
5	Kyela	Ngana	85,895	424	48,810	16	4,291	0	18,655	8,076	71,058	9,082	246,306
6	Kyela	Ngonga	156,539	555	149,733	2	71,059	0	21,521	9,807	92,242	13,375	514,834
7	Kyela	Ikimba	136,871	707	91,469	27	726	0	27,665	12,790	59,216	15,123	344,594
8	Kyela	Itope	13,899	72	2,917	3	726	0	2,878	1,299	13,286	1,536	36,615
9	Ileje	Itumba	269,386	8,173	147,471	4,319	6,878	743	47,660	12,622	45,607	14,556	557,417
10	Ileje	Mlale	102,051	3,929	90,416	2,076	3,306	0	24,038	5,778	54,346	6,996	292,936
11	Ileje	Itale	129,643	6,044	68,981	3,194	5,086	547	41,817	8,890	83,634	10,765	358,602
12	Ileje	Ibaba	133,770	6,401	91,397	3,383	5,387	586	44,891	9,886	88,664	11,400	395,764
13	Ileje	Ndola	136,087	5,472	90,160	2,892	4,605	508	33,819	8,241	75,741	9,746	367,272
14	Ileje	Ikinga	133,622	3,830	59,986	2,024	3,223	352	18,128	6,394	53,937	6,820	288,314
15	Ileje	Kafule	112,800	5,201	85,177	2,748	4,377	469	30,694	8,455	72,355	9,262	331,538
16	Ileje	Malangali	168,829	5,204	107,631	2,750	4,379	0	27,245	8,687	72,189	9,267	406,182
17	Ileje	Kalembo	73,730	2,838	64,902	1,500	2,388	0	19,248	4,381	39,314	5,055	213,357
18	Ileje	Bupigu	126,711	4,931	74,414	2,606	4,149	0	28,290	7,612	68,282	8,781	325,776
19	Ileje	Isongole	176,179	7,938	99,487	4,195	6,690	0	43,237	12,900	67,800	14,137	431,553
20	Ileje	Chitete	142,954	6,959	115,824	3,678	5,856	0	38,825	11,021	96,427	13,894	435,439
21	Ileje	Mbebe	272,691	7,448	123,239	3,936	6,268	0	43,134	10,952	103,031	14,764	585,462
22	Mbozi	Iyula	464,117	15,602	132,325	357	8,938	447	74,381	15,620	58,887	18,916	789,589
23	Mbozi	Nyimbili	410,668	25,919	179,977	593	14,849	743	108,755	25,344	203,795	31,425	1,002,070
24	Mbozi	Vwawa	33,245	7,957	10,989	182	4,558	0	33,545	7,965	86,502	9,647	194,570
25	Mbozi	Isandula	297,255	8,231	97,488	188	4,716	236	32,681	8,240	79,286	9,980	538,300
26	Momba	Chiwezi	44,969	8,718	50,435	33	1,861	0	12,528	3,253	35,811	3,939	161,547
27	Tunduma	Tunduma	31,873	6,793	50,964	477	1,450	0	10,489	49,558	23,743	3,070	178,417
28	Chitipa	TA Mwabulambya	711,424	6,849	271,149	1,196	45,172	1,246	291,837	42,448	728,206	95,599	2,195,126
29	Chitipa	TA Mwenemisuku	438,539	1,585	157,436	277	10,452	249	65,251	12,033	168,817	22,121	876,759
30	Chitipa	TA Kameme	580,650	2,232	307,935	390	14,721	499	102,266	15,476	237,293	31,154	1,292,616
31	Chitipa	Chitipa Boma	24,727	1,705	19,930	298	11,245	249	71,466	7,736	63,460	138,000	338,816
32	Karonga	TA Kilupula	235,651	4,256	153,890	20	142,644	0	52,035	12,515	190,312	19,500	810,822
33	Karonga	SC Mwakaboko	910,903	5,346	550,526	25	14,757	499	64,367	19,951	237,982	12,000	1,816,355
	Total		***7,311,591***	***179,076***	***3,959,074***	***43,976***	***447,211***	***11,257***	***1,602,026***	***423,761***	***3,760,298***	***640,113***	***18,378,383***

LABOUR DAYS (2))

	Region	Ward/TA	Labour days to Adminstration and Social Services								0.4	0.15	
			Regional	District	Agriculture	Education	Health	Roads	Water	Total	Labour supply: adult	Labour supply: child	Total Labour supply, days pa
1	Mbeya Rural	Iwiji	1,516	317	68	7,816	2,459	189	183	12,549	1,989,437	746,039	2,735,476
2	Mbeya Rural	Masoko	90	19	4	7,816	6	11	11	7,956	117,534	44,075	161,609
3	Kyela	Ikolo	1,920	248	105	0	2,260	136	146	4,815	2,647,585	992,844	3,640,429
4	Kyela	Katumba Songwe	2,632	181	77	12,007	1,650	99	106	16,752	1,932,660	724,748	2,657,408
5	Kyela	Ngana	1,204	83	35	5,491	755	46	49	7,662	883,947	331,480	1,215,427
6	Kyela	Ngonga	1,574	108	46	7,181	987	60	64	10,019	1,155,841	433,440	1,589,281
7	Kyela	Ikimba	2,005	138	58	9,145	1,257	76	81	12,759	1,471,993	551,997	2,023,991
8	Kyela	Itope	348	14	6	1,240	128	8	8	1,751	149,483	56,056	205,539
9	Ileje	Itumba	3,174	366	70	15,709	1,999	291	228	21,836	1,416,774	531,290	1,948,065
10	Ileje	Mlale	1,525	176	34	7,551	961	140	109	10,496	680,986	255,370	936,356
11	Ileje	Itale	2,347	271	52	11,617	1,479	215	168	16,149	1,047,755	392,908	1,440,663
12	Ileje	Ibaba	2,486	287	55	12,303	1,566	228	178	17,102	1,109,582	416,093	1,525,675
13	Ileje	Ndola	2,125	245	47	10,518	1,339	195	152	14,620	948,596	355,724	1,304,320
14	Ileje	Ikinga	1,487	172	33	7,360	937	136	107	10,231	663,828	248,936	912,764
15	Ileje	Kafule	2,019	233	45	9,996	1,272	185	145	13,895	901,514	338,068	1,239,582
16	Ileje	Msangali	2,021	233	45	10,001	1,273	185	145	13,902	902,001	338,250	1,240,251
17	Ileje	Kalembo	1,102	127	24	5,455	694	101	79	7,583	492,000	184,500	676,500
18	Ileje	Bupigu	1,915	221	42	9,477	1,206	175	137	13,173	854,710	320,516	1,175,226
19	Ileje	Isongole	756	356	68	6,240	1,942	282	221	9,866	1,376,021	516,008	1,892,029
20	Ileje	Chitete	663	312	60	5,471	1,702	248	194	8,649	1,206,331	452,374	1,658,705
21	Ileje	Mbebe	710	334	64	5,855	1,822	265	207	9,256	1,291,037	484,139	1,775,175
22	Mbozi	Iyula	1,152	202	111	2,233	1,648	122	158	5,626	1,841,156	690,433	2,531,589
23	Mbozi	Nyimbili	1,914	336	185	3,710	2,738	202	262	9,347	3,058,702	1,147,013	4,205,716
24	Mbozi	Vwawa	588	103	57	13,535	841	62	80	15,265	938,960	352,110	1,291,070
25	Mbozi	Isandula	608	107	59	14,002	870	64	83	15,792	971,340	364,253	1,335,593
26	Momba	Chiwezi	11	42	23	15,588	800	25	33	16,523	383,416	143,781	527,198
27	Tunduma	Tunduma	8	33	18	6	624	20	26	735	298,766	112,037	410,803
28	Chitipa	TA Mwabulambya	1,467	981	3,408	1	14,227	989	1,115	22,188	9,304,940	3,489,352	12,794,292
29	Chitipa	TA Mwenemisuku	340	227	789	14,769	3,799	229	258	20,411	2,153,097	807,411	2,960,508
30	Chitipa	TA Kameme	387	320	1,111	7,446	3,268	322	363	13,217	3,032,360	1,137,135	4,169,495
31	Chitipa	Chitipa Boma	295	244	848	19,688	28,453	246	278	50,053	2,316,388	868,646	3,185,034
32	Karonga	TA Kilupula	0	101	1,146	939	41,432	78	0	43,697	2,419,859	907,447	3,327,306
33	Karonga	SC Mwakaboko	0	127	1,440	13,147	8,316	99	0	23,129	3,039,740	1,139,902	4,179,642
	Total		*40,387*	*7,259*	*10,232*	*273,313*	*134,709*	*5,728*	*5,374*	*477,003*	*52,998,339*	*19,874,377*	*72,872,717*

RETURNS TO LABOUR

	Region	Ward/TA	Return to labour from natural resources , US$ per labour day										
			Rainfed Crops	Irrigated Crops	Livestock	Apiculture	Fisheries	Aquaculture	Forestry	Housing	Water supply	SMI	Total
1	Mbeya Rural	Iwiji	10.53	67.60	1.25	5.55	2.99	3.75	2.39	6.25	1.13	3.34	6.42
2	Mbeya Rural	Masoko	9.05	67.60	1.52	5.55	2.99	3.75	2.35	6.25	0.07	3.34	5.46
3	Kyela	Ikolo	26.18	26.03	2.56	4.66	2.99		45.10	6.25	1.12	3.34	9.71
4	Kyela	Katumba Songwe	9.09	26.03	3.36	4.66	2.99		45.11	6.25	1.06	3.67	7.61
5	Kyela	Ngana	45.03	26.03	3.07	4.66	2.99		45.45	6.25	1.07	3.34	20.49
6	Kyela	Ngonga	22.55	26.03	3.38	46.60	1.51		45.10	6.25	1.12	3.87	10.38
7	Kyela	Ikimba	18.63	26.03	2.28	4.66	29.48		45.13	6.25	0.96	3.34	12.29
8	Kyela	Itope	18.63	26.03	1.91	8.60	2.99		45.20	6.25	0.40	3.34	11.39
9	Ileje	Itumba	13.35	27.62	1.12	13.57	2.99	12.74	3.66	6.25	0.88	3.34	7.92
10	Ileje	Mlale	13.88	27.62	1.97	13.57	2.99		3.64	6.25	1.12	3.34	6.65
11	Ileje	Itale	12.24	27.62	1.72	13.57	2.99	12.74	3.59	6.25	1.12	3.34	6.34
12	Ileje	Ibaba	12.32	27.62	1.85	13.57	2.99	12.74	3.58	6.25	1.11	3.34	6.12
13	Ileje	Ndola	13.78	27.62	1.84	13.57	2.99	12.74	3.64	6.25	1.12	3.34	6.93
14	Ileje	Ikinga	14.77	27.62	1.60	13.57	2.99	12.74	3.78	6.25	1.00	3.34	8.33
15	Ileje	Kafule	15.89	27.62	1.69	13.57	2.99	12.74	3.66	6.25	1.08	3.34	7.32
16	Ileje	Malangali	15.58	27.62	1.81	13.57	2.99		3.72	6.25	1.10	3.34	8.09
17	Ileje	Kalembo	13.88	27.62	1.97	13.57	2.99		3.59	6.25	1.11	3.34	6.63
18	Ileje	Bupigu	14.75	27.62	1.11	13.57	2.99		3.67	6.25	1.11	3.34	7.34
19	Ileje	Isongole	13.03	27.62	1.38	13.57	2.99		3.70	6.25	1.00	3.34	7.14
20	Ileje	Chitete	12.83	27.62	1.18	13.57	2.99		3.69	6.25	1.11	3.85	5.98
21	Ileje	Mbebe	11.84	27.62	1.37	13.57	2.99		3.67	6.25	1.12	3.82	6.96
22	Mbozi	Iyula	3.05	12.50	1.76	4.26	2.99	7.60	2.39	6.25	0.39	3.34	2.83
23	Mbozi	Nyimbili	3.18	12.50	1.32	4.26	2.99	7.60	2.45	6.25	1.08	3.34	2.66
24	Mbozi	Vwawa	3.41	12.50	1.60	4.26	2.99		2.45	6.25	0.18	3.34	2.18
25	Mbozi	Isandula	4.25	12.50	1.36	4.26	2.99	7.60	2.48	6.25	0.96	3.34	3.26
26	Momba	Chiwezi	6.10	12.50	1.47	27.14	2.99		2.50	6.25	0.09	3.34	3.29
27	Tunduma	Tunduma	12.86	15.96	1.34	5.55	2.99		2.46	6.25	1.15	3.34	5.42
28	Chitipa	TA Mwabulambya	11.19	89.81	1.27	31.82	3.51	3.62	2.38	17.10	1.38	3.34	5.40
29	Chitipa	TA Mwenemisuku	15.51	40.26	1.09	31.82	3.51	3.62	2.39	17.10	1.10	3.34	8.79
30	Chitipa	TA Kameme	15.93	40.26	1.35	31.82	3.51	3.62	2.35	17.10	1.39	3.34	8.33
31	Chitipa	Chitipa Boma	13.72	28.90	2.23	31.82	3.51	3.62	2.39	17.10	1.18	3.34	3.90
32	Karonga	TA Kilupula	15.62	27.38	2.10	31.59	1.68		4.79	17.10	0.65	3.70	6.19
33	Karonga	SC Mwakaboko	11.82	30.45	1.89	31.59	3.51	3.62	4.81	17.10	1.32	3.34	7.17
	Total		***12.21***	***25.51***	***1.78***	***14.01***	***2.49***	***6.77***	***7.08***	***9.07***	***1.11***	***3.39***	***6.76***

APPENDIX B:

DATA COLLECTION FROM DISTRICT OFFICES

An initial RGDP estimate was developed based on District level data in November 2013. While this was useful, there was very little difference in the RGDP between Wards and T/A within any District. By collecting more data at sub-District level in March-April 2014 the model was improved substantially. Time series data for the period 2010-2012 was collected to establish trends and rates of change.

The District counterpart staff were very helpful, able and willing to collate this data – they have access to the District archives and they know what is available and where it is. The amount of extra data needed to develop the model to sub-District level was relatively small – after preparing the initial District-level model it was clear what parameters would have a strong influence on the model out-turn and what parameters were less important.

The pro forma for collecting this data are reproduced below. In summary:

- Crop area, production and price statistics by Ward/T/A for the period 2010-2012 substantially improved the estimate of about 65% of the basin economy. The top ten crops which contribute 90% to crop value added in the basin were identified and the collection of detailed statistics was confined to these crops.
- Tonnage of inputs (fertiliser and improved seed) supplied to Ward/T/A for the same period, and the system under which they were supplied (subsidised or open market)
- The net irrigated area by Ward or T/A from 2010 to 2012
- An estimate of the price of daily labour (an agricultural rate or a daily wage rate) from 2010 to 2012
- Number of Cattle (cattle comprise about 90% of the value added of livestock so collecting statistics on other types would provide rather limited additional information)
- Number of beehives
- Local prices of difficult commodities like fuel wood, charcoal, timber, honey and selected construction materials
- The number of Small and Medium Sized industries by type
- Collation of the statistics on physical social assets (health services,

water supply, schools, roads, electricity supply, agro-processing, forestry, mining and administration).

While it is not possible to put confidence limits on the accuracy of the RGDP estimates, it will be apparent that data provided by the District offices enables the value added of the rainfed-cropping sector of the economy to be reasonably well estimated. The largest sector of the economy is therefore the best estimated.

Tabulation 1: Crop Area, Production and Price Data by Crop for the Years 2010, 2011, and 2012

Region	Ward/TA	Maize	Paddy	Beans	Sw. potato	Cassava	Tobacco	Tomatoes	Coffee	Groundnut	Fing. millet
Mbeya Rural	Ilembo										
Mbeya Rural	Iwiji										
Mbeya Rural	Isuto										
Kyela	Ikolo										
Kyela	Katumba Songwe										
Kyela	Ngana										
Kyela	Ngonga										
Ileje	Itumba										
Ileje	Itale										
Ileje	Ibaba										
Ileje	Ndola										
Ileje	Ikinga										
Ileje	Kafula										
Ileje	Malangali										
Ileje	Bupigu										
Ileje	Isongole										
Ileje	Chitete										
Ileje	Mbebe										
Mbozi	Iyula										
Mbozi	Nyimbili										
Mbozi	Mlowo										
Mbozi	Isandula										
Mbozi	Ihanda										
Momba	Tunduma										
Momba	Chiwezi										
Chitipa	Mwabulambya										
Chitipa	Mwenemisuku										
Chitipa	Kameme										
Chitipa	Chitipa Boma										
Karonga	Kilupula										
Karonga	Mwakaboko										

Tabulation 2: Crop Input Supply to Wards and T/A: 2010, 2011 and 2012

Government Subsidy

INPUT, QUANTITY 2010

Region	Ward/TA	BASAL TONS	TOP DRESSING TONS	IMPROVED MAIZE SEED KG	IMPROVED PADDY SEED KG	IMPROVED OTHER SEED KG
Mbeya Rural	Ilembo					
Mbeya Rural	Iwiji					
Mbeya Rural	Isuto					
Kyela	Ikolo					
Kyela	Katumba Songwe					
Kyela	Ngana					
Kyela	Ngonga					
Ileje	Itumba					
Ileje	Itale					
Ileje	Ibaba					
Ileje	Ndola					
Ileje	Ikinga					
Ileje	Kafule					
Ileje	Malangali					
Ileje	Bupigu					
Ileje	Isongole					
Ileje	Chitete					
Ileje	Mbabe					
Mbozi	Iyula					
Mbozi	Nyimbili					
Mbozi	Mlowo					
Mbozi	Isandula					
Mbozi	Ihanda					
Momba	Tunduma					
Momba	Chiwezi					
Chitipa	Mwabulambya					
Chitipa	Mwenemisuku					
Chitipa	Kameme					
Chitipa	Chitipa Boma					
Karonga	Kilupula					
Karonga	Mwakaboko					

Other Sources

INPUT, QUANTITY 2010

Region	Ward/TA	BASAL TONS	TOP DRESSING TONS	IMPROVED MAIZE SEED KG	IMPROVED PADDY SEED KG	IMPROVED OTHER SEED KG
Mbeya Rural	Ilembo					
Mbeya Rural	Iwiji					
Mbeya Rural	Isuto					
Kyela	Ikolo					
Kyela	Katumba Songwe					
Kyela	Ngana					
Kyela	Ngonga					
Ileje	Itumba					
Ileje	Itale					
Ileje	Ibaba					
Ileje	Ndola					
Ileje	Ikinga					
Ileje	Kafule					
Ileje	Malangali					
Ileje	Bupigu					
Ileje	Isongole					
Ileje	Chitete					
Ileje	Mbabe					
Mbozi	Iyula					
Mbozi	Nyimbili					
Mbozi	Mlowo					
Mbozi	Isandula					
Mbozi	Ihanda					
Momba	Tunduma					
Momba	Chiwezi					
Chitipa	Mwabulambya					
Chitipa	Mwenemisuku					
Chitipa	Kameme					
Chitipa	Chitipa Boma					
Karonga	Kilupula					
Karonga	Mwakaboko					

Tabulation 3: Irrigation Area and Cost of Labour

IRRIGATED HA

Region	Ward/TA	2010	2011	2012
Mbeya Rural	Ilembo			
Mbeya Rural	Iwiji			
Mbeya Rural	Isuto			
Kyela	Ikolo			
Kyela	Katumba Songwe			
Kyela	Ngana			
Kyela	Ngonga			
Ileje	Itumba			
Ileje	Itale			
Ileje	Ibaba			
Ileje	Ndola			
Ileje	Ikinga			
Ileje	Kafule			
Ileje	Malangali			
Ileje	Bupigu			
Ileje	Isongole			
Ileje	Chitete			
Ileje	Mbebe			
Mbozi	Iyula			
Mbozi	Nyimbili			
Mbozi	Mlowo			
Mbozi	Isandula			
Mbozi	Ihanda			
Momba	Tunduma			
Momba	Chiwezi			
Chitipa	Mwabulambya			
Chitipa	Mwenemisuku			
Chitipa	Kameme			
Chitipa	Chitipa Boma			
Karonga	Kilupula			
Karonga	Mwakaboko			

COST OF LABOUR, LOCAL CURRENCY UNIT PER DAY

Region	Ward/TA	2010	2011	2012
Mbeya Rural	Ilembo			
Mbeya Rural	Iwiji			
Mbeya Rural	Isuto			
Kyela	Ikolo			
Kyela	Katumba Songwe			
Kyela	Ngana			
Kyela	Ngonga			
Ileje	Itumba			
Ileje	Itale			
Ileje	Ibaba			
Ileje	Ndola			
Ileje	Ikinga			
Ileje	Kafule			
Ileje	Malangali			
Ileje	Bupigu			
Ileje	Isongole			
Ileje	Chitete			
Ileje	Mbebe			
Mbozi	Iyula			
Mbozi	Nyimbili			
Mbozi	Mlowo			
Mbozi	Isandula			
Mbozi	Ihanda			
Momba	Tunduma			
Momba	Chiwezi			
Chitipa	Mwabulambya			
Chitipa	Mwenemisuku			
Chitipa	Kameme			
Chitipa	Chitipa Boma			
Karonga	Kilupula			
Karonga	Mwakaboko			

Tabulation 4: Beehives and Local Unit Prices of Selected Commodities

NUMBER OF BEEHIVES

Region	Ward/TA	2010	2011	2012
Mbeya Rural	Ilembo			
Mbeya Rural	Iwiji			
Mbeya Rural	Isuto			
Kyela	Ikolo			
Kyela	Katumba Songwe			
Kyela	Ngana			
Kyela	Ngonga			
Ileje	Itumba			
Ileje	Itale			
Ileje	Ibaba			
Ileje	Ndola			
Ileje	Ikinga			
Ileje	Kafule			
Ileje	Malangali			
Ileje	Bupigu			
Ileje	Isongole			
Ileje	Chitete			
Ileje	Mbebe			
Mbozi	Iyula			
Mbozi	Nyimbili			
Mbozi	Mlowo			
Mbozi	Isandula			
Mbozi	Ihanda			
Momba	Tunduma			
Momba	Chiwezi			
Chitipa	Mwabulambya			
Chitipa	Mwenemisuku			
Chitipa	Kamema			
Chitipa	Chitipa Boma			
Karonga	Kilupula			
Karonga	Mwakaboko			

In local currency units, specify weight units

LOCAL PRICES

Region	Ward/TA	Firewood	Charcoal	Timber	Honey	Ox and plough	Roofing sheet	Bag cemnet
Mbeya Rural	Ilembo							
Mbeya Rural	Iwiji							
Mbeya Rural	Isuto							
Kyela	Ikolo							
Kyela	Katumba Songwe							
Kyela	Ngana							
Kyela	Ngonga							
Ileje	Itumba							
Ileje	Itale							
Ileje	Ibaba							
Ileje	Ndola							
Ileje	Ikinga							
Ileje	Kafule							
Ileje	Malangali							
Ileje	Bupigu							
Ileje	Isongole							
Ileje	Chitete							
Ileje	Mbebe							
Mbozi	Iyula							
Mbozi	Nyimbili							
Mbozi	Mlowo							
Mbozi	Isandula							
Mbozi	Ihanda							
Momba	Tunduma							
Momba	Chiwezi							
Chitipa	Mwabulambya							
Chitipa	Mwenemisuku							
Chitipa	Kamema							
Chitipa	Chitipa Boma							
Karonga	Kilupula							
Karonga	Mwakaboko							

Tabulation 4: Characteristics of Small and Medium Industries

Region	Ward/TA	Flour mill	Rice Mill	Bakery	Restaurant	Guest house	Oil expelling	Taxi service	Bus service
Mbeya Rural	Ilembo								
Mbeya Rural	Iwiji								
Mbeya Rural	Isuto								
Kyela	Ikolo								
Kyela	Katumba Songwe								
Kyela	Ngana								
Kyela	Ngonga								
Ileje	Itumba								
Ileje	Itale								
Ileje	Ibaba								
Ileje	Ndola								
Ileje	Ikinga								
Ileje	Kafule								
Ileje	Malangali								
Ileje	Bupigu								
Ileje	Isongole								
Ileje	Chitete								
Ileje	Mbebe								
Mbozi	Iyula								
Mbozi	Nyimbili								
Mbozi	Mlowo								
Mbozi	Isandula								
Mbozi	Ihanda								
Momba	Tunduma								
Momba	Chiwezi								
Chitipa	Mwabulambya								
Chitipa	Mwenemisuku								
Chitipa	Kameme								
Chitipa	Chitipa Boma								
Karonga	Kilupula								
Karonga	Mwakaboko								