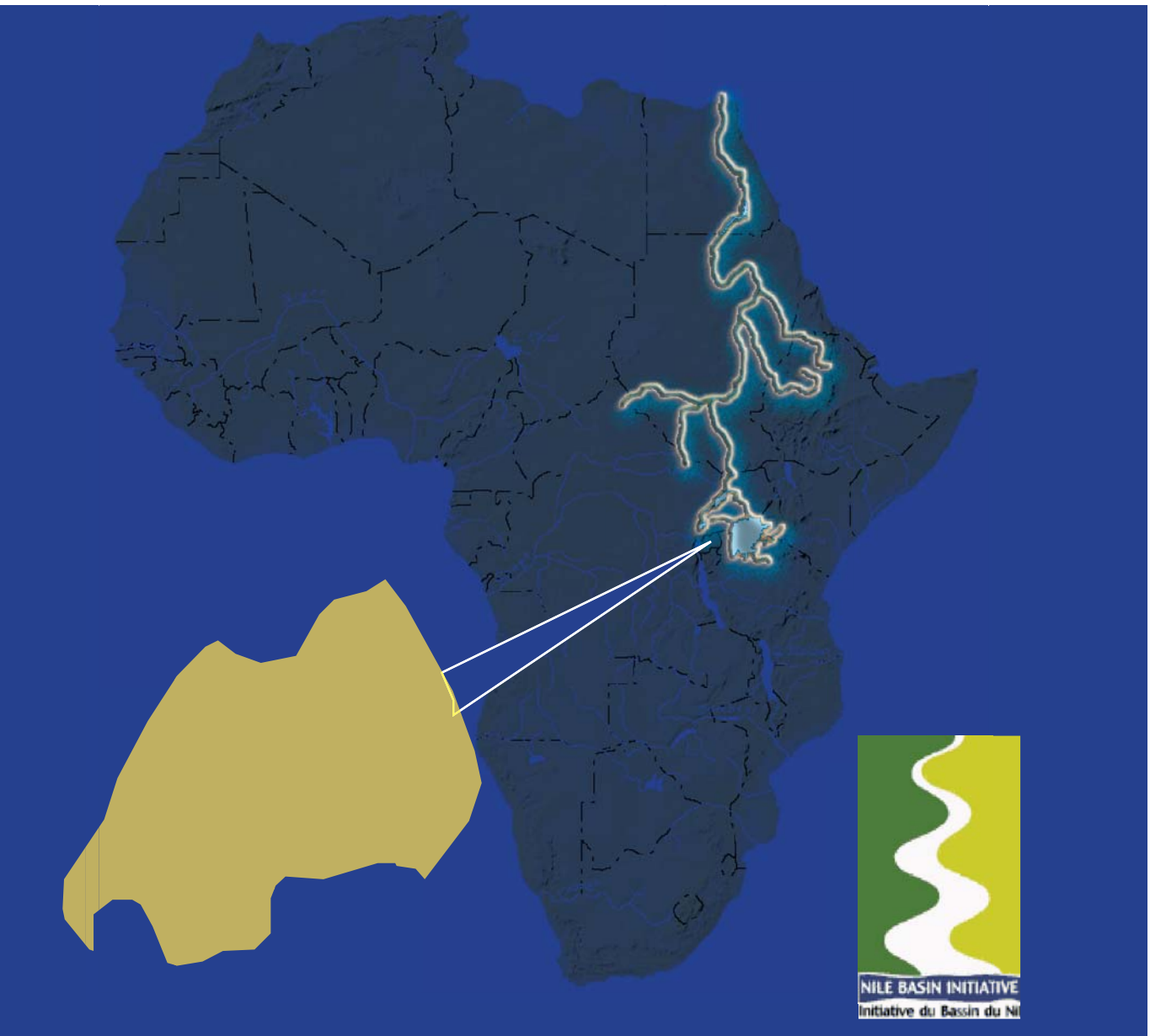
SOCIO-ECONOMIC DEVELOPMENT AND BENEFIT SHARING PROJECT [SDBS]

FINAL REPORT 2008

Policy on "Brown" Water due to Environmental Degradation and/the Sustainable Resource use in the Nile Basin Countries

RWANDA

PROJECT ID Number: P075952



PMU, SOCIO-ECONOMIC DEVELOPMENT & BENEFIT SHARING PROJECT
NILE BASIN INITIATIVE

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This report was prepared by

Prof. Herman Musahara

Prof. Rama Rao

Faculty of Economics and Management
National University of Rwanda
University Avenue
P.O. Box: 56 BUTARE, RWANDA
Phone: +(250) 530 122
Fax: +(250) 530 121
Email: info@nur.ac.rw

PMU, Socio-economic Development and Benefit Sharing
Nile Basin Initiative

Plot 12 Mpigi Road
P.O. Box 192, Entebbe, Uganda
Tel: +256-414-321-424

First Published 2009

For further information contact: Project Management Unit

PMU, Socio-economic Development & Benefit Sharing
Nile Basin Initiative
Plot 12 Mpigi Road
P.O. Box 192, Entebbe, Uganda
Tel: +256-414-321-424

Hellen Natu
Tamene Tiruneh
John Bosco Bampabwire
Peter Nabende
Edith Mbonye
Callist Habaasa
John Baptist Byaruhanga

Contents

List of Tables

List of Figures

List of Abbreviations

EC	Economic Commission
EIU	Economic Intelligence Unit
EDPRS	Economic Development and Poverty Reduction Strategy
CO_2	Carbon Dioxide
DFID	Department for International Development
DRC	Democratic Republic of Congo
EDPRS	Economic Development and Poverty Reduction Strategy
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GoR	Government of Rwanda
HDI	Human Development Index
IWRM	Integrated Water Resources Management
MDG	Millennium Development Goals
MINECOFIN	Ministry of Finance and Economic Planning
NAPA	National Adaptation Programme of Action
NBI	Nile Basin Initiative
PID	Project Implementation Document
PIP	Project Implementation Programme
PRSP	Poverty Reduction Strategy Paper
SDBS	Socio Economic Development and Benefit Sharing
SWC	Soil and Water Conservation
UNDP	United Nations Development Programme
UNFCC	United Nations Framework Convention on Climate Change
WB	World Bank
WSSD	World Summit on Sustainable Development

Acknowledgement

The activities and subsequent results attained in this study would not have come to fruition without the invaluable contribution of various stakeholders. Notably, these include: colleagues in other Participating Institutions, the Nile Secretariat, Shared Vision Programme (SVP) Coordination Unit, SDBS-Project Steering Committee Members, other SVP projects, Subsidiary Action Programmes (NELSAP & ENSAP); the World Bank team, the United Nations Office for Project Services team and Department For International Development team. A word of thanks also goes to all stakeholders in the Nile Basin. Lastly, special appreciations go to the team at the SDBS-Project Implementation Unit for the tireless effort and time invested in guiding this study to a successful conclusion.

Executive summary

The Final Draft Report is consolidated with four major sections that are detachable. The first is the longer and more detailed study report of the Rwanda Participating Institution. The Report is a synthesis of a desk study and field work on Policy to reduce environmental degradation and sustainable use of natural resources in the Nile Basin. The second part is a Policy Brief. The brief uses Rwanda to introduce a concept of Brown Water. Nonetheless the policy is generically corroborating what is also happening in other countries particularly Burundi and DRC which are members of the cluster but also Tanzania and Uganda, riparian countries of the Kagera River Basin. While there has been empirical interest in Blue, Green and Grey Water, the brief ushers in a new challenge of recognizing a Brown Water phenomenon in the Water and Natural Resources Cluster of Burundi, DRC and Rwanda. A third component of the report is the Investment Programme for the Kagera Basin. And fourth is technical on the progress of what the cluster, consisting of Burundi, DRC and Rwanda, has done and achieved.

The Study Report focuses on the theme of policy to reduce environmental degradation in the Nile Basin. It was based on two strands of hypotheses. First is the possibility that there is no policy in place in which case the ultimate end of the study would be to suggest one. Secondly there is a policy but the problem is its implementation whereby our study would have come up with an implementation strategy. Our study report is a hybrid of the two approaches on a number of fronts.

Firstly the fact that a policy and law were identified to be in place in Rwanda did not amount to shifting to part two of the hypothesis. The first reason that emerges in the report is that the existence of a regulatory and legal framework and institutions in one riparian country is not enough. We advance an approach that serves to cover the much larger gap of a lack of basin-wide policy framework. The second reason is that existence of a policy and a law is still inadequate, also because most policies lack evidence. It is usually believed

that policy analysis can be undertaken from documentary evidence and data sets since they are also written documents. The study report sought to get field evidence from the Kagera River Basin, a Nile River sub basin which occupies a large part of Rwanda. In that regard data from the field are on a national policy issue but by being in a Nile Sub Basin they are also transboundary in nature. Finally the study report is linked to sustainable use of resources. The latter part has greatly given scope to our study since sustainable use implies capacity to reduce poverty, to enhance human development and to foster benefit sharing. In other words and for the transboundary value of our study to succeed, policy to reduce degradation of the environment needs to be linked to poverty reduction, human development and benefit sharing. The novelty of the study framework is that for environmental policy to reduce the degradation of the environment effectively it has to be pro-poor.

The preliminary part of the report is thus on the scope of the study and empirical relationship between reducing degradation, human development and the Millennium Development Goals in the basin. The most important thrust of the study is the shift from focusing on the water course and the 'Blue water' hypothesis alone to bringing environment to the forefront in matters affecting the Nile and riparian. Besides the case of the 'Green Water' hypothesis existing proof of the link between environment and human development is provided and the relevance to the Nile Basin as a whole given. The methodology as hinted at is mainly the result of the use of literature review and field work using a questionnaire. The overarching approach was looking at environment as an asset to people and their livelihoods.

The findings in the report are threefold. First are those from secondary data on the state of environment in Rwanda. More than 50 per cent of all farms in Rwanda are affected by soil erosion. Deforestation has been up to 90 per cent of natural forests especially after the 1994 genocide. Degradation affects productivity and is responsible for deep levels of poverty in Rwanda. The general findings tend to defy the Boserup Hypothesis in Rwanda and the Machakos findings of population growth with land degradation while there

is no corresponding rise in poverty. The apparent failure of adapting to land degradation in Rwanda should be to a concern to policy analysis today.

The second part of the findings shows that Rwanda has legal and institutional framework for controlling degradation in place. The policy and law are recent but legislation on conserving the environment can be traced to 1930s, during colonial rule especially in protecting national parks. The issue, however, is that the existence of good policies and pervasive levels of degradation constitute a contradiction. Good policies need to deliver and in order to deliver they have to be mainstreamed into other development policies and be enforced basin wide. There is growing empirical evidence also that policies need to take into consideration direct and indirect incentive structures to enable small farmers who are the most dominant to respond to policies that are related to traditional and modern Soil and Water Conservation (SWC).

The third part focuses on the evidence from the Kagera Valley. There are general policy issues summarized from visits and discussions with people in the valley. There are also data collected from representatives of households in three "hot spots". As a whole the Kagera Valley holds evidence of sporadic degradation from productive activities, extensive cultivation of most of the marshes and multiple demands for various uses. There is evidence of drying up of lakes and falling water levels. No one knows the origin of the small water hyacinth plants that, after every few minutes, pass floating in the mainstream of Kagera River. There is general diffidence on the possible impact of unsustainable uses of the valleys but an overall though perhaps rehearsed usefulness of environmental protection. There are, however, small plots that are still unexploited and give signs of environmental and cultural goods attached to the valley. Contrary to general thinking we find several economic and commercial activities that support agricultural production although, of course, the latter is the most dominant.. Only 32 per cent would say they depend on agriculture alone. In other words when we say more than 75 per cent of the people in the Kagera Valley depend on agriculture that includes the majority who have other small sources to complement their

agricultural incomes. The common feature was agriculture with a few animals or a small business or some other side activity. As a whole the Kagera River valley has the exhibits for a need to closely monitor and guide the use of water and natural resources in the Nile Basin and to come up with a basin wide set of procedures and regulations (ToolKit) of managing the Nile hotspots especially the wetlands.

The final part of the report is on the issue of implementing the policy to reduce degradation and the sustainable use of resources. We propose a step-wise approach consisting of Integration (I), Mainstreaming (M), Inclusion (I)Coordination (C) and Operationalization (O) of policy or in short an *IMICHO* Approach. Checklists of templates and content at each step can form the first step of developing a basin wide Tool Kit for policy against degradation.

The Policy Brief is a much shorter part of the report. It advances a new concept in the discourse of environmental degradation; that of 'Brown Water'. In water resources management there exists Blue water, Green Water and Grey Water. There is also Virtual Water and Fossi Water. We argue that in relation to soil erosion and degradation the waters of Rwanda suggest strongly a concept of Brown Water. The coloration of water in the Nile Basin tributaries of Nyabarongo in Rwanda and even Ruvubu in Burundi is one point behind the concept. But Brown Water is a more dynamic concept involving causes, costs and consequences of soil erosion that have resulted in transportation of good soils from the upstream rivers of the Nile. The dynamics of Brown Water goes further to underline the poverty - environment vicious circle that has resulted in deep levels of poverty in Rwanda and the rest of the countries in the cluster. The proposed solution is not chlorination of the waters but controlling the erosion in the watersheds and possibly using more of the water to alleviate poverty. Indeed the Brown Water concept is not a replacement of the Blue or Green. It is indeed in volumetric and water source typologies a subset of the Blue and to some extent Green Water. At a more specific level three case areas of pilot interventions are proposed as responses at catchment area level; utilization taxes, carbon credits and sericulture, and these have

been elaborated separately by Burundi, DRC and Rwanda respectively.

The third part of the report is an investment programme for the Kagera River Basin. Drawing from the overall findings and the Brown Water phenomenon, a sustainable use of the valleys would be the one that does not damage the environment, market driven and at the same time alleviates poverty. Since there is a likelihood of pressure of the population on the valleys and, in Rwanda, an entrepreneurship programme that enables all types of stakeholders, women, the youth and private sector to invest in activities that protect the environment and generate income would be the most desirable. One such programme is sericulture. Sericulture has a high potential to generate income and at the same time provide strong incentive to protect the ecosystem. By providing alternative sources of substantial income the pressure on the Nile hotspots will be reduced, lessening unsustainable use and reversing the fall of water levels, pollution, Brown Water and poverty. The programme, nested in promoting entrepreneurship in the Nile Hotspots, would form the backbone of SAP strategy of intensifying benefits of their investments by helping people address poverty while protecting the environment.

The final part of the report is on cluster activities. The cluster has evolved from scoping studies to projects during the year 2008. Burundi, DRC and the lead PI Rwanda have all focused on policies related to management of the watersheds in the upstream areas of the Nile Basin. Through cluster workshops it has been possible to evolve a common argument of management of the watersheds for poverty reduction, human development for benefits sharing and protecting the waters of the Nile. The cluster studies present a strong argument for a common concern on problems that are transboundary but which are often overlooked. It is important to note how soil erosion, cost of degradation can affect lives of people in the countries (Rwanda), as well as income-generating activities like tourism (Burundi) and water levels in Nile reservoirs(DRC).The Annexes contain list of participants to cluster meetings and instruments used in the field surveys. Each of the first three reports has a set of references.

Introduction

It has been realized that limiting focus to the supply and demand of water in the water course of a transboundary river system is a narrow approach to understanding the dynamics of river basin management. 'Blue' water in the water course is very necessary in the discourse of water and natural resources management of the Nile Basin but it is not sufficient. Besides Blue water, analysis related to environment needs to include also the influence of 'Green' ([1]) and within the scope of our study 'Grey' ([2]) and 'Brown' ([3]) waters. A broader analysis that addresses the environment is important because it includes all types of demand for water and all types of stakeholders in the basin. The supply and demand of water in the basin are greatly linked to the watersheds and people living in them. But there are other dynamic factors that constitute the environmental concern. The impact of climatic change on the Nile Basin is a current environmental concern that has to be addressed. To capture the link between environment and livelihoods is the notion of ecosystem services. The latter services include market value goods, myriads of non-marketable services that the environment offers – also called wild goods – and the power to support people and biodiversity in the study areas.

Reducing environmental degradation in the Nile Basin is an answer to the core problems of the riparians for at least two reasons. Firstly eight of the nine Nile Basin countries are poor. Five of them have communities that are in countries that are among the poorest in the world. Noteworthy is that the poverty of the people in the countries can be addressed substantially by reducing degradation of the environment because they depend largely on natural resources for livelihood. It has been established that environmental degradation is the cause and effect of poverty and reducing it is an attempt

1 Green Water refers to underground water in forests and grasslands that influences water levels in the water course and which can be diminished by environmental degradation

2 Grey Water refers to waste water such as that disposed from industries, in which case they form a part of water pollution

3 Brown Water is a concept designed in this report to denote the waters of Nile tributaries in Rwanda and Burundi that are brownish signifying massive amounts of soil erosion and siltation of soil from watersheds of the rivers to the water courses

to break a vicious circle that traps communities into deep levels of poverty in the basin.

Secondly benefit-sharing is dependent on the environment and reducing environmental degradation intensifies benefit creation. No benefits to and beyond the river can be reaped if the environment is not well managed. More benefit generation provides more inroads to greater cooperation than conflict.

The primordial focus of the study has been how to derive policies towards reducing degradation of the environment. To do so has required defining the policies, the institutions, the processes and mechanisms of making them effective. Above all is the task of making sure the activities are sustainable in the sense that policies of reducing environmental degradation reduce poverty by being pro-poor; they enhance growth by proper utilization of natural resources and are gender sensitive but at the same time do not compromise the potential use of the same environment by future generations.

The study is within the area of policy for reduction of environmental degradation. It is carried out in a context of sustainable use of natural resources in the Nile Basin and thus defines the relationships between policy and water, environment, livelihoods, pro-poor growth, gender, economic growth and poverty reduction. The links are not binary but dynamic, integrated and by the nature of the study transboundary. Consistent with the overall goal of the Nile Basin Initiative our analyses of policy for reduction of environmental degradation are also based on how sustainable use of natural resources would not only reduce the degradation of the environment but also benefit creation and cooperation in the basin.

The study is intimately linked to the role of the Nile as a transboundary river system and the riparians that depend on it. For centuries the River Nile and its waters have been a source of livelihood to millions of people. There are about 160 million people in the Basin and about 300 million in the riparian countries. From its sources in upstream countries in Central Africa to the

Mediterranean Sea it covers 6700 km. It is not only one of the largest river basins in the world but also has a unique ecosystem (World Bank 2006). It is linked to high mountains, wetlands, rivers, deserts, forests, water rapids that offer hydro power potential, lakes and savannahs. Of the Nile Basin 10.7 per cent is cropland, 2 per cent forest, 53 per cent grassland, 1 per cent built up area 67.4 arid land 6.1 per cent wetlands and 1.4 per cent under irrigation(Hussain et al 2007).

The Nile Basin has been host to some of the greatest civilizations in Africa. It has the potential of facilitating a large economic transformation in the countries and provides a basis for effective benefit sharing (SDBS 2007).

However, in the majority of the Nile Basin countries evidence of massive degradation of the environment has been sufficiently identified (SDBS 2007,World Bank 2006). Massive deforestation, falling water levels, deteriorating water quality, falling agricultural productivity and high rates of population growth are infringing on livelihoods of millions in the Nile Basin. More than 50 per cent of the populations in the latter countries depend on natural resources for livelihoods. Some of the degradation of the environment has been caused by the necessity of exploiting natural resources. It can be argued that poverty is one of the causes of environmental degradation. There is, however, evidence that environmental degradation in turn also causes poverty, completing a vicious circle. The first focus of the study has been to identify policy that can undo the vicious circle of poverty in terms of one linked to the environment.

Nonetheless, it is incorrect to confine issues of environmental degradation to discourse on poverty. Environmental degradation is not caused by poverty alone. The search for rapid economic growth and the activities of governments, large companies and private sector investors have also been responsible for degradation of the environment and pollution. Policy frameworks are thus also necessary to guide sustainable management of natural resources in a manner that is pro-poor but which also conserves the environment for rapid growth as well as for use by future generations. On one hand there is need for policy to

contain the impact of the growing populations in the basin on resources and livelihoods. On the other there is an equally important need to use the increasing populations to realize the value of conserving soil and water as prerequisite to economic growth. Additionally there is also need for policy to mitigate the effects of climatic change to environment and livelihoods in the basin.

A primary aim of the study is to show how important reduction of environmental degradation is at the heart of the Nile River Basin. As noted at the beginning studies of transboundary river systems are no longer confined to 'water courses' only but also include watersheds that affect the levels, supply and quality of the water. They include various kinds of demand to the water and how different stakeholders influence or exercise their powers of influence on the water use in the water courses. Ultimately good management of the environment which guards against degradation is a basis for mitigating conflict and a method of promoting cooperation.

The rest of the report is organized as follows; Section A is the overall Study Report. In particular it is the findings of the Rwanda Case study on reducing environmental degradation and the sustainable use of resources. Section B is a policy brief. The policy brief is generally on policy to address environmental degradation in the cluster countries. Specifically it introduces a new concept of 'Brown Water' to denote the impact of soil erosion on the sustainable use of resources in the watersheds of the Nile Basin. Section C is on the Investment Programme. We propose an entrepreneurship development programme that addresses environmental degradation and provides incentives to communities to protect the environment while promoting economic growth and reducing poverty. Section D is a brief report of Cluster activities. The Water and Natural Resources Cluster consists of Burundi, DRC and Rwanda.

SECTION A

STUDY REPORT

Policy on reduction of Environmental Degradation and Sustainable use of Resources in the Nile Basin the Case of Rwanda

1

Background

1.1. Environment

A working definition of environment for the purpose of the analysis is that it is the biophysical environment that provides goods, natural resources and ecosystem services that provide food production, energy and raw materials and a recipient and partial recycler of waste products from the economy and an important source of recreation, beauty, spiritual values and other amenities (DFID, WB, EC, UNDP 2002)

It is thus clear that as a concept environment is broad and complex. It can range from the air we breathe and the CO^2 that is emitted in it, through issues of natural resources generally to pollution, climatic change and the ozone layer. The most important thing pointed out earlier is that it is very close to our lives. It is directly related to our wellbeing or inversely to our poverty.

For technical purposes the environment in this report will denote some or all of the following

- soil, water, climate and the landscape
- flora, fauna, ecosystems and biodiversity
- use of land, natural resources and raw materials
- protected areas and sites of special significance
- heritage, recreation and cultural assets
- livelihoods issues arising from interaction with the above

1.2. Why reduce degradation of the environment?

Environmental degradation which is a concern to the Nile Basin include

- Degrading agricultural lands
- Falling water levels

- Shrinking tropical forests
- Diminishing supply of clean water
- Dwindling fisheries
- Climate change effects
- Effects of the water weeds especially the water hyacinth

Sound and equitable environmental management is one way of reducing poverty and stimulating economic growth. There is poverty and inequity in the majority of communities in the Nile Basin. A fundamental role of reducing degradation of the environment is to address the poverty and reduce the inequity which is prerequisite to a sustainable development path.

The study report is not premised on the common hypothesis that it is the poor alone who cause degradation. We support the observation that the poor have low levels of consumption and production relative to those of the rich. Instead, given incentives by policy and assisted by technology the poor are in position to invest in environment which is closely related to their livelihoods and reduce their poverty. Poor people have to be stakeholders who have to participate in environmental management in the Nile Basin. We support the argument that a pro poor growth arising from sound environmental management policy is more sustainable than one that stimulates rapid economic growth but does not sufficiently address inequality and leaves several people still poor. The report is thus based on the understanding that reducing degradation of the environment is not a linear approach of mitigating soil erosion or deforestation. It is a dynamic process that involves poverty reduction and participation of all stakeholders in the basin as a basis of sustainable use of resources. It is in the holistic sense that reducing degradation of the environment becomes the centre piece of integration and cooperation in the Nile Basin.

There is need to sustain the long-term capacity of the environment to sustain basic human needs and provide opportunities to enhance human development and well being. As the HDR 2006 puts it:

…Mismanagement of international water basin threatens human security in some very direct ways. Shrinking lakes and drying rivers affect livelihoods in agriculture and fisheries, deteriorating water quality harmful consequences for health, unpredictable disruptions in water flows exacerbate effects of drought and floods

1.3. Importance of the reduction of environmental degradation in the Nile Basin

Reducing degradation of the environment is important to the poor and, as said, a majority of the people in the basin are poor. Perceptions of well-being of the poor are attached to environment. Environment is attached to the poor with regard to their health, earning capacity, security, energy supplies, and decent housing.

It is important to note, however, that the different social groups prioritize environment differently. Women, for instance, are more interested in proximity to potable water and source of energy at household level.

The link between environment and poverty conditions are summarized in the Table 2.1.below.

Table 2.1. Environment and poverty

Conditions of Environment	Poverty Dimensions
Access to natural resource ecosystem	Livelihoods
Access to safe water and sanitation pollutants	Health
Ecological fragility likelihoods of natural disasters	Vulnerability

Source: *UNEP 2005*

Three dimensions of poverty related to the environment are identifiable; livelihoods, health and levels of vulnerability. Improved access to natural resources and supply of goods and services from the ecosystem is closely related to livelihoods of the majority of people depending on natural resources for a living. Pollution to the environment and access to water and sanitation bears significantly on the health of members of communities that depend greatly on natural resources. Finally a fragile ecology and natural disasters are closely related to the levels of vulnerability of the poor.

1.4. Environment and human development

As pointed out in the introduction, the whole point of reducing environmental degradation in the Nile Basin is to reduce poverty, manage the environment for economic growth and promote human development. Complementing the usual approach of considering environment as one of the Millennium Development Goals, we support the argument that environment is part and parcel of each of the goals. Harnessing the environment is important to human development through all the MDGs. The close relationship with each is summarized in Table 2.2a.

Table 2.2a: The links between environment and MDGs

Millennium Development Goals	Examples of Links to the Environment
1. Eradicate extreme poverty and hunger	Livelihood strategies and food security of the poor often depend directly on healthy ecosystems and the diversity of goods and ecological services they provide.
2. Achieve universal primary education	Time spent collecting water and fuel-wood by children, especially girls, can reduce time at school.
3. Promote gender equality and empower women	Poor women are especially exposed to indoor air pollution and the burden of collecting water and fuel-wood, and have unequal access to land and other natural resources.
4. Reduce child mortality	Water-related diseases such as diarrhoea and cholera kill an estimated 3 million people a year in developing countries, the majority of which are children under the age of five.
5. Improve maternal health	Indoor air pollution and carrying heavy loads of water and fuel-wood adversely affect women's health and can make women less fit for childbirth and at greater risk of complications during pregnancy.
6. Combat major diseases	Up to one-fifth of the total burden of diseases in developing countries may be associated with environmental risk factors – and preventive environmental health measures are as important and at times more cost-effective than health treatments
7. Ensure environmental sustainability	Current trends in environmental degradation must be reversed in order to sustain the health and productivity of the world's ecosystem

Source: *UNEP 2004*

Table 2.2b: Environment and human development

	Men and women	Rural/urban
Equity and well being of individuals	Destruction of forests affects women and children who have to forage for fuel. This limits their choices with respect to family nurturing activities and school attendance.	Lack of access and secure tenure of land, and land degradation force rural poor into a state of landlessness: poor landless have few choices but to seek scarce unskilled urban employment.
Participation and empowerment in development	Schemes to supply clean water are seldom designed with the involvement of the poor, who remain badly supplied and suffer resultant ill health.	Urban development frequently takes up good quality agricultural land, thus removing the livelihood base of rural communities who have no say in development planning.
Freedom, dignity and accountability	Heads of household made sick by pollution lose the dignity of supporting their families and lack alternative opportunities.	Rural poor migrating to cities to escape effects of environmental degradation face severe unemployment and suffer the shame of abandoning their families.

Source: *Natasha Kanjee and Philip Dobie, Environment Thematic Guidance, 2003*

1.5. General conditions in the Nile Basin countries

That reducing degradation of the environment is important for the Nile Basin is corroborated by major socio economic indicators. With the exception of Egypt GDP per capita for all Nile Basin countries is less than US $ 1000. Of all the countries Burundi, DRC, Ethiopia and Rwanda have some of the lowest levels of GDP per capita in the world. Levels of poverty and inequality are also high as indicated in Table 2.3. Indicators in Column 6 reflect low levels of human development. In all countries except two, Egypt and Sudan, life expectancy is less than 50. With the exception of Egypt, Sudan and Uganda levels of poverty on the US $ 1 a day is higher than 40 per cent of the population. One in every 3 and in some countries in every 2 people are poor in most of the Nile Basin countries

Table 2.3: Economic situation indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Burundi	181	42.5	-0.8	1.8	32.9	66	0.384	44	59.3	54.6	95.7	Na
DRC	240	41.9	-4.8	-	-	64	0.391	43.5	67.2	na	97.2	Na
Egypt	3908	28.9	2.6	4.4	25	4	0.702	70.2	71.4	16.7	9.4	2.0
Ethiopia	220	-	-0.2	-	-	57	0.371	47.8	Na	44.2	96.5	0.1
Kenya	717	40	-0.6	3	33.7	49	0.491	47.5	73.6	52.0	83.1	0.3
Rwanda	362	44.9	-0.4	2.4	36.1	46	0.450	44.2	64.8	60.3	84.7	0.1
Sudan	986	28.9	1.6	4.2	24.2	40	0.516	56.5	60.9	35.7	86.4	0.3
Tanzania	528	40	0.8	8.2	54.0	21	0.430	45.9	69.4	57.1	94.4	0.1
Uganda	507	38.2	2.5	2.8	30.1	46	0.502	48.4	66.8	37.7	93.5	0.2
		37.4		3	29.8	28						

Source: *Hussain et al 2007 and HDR 2006*

Key: (1)GDP per capita 2005 (2) Gini Coefficient (3) GDP growth in per cent pa for 1975-2005 (4) Income by lowest 10 per cent (5) Income by highest 10 per cent (6) per cent under nourished (7) HDI (8) Life expectancy (9) Adult Literacy (10)Poverty as per cent below US $ 1.(11) per cent dependent on traditional fuel consumption (12) CO2 emission

1.6. Policy on environment, sustainable use and pro - poor growth

Two facts that were established at the beginning of the study report is that environmental degradation breeds poverty and reducing environmental degradation is poverty reducing. Another approach is that for poverty to be reduced there has to be sufficient growth in the economy. In countries where natural resources are the most dominant the most important task is to identify which policies on natural resources increase growth.

a) Natural resource related policies and investments can sustain growth by increasing output from the same natural capital and by increasing natural capital, provided there are no subsidies (DFID 2005). The DFID policy

guide points out correctly that growth from the same natural capital stock can be achieved by:

- Sustainability using output from all available natural assets, for example fishing techniques to avoid catching young fish
- Sustainability increase demand for natural resource goods and services such as tourism
- Encourage technical change to increase natural resource productivity such as use of efficient technology
- Growth from increasing the capital stock can be achieved by investments, policies and institutions for natural capital and removing the constraints to greater investment.
- It is important to note that policies and institutions are not an end in themselves. The investments in natural resources have to be financed. Past problems have been related to market failures in financing investments in natural resources

b) Natural resources can also contribute to pro-poor growth

- Natural resources are important for the livelihoods of the majority of the people in the Nile Basin. Indeed it is certain to say that it is possible to escape from poverty by using natural resources
- Both rich and poor depend on natural resources but the maximum benefit from them is constrained by entry barriers on one hand and power relations among the stakeholders on the other.
- Poor people can escape from poverty by their own use of their natural capital. Ecosystem goods and services from forests, agro ecosystems, watersheds, fisheries, and grasslands are most frequent significant assets the poor have access to.
- For poor people to lift themselves out of poverty they require technology, capital, market access and an enabling environment. A more successful approach may be to provide a more enabling business environment by providing secure resource rights, support for common property management, streamlined regulations, improved access to markets (e.g. improved transport access) and technical support

- Large scale natural resource extraction and resource protection can be made pro-poor by not harming the poorer neighbouring populations and preferably supporting their development
- There has also to be pro poor macroeconomic policies in the economy as well. It would be possible to ensure that livelihoods of poor people are not negatively impacted by the way resources are extracted in a given economy.
- Natural resources can provide revenue for pro-poor growth. While some countries have fallen into what is called the "resource curse" by failing to invest this natural resource wealth in pro-poor growth, there are other countries which have successfully used this wealth to stimulate growth for poverty reduction.

1.7. Reducing environmental degradation and benefit sharing

Environmental degradation is a common problem in most of the Nile countries. Reducing degradation of the environment is key to reducing poverty and promoting economic growth. However, the most important argument for us in the study report is that reducing environmental degradation is closely linked to the notion of benefit sharing.

The link is direct in relation to challenges and opportunities related to the benefits to the river and benefits from the river. Reducing degradation means increasing opportunities of improving water quality, river flow characteristics, soil conservation and overall sustainability which are prerequisites to benefits to the river. Increasing benefits from the river is in terms of improved water resources management.

There are also indirect benefits through increased growth of the economy and reduction of poverty. In other words, successful reduction of degradation of the environment is key to increasing benefits and reducing costs in terms of benefits because of the river and benefits beyond the river. These are summarized in Table 2.4.

Table 2.4 : Reducing environmental degradation and benefit sharing in a transboundary river system

Type	The Challenge	The Opportunities
Increasing Benefits To The River	Degraded water quality, degraded watersheds, wetlands, biodiversity	Improved water quality, river flow characteristics, soil conservation, biodiversity and overall sustainability
Increasing Benefits From The River	Increasing demand for the water, sub optimal water resources management, and development	Improved water resources management
Reducing Cost Because Of The River	Tense regional and political impacts	Policy shift to cooperation and development away from food and energy
Increasing The Benefits Beyond The River	Regional fragmentation	Integration of regional infrastructure, markets and trade

Sources: *Sadoff, C. and Grey, D, 2002*

1.8. Ecosystems approach and the importance of an integrated approach

The concept of environment as it is related to livelihoods evokes the ecosystem approach. Sound ecosystems ensure balanced communities of species and rich livelihoods. Our meals, our health and our livelihoods depend on biodiversity. Food resources from agriculture or fisheries, the diversity of medicinal herbs, water-consuming industries, or tourist activities developed next to lakes and rivers demonstrate that water resources are vital to nature and humans. In addition, nature plays a role of regulation and purification of water resources, thus contributing to better water supply and quality. Ecosystem is a complexity of goods and services in the environment that are linked to nature, people and their interests and livelihoods. It is only an integrated approach that ensures its sustainable management and reduction of its degradation. One such integrated approach is the IWRM.

IWRM is understood as a water resources approach that involves interests of all stakeholders including gender. It is not confined to water in the water course alone.

The Nile River Basin has some ecosystems such as wetlands or forests that have strong water retention capacities. Water penetrates into these ecosystems, is stored, and then restored. During wet periods, these ecosystems contribute to peak flow mitigation. During dry seasons, water is progressively released, and maintains a base-flow justifying the necessity of preserving these zones. But the question that comes to mind is: are these realities taken into consideration when national water and environmental policies are elaborated? Are Nile Basin principles ever considered in national and regional policy instruments? One such case is the Kagera Basin in Rwanda that constitutes our case study area.

Water as well as other natural resources is most often viewed in relation to economic development. Yet, a fundamental teaching of environmentalism is that land, water and air have value beyond their use in economic activities (MacDonnell and Bates, 1993). In nature, water is a unifying resource, it links people and places and it joins interests. Yet, in some places, the world of water policy has been narrow, localized and exclusive. However, water should be seen as the connecting thread in the use of all natural systems and resources. Fortunately, in the Nile Basin discourses, a more comprehensive treatment of water issues is beginning to reflect the most obvious connections between water and other resources and new institutions are starting to emerge with regard to Integrated Water Resource Management (IWRM). In fact the Applied Training Programme has been carrying out training in IWRM for the Nile Basin.

2

The Problem

A majority of the countries in the Nile Basin are some of the poorest in the world. Most have a per capita income of less than US$ 250. In these countries, there are problems of population pressure, environmental degradation and threatened ecosystem services (World Bank 2006). There are issues related to watersheds, water and natural resources in all riparian countries, especially how they interface with livelihoods. The generic nature of the problem can be understood at even more specific levels.

First policy and related studies tend to focus on the water course or 'blue' water alone. However, the problem is that 'green' water involving the environment has bigger linkage with livelihoods and the water flows themselves. At the moment degradation of ecosystems is closely related to diminishing water flows, energy crises and deteriorating livelihoods. The focus on 'blue' water results in a disjointed approach that breaks the transboundary river system into 'upstream', 'mid stream' and 'downstream' parts in view of how they are disposed to the use of the Nile water. Yet a transboundary river system is essentially one and should be treated so. Benefit sharing in the riparian countries can be enhanced if the river system is seen as one and issues are addressed jointly and collaboratively. There is a lack of a policy framework that is integrated enough to be applicable at national level with a transboundary relevance and enforcement at the other.

Rwanda is located in upstream areas of the Nile Basin and it enjoys rich wet seasons and has a good hydrographic network that should satisfy the increasing demand in water. The Kagera River joins the Nile through Lake Victoria and contributes up to 10 per cent of the water of the White Nile. However, the underground water in Rwanda is seriously threatened by increasing massive deforestation and degradation due to high population growth that depends on wood as the main domestic energy source.

Additionally inadequate agricultural technologies that do not take into account social costs caused by poor agricultural production contribute to water resources degradation. At the same time, across the country, there is a lot of wastage of water including inexcusable tolerance of activities that pollute or deplete underground sources (MINITERE, 2004). While on one hand there is apparently unsustainable use of 'green' water in some valleys and marshes there is at the same time a low level of withdrawal of 'blue' water from rivers (Sadoff 2005 and SIDA 2005) and sub optimal uses of wetlands such as low or zero fishing in most of the lakes of Rwanda.

Besides that the population pressure is high, Rwanda is generally poor. The 2002 national population census report documented that the population density had reached 322 inhabitants per sq. km (RoR 2003). More than 70 per cent have less than a hectare of land. But FAO estimates that a family needs at least 0.75 of ha to support agriculture that can provide adequate nutrition to the family. The problem of reduced size of cultivated land per household is observed across the whole country and it is becoming more and more obvious that the Rwandan family farm unit is no longer viable (MINITERE, 2004).

About 92 per cent of Rwandan inhabitants live in the rural areas and 90 per cent of them depend on agriculture. The per capita income is estimated to be US$ 250. The incidence of poverty below poverty line which was slightly above 60 per cent till recently has declined by less than 4 per cent point in the last five years(RoR 2006). Rwanda is so far 158th out of 177 countries on the Human Development Index (UNDP 2007)

Moreover, the generic nature of the problem is accentuated by the fact that more than 70 per cent of the poor are in the rural areas depending on subsistence agriculture for a livelihood. Rwanda has a hilly topography and as a consequence, more than 50 per cent of farmsteads experience severe forms of soil and fluvial erosion. Because of land scarcity there is over-cultivation of agricultural fields and almost all marginal lands are being utilized. The gross consequences are falling yields from agriculture. Due to demographic pressure, man-based environmental degradation, and lack of application of

modern methods of agriculture productivity per area of all major crops has been declining since 1990s (MINITERE, 2006).

Against the above described situation facing land and water resources in Rwanda, the questions that we attempt to answer are:

- To what extent is the policy on reducing environmental degradation in place in Rwanda?
- Are the current natural resource uses of land and water resources sustainable? As defined do they maximize goods and services for livelihoods without damaging the environment for use by future generations?
- What are the costs and benefits of the current practices in land and water resources use?
- How can a comprehensive policy of reducing degradation involve principles and practices of sustainable use of natural resources?

Secondly, in order for water and natural resources management policies to be effective in the Nile Basin, it is necessary that they are harmonized and synchronized with cooperation initiatives.

Thirdly, policies on water and natural resources in individual countries need to mainstream benefit sharing so that they can be easily linked and rationalized with regard to Nile Basin initiatives that affect the country.

Finally, there is a need to have a policy platform that can provide the tools and information linking all the parameters. The process of linking these parameters need well-defined mechanisms that are consistent with the vision and mission of the Nile Basin.

3

Objectives

The overall objective of the study on which the report is based was to come up with operable policies of reducing environmental degradation in the Nile Basin. At a specific level the objectives to which the report has responded are manifold;

1. To delineate the rationale of policy on reducing environmental degradation in the context of the Nile Basin, poverty reduction and benefit sharing
2. To review the current policy frame work on environment in Rwanda and how it can be made effective in transboundary need for reducing degradation.
3. To assess the link of the policy framework to sustainable use of natural resources by making use of field data collection, observations and interaction.
4. To identify major policy parameters in the design of policy framework for reducing degradation of the environment in the Basin countries and to assess them using data and information from Kagera River Basin, a sub basin of the Nile in Rwanda
5. To design implementation approach and agenda of the policy recommendation

4

Methodology

4.1. Methodology for a field survey

Activities

- Undertook a field study to collect evidence to support a policy on reduction of environment in the Nile Basin and to argue for sustainable use of natural resources
- Collect data to see the importance of the Kagera River valley with or without natural or wild goods.

Field data

The aim of collecting primary data as mentioned earlier was to enable researchers produce an evidence policy based analysis. On the other hand the link between policy on environmental degradation reduction in Rwanda and sustainable use of resources in the Nile Basin required data from the field.

Three clusters were deliberately selected. Cluster A was an area on the Nyabarongo River, a tributary of the Kagera River just before it meets Akanyaru to form the Kagera River. The location is near Kigali. Cluster B was the Kagera just before it meets the Ruvubu River from Burundi in Kibungo to form the Rusumo Falls and flow into Lake Victoria. Cluster C agricultural valley of Rwabusoro on the Akanyaru tributary of the Kagera near Butare in Rwanda. In each of the cluster data were collected from 20 households with a clear distinction between exploited and non-exploited areas. Different types of data and information were collected using a questionnaire and discussions.

4.2. Methodology for overall policy analysis

Types of Data

1. Secondary data on national policies on water and natural resources
2. Primary data on water and natural resources in Kagera Basin

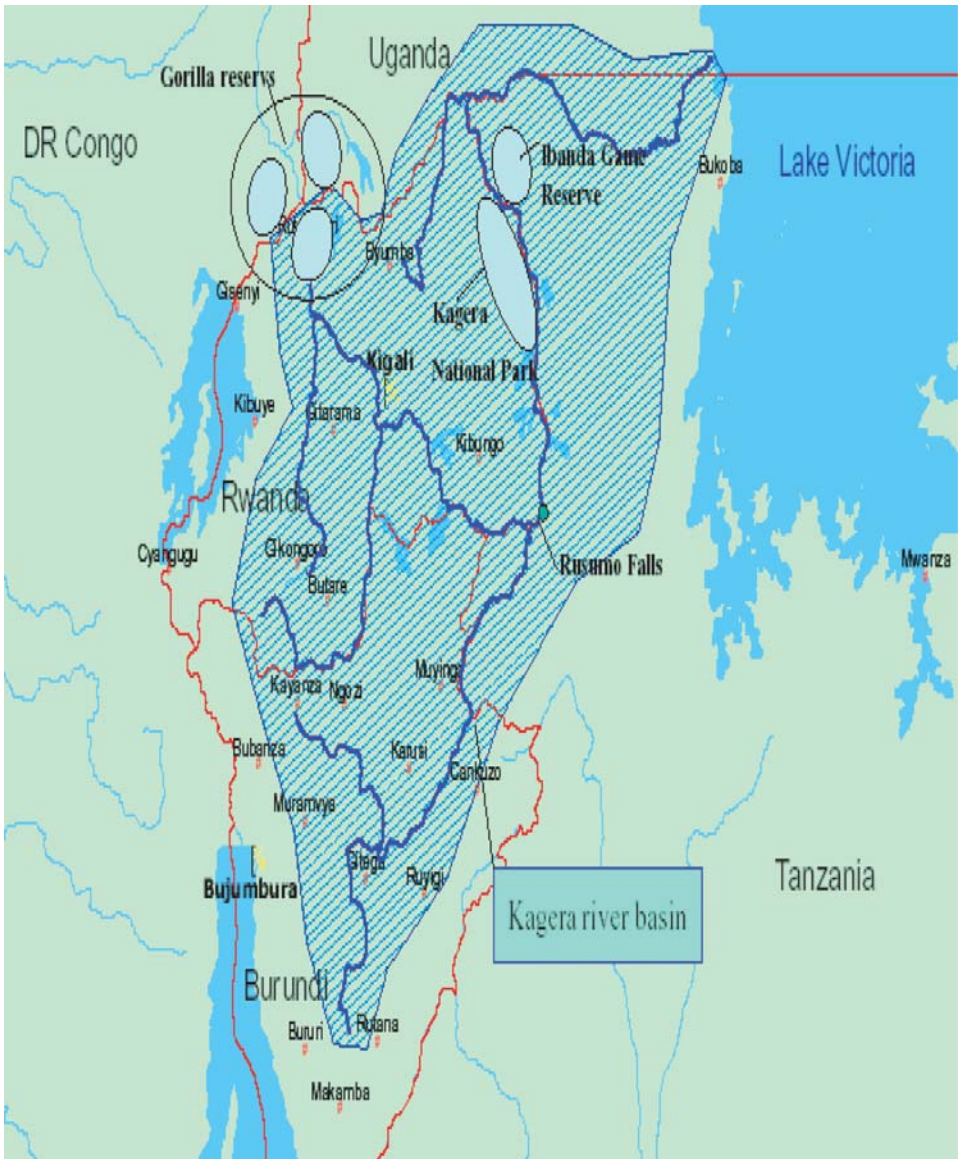
Sources

1. Literature survey
2. Field Survey
3. Nile Basin data bases
4. Government Ministries in charge of water and natural resources
5. Sources of empirical data on environment particularly UNDP, UNDP. UNEP, GIS, NUR, National Institute of Statistics, Electrogaz and REMA.

Survey Methods

1. Cluster samples of areas on the Kagera as identified on the map in 5.1. .
2. Interviews to selected stakeholders

Map 1: Kagera River Basin



5

Rwanda Environment situation and Policy Review

5.1. Environmental degradation in Rwanda

Degradation of watersheds is known to lead to erosion and pollution of rivers. But above all it is thought to be responsible for the shortage of 'green' water and, to a great extent, rain. But there is also degradation of marshlands due to human activities that affect water levels and productivity.

Baechler (1999) indicates that Rwanda can be divided into favourable and un-favourable eco-geographical areas. The Central Highlands are an underdeveloped mountainous region with steep slopes and deeply weathered acid soil of limited fertile volcanic soil in the North West and previously unusable swamps and savannah region in the South and East are being used to the limits of their capacity. On the western boundary up to the Rift Valley, even the most extreme slopes are cultivated. Today, he notes, the fertile soil is degraded while geographical alternatives are rapidly diminishing.

His work revealed some interesting figures. Loss of humus is to the extent of 10.1 MT per ha per year and can go up to 36 MT/ha on 5 per cent of the soils and more than 68 per cent MT/ha on 1 per cent of the soil. Clay (1998) states that soil erosion is moderate to severe on 50 per cent of the land surface of Rwanda.

Rwanda, according to Rwanda Development Indicators (2001), is losing up to 12.251 million tons of soil per year due to soil erosion, a figure which is said to be equivalent to feeding 40,000 people.

Environmental degradation is not limited to soil erosion (fluvial and dry) alone. Of primary forests, which covered 80 per cent of the country, only 5 – 8 per cent is left. In 1980s the deforestation rate was 2.3 per cent or 2000

ha per year. Between 1970 and 1986, 56 per cent of exploited acreage pushed cultivators into poor soils in marginal land (Baechler 1999). Previous lower limit of cultivated land was 1800 m but today the land limit is 3000 m. The Virunga chains were reduced from 34,000 ha to 15, 000 ha between 1958 and 1979. Between 1958 and 1996 natural reserves were depleted by 34.8 per cent, Nyungwe by 17.2 per cent, Gishwati 86.4 per cent, Mukura 46.7 per cent, Virunga 62.5 per cent and Akagera 17.6 per cent.

Yet it is common knowledge that forests provide many valuable environmental services. At the watershed level, they reduce sedimentation, stream flow regulation, help maintain soil quality, limit erosion, stabilize hillsides, modulate seasonal flooding and protect water. Many people living in and around forests depend directly on them for food, medicines and other basic needs.

There are many problems associated with deforestation: flooding, siltation, loss of plants and animals, genetic material that have great potential value for medicine, agriculture and other industries.

Since tropical forests act as an effective filter between the atmosphere and the soil, any attempt to remove the forest cover will decrease the soil protection leading to ground water reserve depletion, and all increase of the rates of erosion along stream banks, gullies and roads. It is estimated that the cost of degradation in Rwanda is up to 1.5 per cent of GDP.

Degradation with regard to water and natural resources is well demonstrated by unsustainable use of marshlands. The Rwandan Rugezi Wetland study ([4]) demonstrated how mismanagement of water sources can lead to an energy crisis and lower water levels and flows into the Nile Basin. HEP

The cost of this has been shortage of electricity which is costing the economy heavily. A direct cost has been resorting to electricity generated by diesel engines costing the government in excess of 100 million francs a month. This was estimated to be about US$ 63,000 dollars per day (EUI 2006). In the long run the energy shortage will have impact on the growth rate of the economy

4 UNDP/UNEP/REMA (2006): Economic Analysis of Natural Resource Management in Rwanda. It was carried by two of the authors to this report under the UNEP/UNDP flagship

and the rising cost of living (World Bank 2004). At the end, the poor people who are the majority in Rwanda will suffer the most from the consequences of water resources mismanagement.

5.2. Policy on environment in Rwanda

5.2.1 Background to institutions and regulation of environment in Rwanda ([5])

In Rwanda formal legal attention to environmental issues goes back to the colonial period. During that time several actions aimed at the protection and conservation of environment were launched at different periods. Concrete cases are the introduction of Albert Park (1925), the Natural Forest of Nyungwe as a reserve forest (1933) and the Akagera National Park (1935). Soil conservation initiatives were also launched by INEAC (later in 1937-ISAR). After independence, action programmes were put in place. These include human settlement (1977), stockbreeding (1978), soil protection and conservation (1980), water supply in rural areas (1981), erosion control (1982), and reforestation (1983). In 1985, the Ministry of Health and Social Affairs, which had a component of environment in its mandate, organized the first ever national seminar on environment whose objectives were:

(a) To enable the country to strike a dynamic balance between population and resources while complying with the balance of ecosystems;
(b) To contribute to sustainable and harmonious socio-economic development such that, both in rural and urban areas, men and women may realize their development and well-being in a sound and enjoyable environment;
(c) To protect, conserve and develop natural environment, these activities being the concern of each and everyone.

In 1989 was created the "Environment and Development Project" in the Ministry of Planning, which later became the National Environment Unit, a springboard for the establishment of the Ministry of Environment and Tourism (MINETO) in 1992, the duties of which included, the coordination of all environment related activities carried out by different ministries. 1992

5 This section borrows heavily from the Rwanda Environmental Policy Document, (2005)

was marked by the drafting of the Law on Environment.

The 1994 genocide, however, brought to a standstill the initiatives that had been launched and they were revived by the Government of National Unity. The most important action was issuing the environmental policy and enacting a related law..

5.2.2 Environmental Policy

After the 1994 genocide, various initiatives to improve environmental management were established. A policy on environment has been developed, Organic Law N° 08/2005 of 14/07/2005 determining the use and management of land in Rwanda, law on the protection, management and use of water resources were enacted. Rwanda Environmental Management Authority (REMA) (see law N° 16/2006 of 03/04/2006), an agency whose major responsibility is supervision, following up and ensuring that issues relating to environment receive attention in all national development plans is in operation. Specific laws on forests and policies and water and sanitation are in place.

In general, the 'Politique Nationale de l'Environnement' (PNE) of 2003 and the 'Loi organique N° 4/2005 du 8 avril 2005 portant modalités de protéger, sauvegarder et promouvoir l'environnement au Rwanda' provide for measures to protect watersheds in order to prevent wetlands deterioration.

The main department in charge of water management in Rwanda is the 'Ministère des Terres, de l'Environnement, des Forêts, de l'Eau et des Ressources naturelles'(MINITERE) which, through its 'Direction de l'eau et de l'assainissement', is in charge of rural water supply, management of water resources and water treatment. In 2004 the MINITERE issued a Sectoral Policy on Water and Sanitation which recognizes the sustainable management principle and has the stated objectives, among other things, of improving access to drinking water, access to water for agricultural use and the use of water as energy source. A Water Act is currently in preparation.

Rwanda's Forest Regime was enacted in 1988 following the 'Loi no 47/1988 du 5 Décembre 1988 portant organisation du régime forestier au Rwanda' which led to the creation of the 'Service Forestier National' . The Department in charge of forest development is the 'Direction des forêts' of the 'Ministère des Terres, de l'Environnement, des Forêts, de l'Eau et des Mines' (MINITERE). The 'Office Rwandais du Tourism et des Parcs Nationaux' (ORTPN) is in charge of the management of natural forests classified as National Parks.

According to the National Environment Policy, the abusive exploitation of forests is the third government priority in terms of environmental problems and the policy calls for the rehabilitation of degraded ecosystems

The environmental management policy has been developed focusing on the problems related to population and resources imbalance, land use management, degradation of natural resources, poor recognition of the environmental dimension by socio-economic sectors, disasters which affect the environment, environmental problems of an international scope (climatic change, Ozone layer depletion), legislative and regulatory shortcomings and inadequacy of some policy legislations and sectoral strategies, and the institutional and legal framework of the environment.

Policy options on the above problems were developed together with their strategic actions. The following are policy options developed in light of the above identified problems:

1. To ensure that water is used in the various economic and social sectors without endangering environment
2. To improve the conservation and management of wetlands.
3. To improve the conservation and management of forests and protected areas.
4. To guarantee the conservation and sustainable utilization of biodiversity of natural ecosystems and agro-ecosystems in compliance with the equitable share of benefits derived from biological resources.
5. To promote environment-friendly agro-pastoral and fishing methods and techniques.

6. To ensure compliance with environment in all transport and communications activities.
7. To integrate environmental aspects in commercial and industrial activities and promote environment friendly tourism.
8. To increase energy demands while minimizing the negative impact on environment and ensure compliance with the environment dimension in mining and quarrying activities.
9. To give the country an educational, information, awareness creation and environmental research promotion policy.
10. To include health and sanitation at the centre of environmental issues.
11. To integrate the environment dimension in economic planning.
12. To take part in the establishment of a framework for early warning and management of natural and/or man-made disasters;
13. To contribute to the establishment of a policy and legislation aimed at following up regularly the evolution of the climate and reduce to the strict minimum substances which pollute the atmosphere.
14. To mainstream gender in the protection of environment.

5.2.3 Review issues that relate to policy that will support sustainable use of resources.

At a national level, it is admirable that the institutions, the policy and the law are in place. This is the first step. The second step is to examine the enforceability and the capacity of the institutions in operationalising a strategy to reduce degradation of the environment. In a recent evaluation in Rwanda when preparing the EDPRS log frame the following lacunae were identified in terms of ground zero verifiable indicators.

1. National land degradation mapping to establish productivity potential;
2. Mainstreaming the environment in all sector policies, strategies and monitoring systems at both central and local institutions;
3. Collaboration with MINEDUC on integrating environmental programmes into the school curriculum;

4. Increasing local community involvement and incomes of population employed in the "new" ecotourism sector/other off-farm activities;
5. Introducing the public/private programs providing biodegradable alternatives to banned items (e.g. plastic bags);
6. Collaboration with MINISANTE on annual reduction in the proportion of population with environmental illnesses;
7. Improvements in tenure security for women and members of vulnerable groups;
8. Development and operationalization of land-use master plans to guide land use management decisions at national and decentralized levels, including inputs from bottom up consultations
9. Land use inventory and land suitability classification;
10. Degree to which all stakeholders (women (30%) and vulnerable groups) are well-represented and actively involved in decentralized land use management decisions;
11 Collaboration with MININFRA to make alternative energy supplies accessible (Methane, biogas, peat, solar, electricity);
12. Development and implementation of forest management plans (to acceptable national standard) in districts

Nevertheless, as a progress report for Rwanda on MDG 7 (2007) suggests, in order to have effective implementation of laws, policies and other regulations, more funds and capacity building are needed. Accordingly, this can only happen when environment is taken into account as a mainstream in policy development.

The first finding is that despite existence of a law and a policy several shortcomings that make the policy ineffective are present. The concept of mainstreaming should not be confined to including in the policy only documents but integration into policies and sectors as well as institutions and mechanisms to oversee implementation.

A second observation is that existence of a policy in Rwanda does not mean existence of the same in other NBI countries. It is important to have a

harmonized approach on policy to reduce the environment in the basin and to put in place mechanisms to monitor and audit environmental management.

In no area in the framework of Rwanda policy and law does benefit sharing and cooperation appear as a desirable goal of the policy. The harmonization approach should take care of distilling benefit sharing into national policies.

That degradation is still rampant in Rwanda means the gap between the ideal and the real need to be covered by implementation. However, implementation of good polices can still be hampered by lack of resources and capacity. Resource mobilization and capacity building for policy to reduce degradation are needs that have to be assessed.

6

Evidence from the Kagera River Basin

6.1. Introduction

The United Nations' International Strategy for Disaster Reduction (2007) defines Environmental Degradation as the reduction of the capacity of the environment to meet social and ecological objectives, and needs. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards. Some examples: land degradation, deforestation, desertification, wild land fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise and ozone depletion.

The policy framework to contain environmental degradation must take into account the diversity of the natural resources and environment, varying causes of degradation and the complex links between poverty and the environment. It should take the poor people not as part of the problem but as part of the solution. The policy should address the problems as a part of the growth process and environmental improvements should be continued until rising incomes make more resources available for environmental protection. There is need to recognize that there is natural erosion which is accelerated by human activity. This is how sustainability can be assured. The Human Development Report (UNDP, 2003) prescribes six principles to guide environmental policies which include:

- Strengthening institutions and governance
- Making environmental sustainability part of all sector policies
- Improving markets and removing environmentally damaging subsidies
- Bolstering international mechanisms for environmental management
- Investing in science and technology for the environment
- Increasing efforts to conserve critical ecosystems

The issue, however, was that all these seem to be known and documented. It is almost certain that the importance of reducing environmental degradation

has been taken in all Nile countries somehow and for several forms of degradation. What is crucial is providing evidence from Nile hotspots to assist policy makers to lay down mechanisms to ensure proper implementation. This section summarizes findings on Kagera River Basin .First is a section on secondary data and information already existing on the basin especially that which provides background to the Rwanda part, which is the focus of our report. Second is a summary of policy issues compiled from physical visits to the valley, checked against stylized policy parameters for reducing degradation. The last part of the section presents a summary of the data from 120 households in three spots of the valleys to offer evidence and lessons for sustainable and sustainable use of valleys in the Kagera River Valley. Extensive data sets and a photo gallery are presented separately from the main report.

6.2. Features of the Kagera River Basin

The Kagera Basin covers Burundi, Rwanda, Tanzania and Uganda with a total area of 59,800 square kilometers. Table 6.1. shows the coverage in each country. The Kagera river is the principal contributor of water to Lake Victoria and it is regarded as the source of the White Nile.

Table 6.1. Coverage of the Kagera River Basin

Country	Sq.km	Percent share
Burundi	13,060	22
Rwanda	20,550	34
Tanzania	20,210	34
Uganda	5,980	10
Basin	59,800	100

Source: *NELSAP (2004) Kagera Basin Project Document, 2004.*

In general the Kagera Basin has an elevation of 1,200-1,600 m but in some areas it goes above 2,500 m. This makes the basin prone to heavy erosions that have direct impact on water courses and wetlands. The situation becomes more serious in the upstream countries of Burundi and Rwanda which are mostly hilly and highly eroded.

In 2004, the Kagera River Basin transboundary integrated water resources management and development was proposed. The main objective was to develop tools and permanent cooperation mechanisms for the joint, sustainable management of the water resources in the Kagera River Basin in order to prepare for sustainable development investments to improve the living conditions of the people[6]. This initiative also intends to reduce unsustainable use of the river basin.

The Kagera Basin has many challenges. The four countries in the Kagera are among the poorest in the world and it has a population of about 14 million people, about 40 per cent of the 35 million living in the Lake Victoria Basin[7]. Most of this population relies on subsistence agriculture with less possibility of investing in soil improvement and land degradation prevention. Some of the unsustainable practices especially in upstream countries are lack of protection of the land against erosion, deforestation and inadequate ways of solid and liquid waste management in urban areas and other big agglomerations. The population pressure in the area exacerbates the situation: the population density in the area is 227 people per square kilometer; 30 per cent higher than population density in the rest of the Lake Victoria Basin, which is 174 persons per square kilometer. Table 6.2. shows the state of the four Kagera basin countries in terms of population density and per capita income. Kenya was included for comparison purposes.

Table 6.2.. Salient features of Kagera Basin countries

Country	Pop(million)	Basin pop	Density per/ sq.km	GDP/ capita(USD PPP)	HDI 2002	HDI rank (173 countries)
Burundi	6.4	4.1	314	591	0.313	171
Rwanda	7.6	6.9	336	943	0.403	162
Tanzania	35.1	1.4	70	523	0.440	151
Uganda	23.3	1.2	194	1,208	0.444	150
Kenya	30.7	0.0	321	1,022	0.513	134
Total/ Average	N/A	13.6	N/A	857	0.423	N/A

Source*: NELSAP (2004) Kagera River Project Document*

6 NELSAP (2004); Kagera River Project Document
7 NELSAP (2004); Kagera Basin Project Document

The catchments areas of Rwanda such as Nyungwe National Park and Rugezi wetland have been affected by the population pressure in Rwanda. The Government of Rwanda has put a lot of efforts to protect these ecologically sensitive areas, however, more investments are needed in priority areas such as energy, reforestation, soil erosion prevention measures, integrated waste management, storm water harvesting and income generating activities that will make the population riparian to the catchments areas depend less on natural resources. But also, as recommended by the Economic Analysis of Natural Resources Uses in Rwanda, which used Rugezi wetland as a case study, the sustainable use of these natural resources requires a well planned way of involving the local population in the conservation measures. There are empirical findings that support the need to take into consideration the views, values and needs of the farmers if any of these initiatives has to succeed (e.g. Beshah 2003,Okoba 2005).

The Kagera Basin has important environmental resources. The forests at the mouth of the Kagera river are unique to tropical Africa, mainly because they are composed of equal proportion of low land flood plains and high land forest species. Minziro, Munene and Rwansina are forest reserves located at the estuary where the Kagera river enters Lake Victoria. These forests are classified as unique for their rich biodiversity and their important ecological component in the plain floods area, regulating the flow of water through the Kagera River system. It is noteworthy to point out in reverse argument that degradation of the environment and increased sediment loads affect quality and later the flood regime of a river.

The Rwandan side of the river hosts extensive swamp areas with tall grasses and papyrus, which provide important water regulation and buffering functions. These diverse ecosystems are also home to a variety of other micro-organisms, mammals, birds, and reptiles of high global significance.

All these natural resources could disappear if there is no sustainable and integrated management of the whole basin. The main threat to these resources is due to human encroachment, especially in countries like Rwanda

which have very high population pressure. Land degradation and biodiversity loss are central issues in the basin and the consequences of unsustainable use of land and other renewable resources, especially in upstream countries constitute an important threat to the river system. This also clearly indicates the transboundary nature of natural resources and environmental problems that have to be tackled in an integrated manner. A study on sustainable and unsustainable use of these resources through the Rwandan case study should help to justify the importance of the investment that have to be channelled in the basin for the purpose of alleviating poverty and protect the natural environment for a harmonized future of the region and the world.

Table 6.3. Benefits from environmental management of Kagera River Basin

Level	Benefits
Region	Stability
	Economic integration
	Regional infrastructure assets
Riparian countries	Sediment control
	Watershed management
	Energy supply and rural electrification
	Irrigation and agribusiness
	River regulation
	Biodiversity conservation
	Commercial development
	Private sector development
Downstream	Water quality control
	Water hyacinth control
	Sediment reduction
	Regional stability
	Growing trade markets

Source: *HDR 2006*

6.3. Salient evidence from Kagera River Basin field data

Data for the report were collected through several visits to the Kagera River valley. The first such visit was on identifying conspicuous policy issues arising from field observations and discussions. These are presented as summary in Table 6.4. Gallery of pictures on such trips in the Kagera River Basin valley has been stored.

Table 6.4. Summary findings of Kagera Field trip

	General Observation	Evidence from the field	Overall Lesson
1	The 'brown 'water of Kagera	Nyabarongo and Kagera	'Brown' water concept unlike green or blue is that nested in erosion, sedimentation and pollution
2	Multiple of environmental and agricultural foods	Gashora wetlands still has original portion with papyrus and ferns. Several children and women interviewed with environmental inputs from the valley. The lower side is extensively cultivated. There was virtually no pristine area at Rwabusoro	There is ample evidence to carry out a CBA on major uses of Kagera River valleys and valuation of important wetlands in the Nile catchments areas to inform sustainable use
3	Conspicuous evidence of degradation resulting from a combined effect of human exploitation and possibly climatic change. Water levels are going down	Cyohoha valley is a dried lake. The bridge along Akagera indicates falling water levels besides evident seasonal variability. The few birds seen in Cyohoha remind of the effect of pressure on species in the hotspots	The crisis of time preferences transboundary significance in use, ignorance or both shields the fact that degradation is taking place fast and it has a transboundary ramification
4	Considerable amount of human activity on the valleys and banks of the river contributing to pollution and degradation. There was limited amount of counter measures being undertaken simultaneously except in few cases	Ruliba brick industry, brick and tile quarrying and mining in a majority of places and other brick kilns of a smaller scale	For livelihoods, for growth and poverty reduction production is inevitable. But there has to be the counter actual

5	Kagera is a possible major source of the water hyacinth	In Gashora every few minutes a bunch of the weeds could be spotted but not yet fully developed	Knowing the source would ease control downstream the basin
6	Competing demands and uses are evident	Livestock, sugar cane by Nyabarongo, water for domestic industrial uses (see picture gallery)	The demand and uses of the valley is one major cause of pressure on the valleys and degradation
7	The Kagera valley is not an environmental and agricultural trove only but a cultural centre as well	The inputs from the valley are used to produce cultural goods like mats that are irreplaceable	Ecosystem services in Nile Basin hotspots have immense cultural value
8	Role of gender in protection of the environment and sustainable use cannot be avoided	Every where in the valley, carrying environmental and cultural goods, in weeding crops in the valleys ,in drawing water and washing clothes from the valleys	The role of women is important in sustainable use and reduction of degradation
9	Some economic activities are visibly absent in significant proportions such as fishing and boat/ canoe activities	There were some boats for transporting sugar cane near Nyabarongo, but dug out canoes were seen in only two occasions and on dry ground.	Variability and seasonality is an important aspect of the river valleys. Canoes are immensely useful in rainy and flood seasons

6.4. Evidence from Nyabarongo/Gashora and Rwabusoro hotspots

The Kagera Basin member countries have committed themselves to a joint management of the basin including joint exploration of transboundary development projects. These transboundary projects will require a prior analysis of the current status of the river basin and explore scenarios with projects and without projects; and this requires the application of Cost-Benefit Analysis (CBA).

Cost Benefit Analysis is a technique of investment appraisal for the public sector. It builds on an analogy with what might be called best-practice investment appraisal for the private sector and justifies departures from that best practice on the grounds that the investor is a society as a whole([8]).

8 Bowers, J. (1997); Sustainability and Environmental Economics: An Alternative Text. Singapore, Longman

The many proposed projects for the basin will each require a detailed CBA. However, even before major projects start in the area, a general CBA is required where the sustainable use of the Kagera Basin, which requires investments in various projects, is compared to the cost of doing business as usual. The rest of the section presents data from the field to inform decisions on sustainable and unsustainable uses of resources.

6.4.1 Profiles of two cluster areas

Only two hotspots are reported here. The Gashora represent Kagera proper with some areas that are exploited and others not exploited. Essentially this is the area where pristine conditions can be found. The Nyabarongo or upstream Kagera is similar to this. The second hot spot is the Rwabusoro area which is a marshland along Akanyaru the tributary of Kagera that traverse Burundi and Rwanda.

Gashora

The marshland is used by people from two neighboring sectors that are Gashora (Bugesera District) and Rukumberi (Ngoma District). This area is surrounded by numerous lakes which are somewhat linked to the Kagera River, these include: Mirayi, Rumira, Kidogo, Kirengeri, Gahanva, Rweru, Cyohoha (south). It has been reported that the available lakes supply the area with enough water and there seems to be little fear of the falling levels or drying up found in other parts of the basin.

However, floods which occur cause diversified impact so that in April when they occur people get fish which are freely found floating on flood waters. Some fish is sold while other is eaten.. In the periods of August to September naturally the area is dry, but due to rainfall in northern parts of Rwanda where some rivers pour water into river Akagera causing floods and siltation, in the long run when floods end and the area is dry, the remaining soil is fertile, improving the natural yield in the valley.

It was found out that the Ministry of Agriculture together with the Ministry of Defense have jointly constructed a water drainage system which helps to reduce the gravity of floods.

This marshland is economically viable and farmers are grouped into one cooperative called INDAKUKI (Indatwa Kukigori) which helps them in securing inputs, their distribution and searching potential markets for their produce. It was reported that farmers are obliged to grow only maize which is regarded as a commercial crop in the area. However, due to household needs farmers grow also beans, pumpkins, and vegetables like tomatoes, carrots etc which earn them a considerable income.

Currently as reported the maize grown is sold to the traders directly. However, the cooperative has a project which is under way to process maize in their area and sell final output (i.e maize flour and cooking oil), in order to get higher prices offered at the markets for these outputs. On this point the cooperative acknowledged the possible support from government and the European Union in securing a plant for flour milling. The aim is to diversify production and improve the level of earning of the farmers.

People around the area are continuously benefiting from the marshland in the form of activities related to the marshlands and they extract raw materials to manufacture several items which are sold and earn them money. It has been reported that there are people who do not have plots in the marshland but depend on them to use grass and other plants from the marshland for handicraft making, construction of water storage containers etc. For example the COVAGA (Cooperative de vannerie de Gashora), which is the women cooperative that uses raw materials from the marshland for handcraft making has achieved a commendable progress in production of handcraft materials though they face the problem of market.

People in the area are keenly working to protect the environment especially in caring for the marshland which, according to them, is paramount for their living. In this regard they have established the cooperative known as COGEBAVU which monitors all activities carried out in the marshland and also sensitizes people who are using that marshland to use it rationally. In this ambit people are instructed to grow their crops about 50m away from borders of the river in order to avoid water contamination and siltation. However, it was observed

during our visit that this regulation is not well respected in certain sides of the river where people have planted their tomatoes and bananas near to the banks on the pretext that they need water to irrigate their plants. This, however, has resulted in inexplicable losses especially during flood periods and loss of lives when hippopotamus get out of the river to look for their pastures and then find people on their farms.

Rwabusoro/Busoro

Quite interesting is the fact that the two sides of the river are named differently and exploited differently, especially at the Busoro side. On one side, only maize is allowed but on the part that is near the river beans, nuts, sugar cane and vegetables are grown. On the Rwabusoro side, only beans are allowed, but on observation, we realized that even other crops are cultivated, such as nuts, sugar cane. So, the marshland usage is different due to policies of the districts that the marshlands belong to. This can be a threat to the marshland.

Officially maize is allowed to be cultivated here. But from the photo and information people defy the regulation and grow beans and vegetables

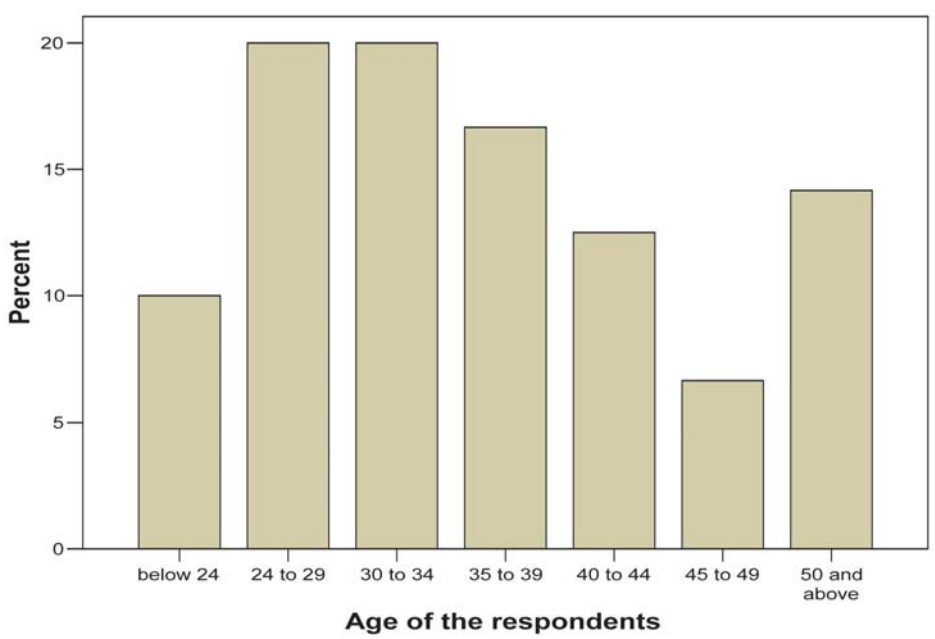
The other part of the bridge is used for beans cultivation as seen below

1. The Kagera River is important to people living around it. It is used for drawing water for domestic use and for drinking while they are working in the marshland as seen below:
2. Although the river is important for the people living around it, it is also a threat to them because most of those interviewed confessed drinking the valley water without boiling it.
3. There was an interesting observation that people living near and depending on the marshlands have smaller plots and were relatively poorer than those living in uplands with larger plots. Those living further uplands have larger and stronger cooperatives as well.
4. They often carry out other activities such as business, and the say that the earnings from the marshland help them increase their capital, which helps them get more money which they use to increase the size of their farm either by buying or renting.
5. A difference was that the farm owners for Rwabusoro are richer than those of Busoro and mostly live far from the valley. In specific cases and spots people may prosper differently in relation to the Rive valley.
6. Lastly was the observation on environmental degradation. It is found that the water levels in the Akanyaru River have decreased substantially. There is, of course, substantial increase in water level during the rainy season.

Nonetheless, our interviews confirmed that over the years the average water water level has declined even during the rainy season. Of, course we believe more information is needed to isolate, for example, the effect of climate change over the years.

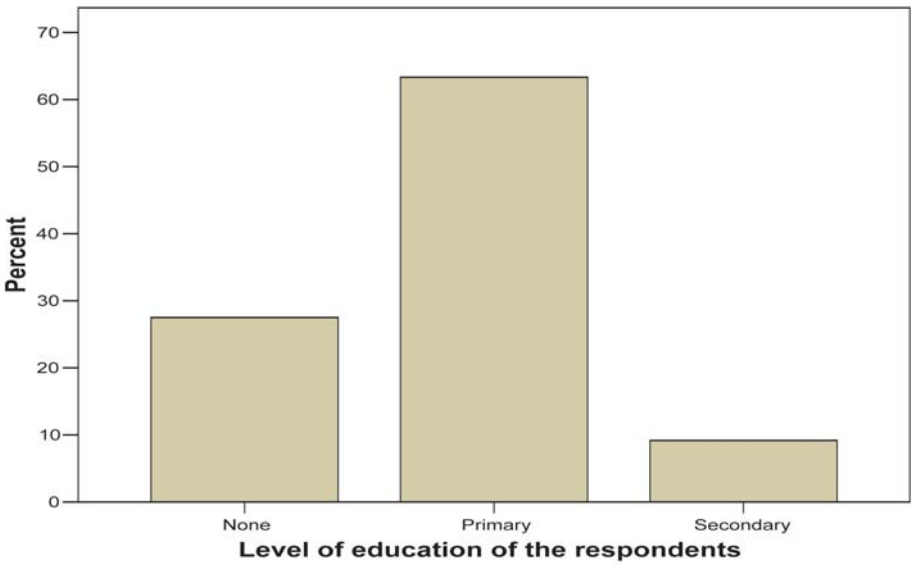
Household data over the basin as a whole

Figure 6.1 Age of the respondents



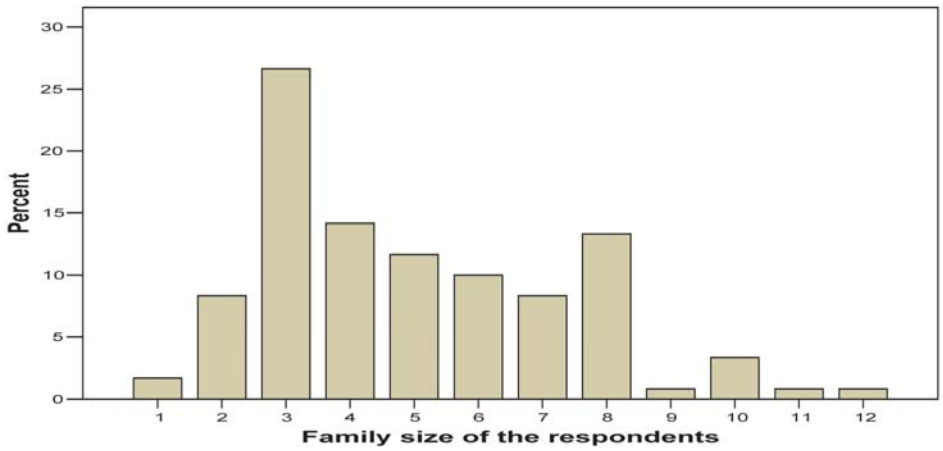
As the diagram above shows 20 per cent of the respondents were aged between 30 and 34 years and between 20 and 29 respectively, and 14.2 per cent of the respondents aged above 50 years. Basically this age structure in agriculture portrays how people are engaged in this sector, and they can work for long time since the majority of respondents who are working in the marshland are youth. This has an impact on the use of the marshland in the long run if beneficiaries do not get other occupations.

Figure 6.2 Level of education of the respondents



From the above diagram 76 per cent of the respondents attained primary education, 11 per cent got secondary education and 33 per cent no level of education. The low level of education hinders people in the area from looking for other occupations. As they expressed, they are dependent on the marshland as the only provider of their daily income and food. They cannot look for better paying jobs due to low qualification. In this ambit the provision of other sources of income which are related to their education level and/or formal training on certain specialization can be a boost to local people and help them to diversify their activities or quit the marshland completely.

Figure 6.3 Family size of the respondents



Indeed a corollary argument in this regard is the possibility of enhancing the value of output from the marshlands in a manner that will make the farm users appreciate the value of the wetlands and agree to protect it. Of course, as argued, this needs also clear tenure and access rights and community based rather than government institutions to control land use.

The diagram above (under (3)) shows the size of the family contacted during the study. In general the size varied according to the number of children and adults in the households. In this regard 26.7 per cent of the households consist of 3 people and 0.8 per cent has 12 people.

Table 6.5. Descriptive Statistics

Demographic unit	N	Minimum	Maximum	Mean	Std. Deviation
Children	120	0	10	3.12	2.235
Adults	120	0	7	1.86	.748
Family size of the respondents	120	1	12	4.98	2.362
Valid N (list wise)	120				

The table above indicates in general the average family size. On average each family has 3 children, 1 adult, and on average each family has 4 people. Basically,

family size and composition show the capacity of the family in supplying labor force, and/or the dependence ratio. In a situation where both parents area available a family of 5 is a figure near the national average. However, with the generally low levels of education the pressure of depending on the valleys will mount over the years if alternative forms of supporting the population are not found.

Table 6.6. Source of income of the respondents

Source of Income	Frequency	Percent
Agriculture	44	36.7
Agri+Construction	12	10.0
Agri+Livest+Empl	8	6.7
Agri+Livest+Busin	6	5.0
Agri+Livest+Const	3	2.5
Business	1	.8
Quarrying	2	1.7
Construction	6	5.0
Agri+Livest	30	25.0
Agri+Employed	3	2.5
Agri+Business	5	4.2
Total	120	100.0

From the table above, 36.7 per cent of the respondents depend on agriculture alone as the source of income; 25 per cent do both agriculture and livestock farming as their source of income; 10 per cent combines agriculture and quarry, and participate in construction works to earn subsidiary incomes. In this realm people work as casual labourers in road construction, and others participate in the construction of their neighbours' houses. These activities as reported to help them to get temporary occupations and earn them substantial amounts of money especially when they are not working in the marshland, or when they decide to practice the division of labour among adults in households. Further, others reported they combine agriculture, livestock keeping and business where 6.7 per cent of them are engaged in these sectors. Basically they are

farmers who play the role of middlemen and buy output during the harvest periods form their fellow farmers and sell it to the neighbouring sectors or other dealers. This activity earns them income but at the same time leads out from the area to get easily on the market, thus helping small farmers. They are few who do other activities, such as 0.8 per cent, who do business alone; 1.7 per cent quarrying due to presence of mines extraction, and 5 per cent do construction because they have attained formal training. Generally farmers are interested in combining agriculture and livestock keeping because they feed their animals with remains of the plants, and milk produced is partly used at home and the rest sold, which earns them some money.

The data above points to two possible findings: In the Rwanda Kagera valley, unlike the general hypothesis, over-dependency on agriculture is not absolutely true. A majority of the farmers seem to be engaged in one form of activity or another which is not agriculture. However, this does not preclude dependency on the valleys for other goods. Indeed, from the agricultural activities more than 90 per cent of the farms are located in the marshlands

Table 6.7. Location of the farm

Location	Frequency	Percent
Located in the marsh land	109	90.8
Not located in the marsh land	11	9.2
Total	120	100.0

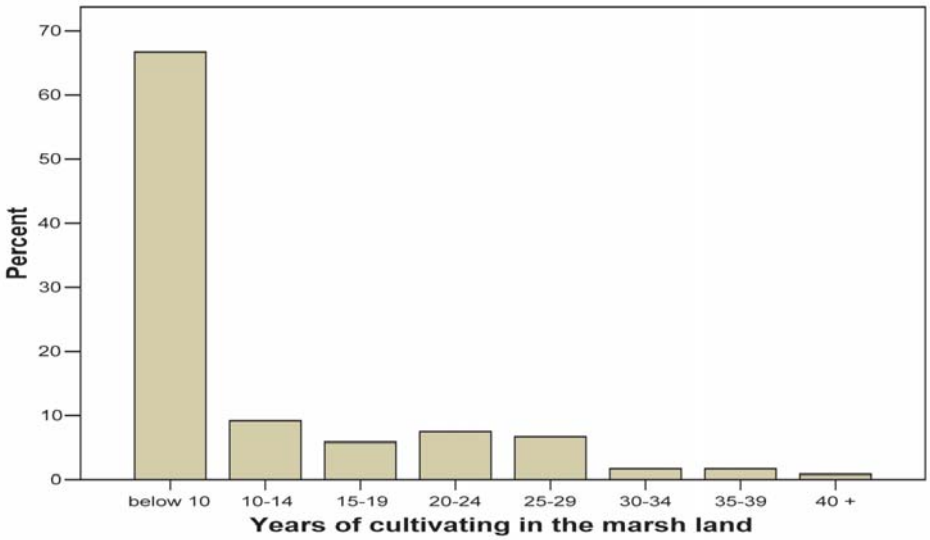
The table above shows that 90.8 per cent of the respondents have their farms located in the marshland and 9.2 per cent of their farms are not located in the marshland. Generally respondents in the area acknowledged that they depend on their marshland for the farming activities. However, the marshland remains important even for those without farms located in it, since they get inputs for basket making and for construction and pastures for their animals from the marshland.

Table 6.8. Approximate size of the farm (Ha)

Size in Ha	Frequency	Percent
0 -0.5	46	38.3
0.1-0.5	47	39.2
0.5 -1	21	17.5
1.5-2	1	.8
2+	5	4.2
Total	120	100.0

From the table above, 39.2 per cent of the respondents have between 0.1 and 0.5 hectares, 38.3 per cent have between 0and 0.5 hectares, 17.5 per cent have between 0.5 and 1 hectare, 4.2 per cent have above 2 hectares and 0.8 per cent of the respondents have hectares. Generally, due to large number of people who need to use the marshland for cultivation, each family owns a small plot of land. This factor has hindered production in the area and yield is not sufficient to cater for the all the needs of the families.

Figure 6.4 Years of cultivating in the marsh land



The diagram above shows that 66.7 per cent of the respondents have started cultivating in the marshland recently (below ten years ago), 9.2 per cent have started using marshland between 15 and 19 years ago, 7.5 per cent have been

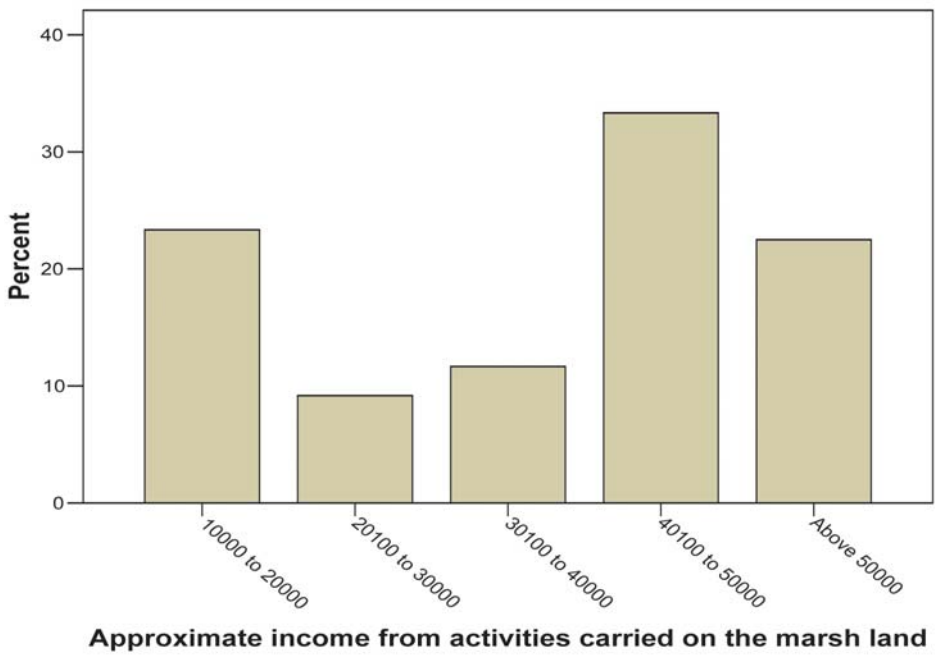
using the marshland for the period between 20 and 24 years ago, 6.7 per cent of the respondents have been using the marshland for the period between 25 and 29 years ago, 5.8 per cent of the households have been cultivating the marshland between 15 and 19 years ago, 1.7 per cent between 30 and 34, and for the period between 34 and 39 years respectively, and 0.8 per cent have been cultivating in the marshland for 40 years. It should be noted that the majority started cultivating in the marshland when government decided to redistribute the land in the marshland in order to improve the production in the area, and increase occupation: but also Bugesera, which is the area under study, has suffered a series of food shortages in the past, thus the use of marshland is the solution to curb this problem. The trend of households cultivating the marshland is increasing due to population growth in the region.

Table 6.9. Use of the marshland before exploited

Use of Marshland	Frequency	Percent
Have no Marsh land plot	36	30.0
Grazing	15	12.5
Basket making materials and water	3	2.5
Basket making materials and fishing	1	.8
Basket + construction materials	2	1.7
Fishing and construction materials	1	.8
Fishing construction materials	1	.8
Basket making materials	11	9.2
Water used at home	14	11.7
Clay for pot making	1	.8
Fishing	6	5.0
Construction materials	17	14.2
Grazing and basket making materials	10	8.3
Grazing and water used at home	1	.8
Grazing and materials	1	.8
Total	120	100.0

From the table above 30 per cent did not use marshland before partly because it was not allowed to exploit it and or they did not have activities related to the marshland. From the people asked in the areas covered 12.5 per cent used marshland to get pastures for their animals, and 9.2 per cent used marshland for basket making which is the main occupation for women for a long time in the areas. Furthermore, 14.2 per cent used marshland to extract construction materials for their houses; 8.3 per cent used it for grazing and basket-making materials, 11.7 per cent used it to fetch water from the river; 5 per cent used it for fishing especially during the rainy season (when the river is flooded) because fish appears on top of the water; and 2.5 per cent used the marshland for basket making materials and as a source of water. It is evident that though the majority were not using the marshland before for cultivation in their areas, they used inputs resources available such as clay, grass, water etc to sustain their family needs. The value of the materials (i.e resources) extracted from the marshland before cultivation is enormous, the factor which shows how people are benefiting from it.

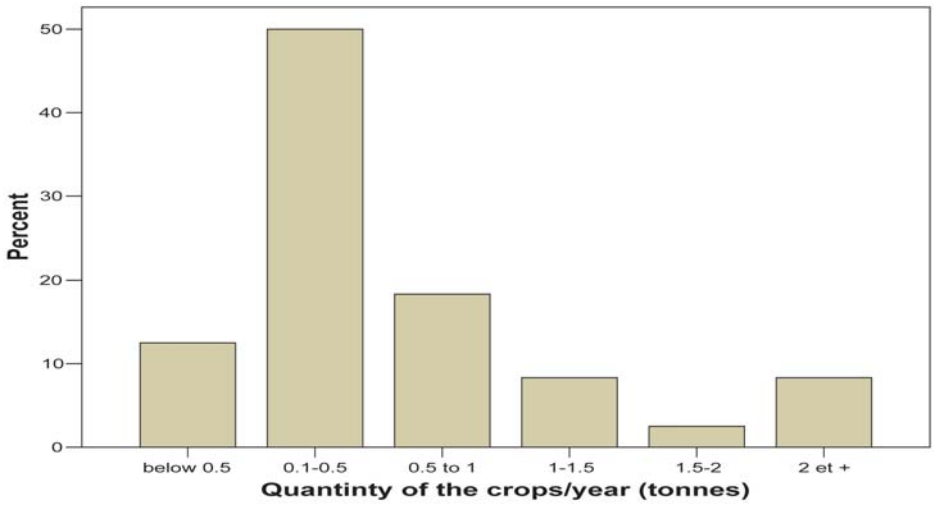
Figure 6.5 Approximate income from activities carried on the marsh land



From the diagram above, 32.5 per cent of the respondents earns between Frw 40, 100 and Frw 50,000, 23.3 per cent get income between Frw10,000 and Frw20,000, 22.5 per cent earns above 50,000, 11.7 per cent of the respondents earnsbetween 30,100 and 40,000 and 9.2 per cent of the respondents earn between 20,100 and 30,000. It is noteworthy that by Rwandan standards the marshland is economically viable for the people around. In this realm, people around the area are continuously benefiting from activities related to the marshland, and they extract raw materials to manufacture several items which are sold to earn them money.

It has been reported that there are people who do not have plots in the marshland but use grasses and other plants from the marshland for handcraft making, construction of water storage containers etc. For example the COVAGA (Cooperative de vannerie de Gashora), which is the women cooperative that uses raw materials from the marshland for handicraft making has achieved a commendable progress in production of handicraft materials though they face a problem of market. Furthermore, farmers in Gashora have formed maize growers' cooperative (INDAKUKI) which is helping them to search for markets for their produce and this improves their earning.

Figure 6.6 Quantity of the crops/year (tonnes)



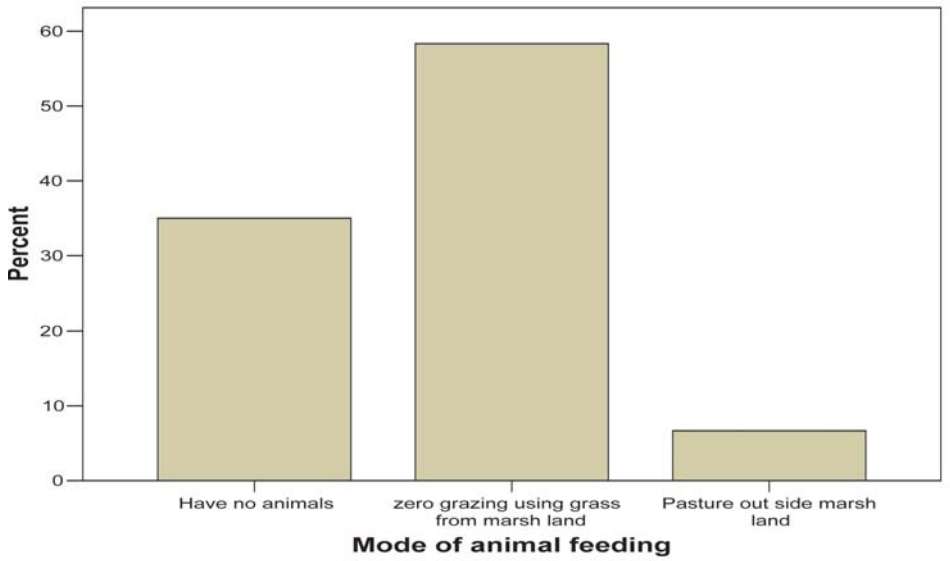
From the diagram above, 50 per cent of farmers get between 0.1 and 0.5 tonnes, 18.3 per cent of them get 0.5 to 1 tonnes, and 8.3 per cent get between 1 to 1.5 tonnes and the same percentage get above 2 tonnes (respectively). Basically there are farmers who reported to harvest up to 4 tonnes of maize or tomatoes in one season; this quantity allows farmers to get enough food at home and surplus for sale.

Table 6.10. Keeping of any animals

Keeping Animal	Frequency	Percent
Yes	77	64.2
No	43	35.8
Total	120	100.0

From the table above, 64.2 per cent of the respondents keep animals and 35.8 per cent do not. Addendum, the majority keeps large ruminants, and due to government policy of zero grazing people feed their animals at home. Thus, they graze their pastures from the marshland to feed their animals at home.

Figure 6.7 Mode of animal feeding



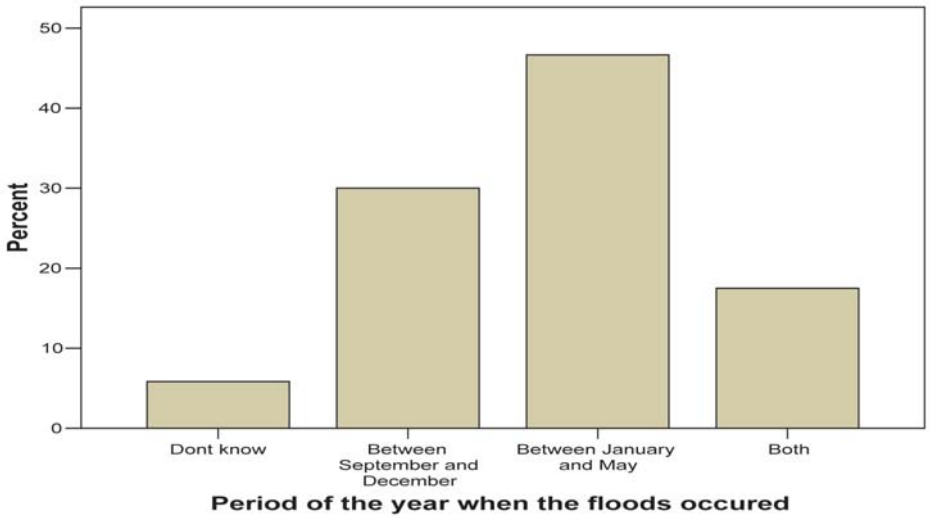
From the diagram above, 58.3 per cent of the respondents feed their animals using grass from marshland, 35 per cent do not feed their animals (this is especially for those keeping birds such as chicken etc), and 6.8 per cent of the respondents feed their animals using grass outside the marshland. Generally this relationship indicates the importance of marshland in the animal-keeping sector which is also important in generating money and employment to the majority of rural dwellers.

Table 6.11. Experiencing of any floods

Experience of Floods	Frequency	Percent
Yes	112	93.3
No	8	6.7
Total	120	100.0

From the table above, 93.3 per cent of the respondents have experienced floods, 6.7 per cent have not experienced floods; this is partly because they don't have farms in the marshland or have started farming in the marshland recently.

Figure 6.8 Period of the year when the floods occured



From the diagram above, 46.7 per cent have suffered floods between January and May, 30 per cent between September and December, 17.5 per cent in both periods, and 5.8 per cent of the respondents could not tell about the period of occurrence. However, floods occur in different periods depending on the source. For example, in Bugesera, in the periods of August to September naturally the area is dry, but due to rainfall in the northern part of the country the rivers pour water into the Akagera and causing floods and siltation.

Table 6.12. Type of damage suffered during the floods

Damage of Floods	Frequency	Percent
None	22	18.3
houses destroyed	4	3.3
crops destroyed	88	73.3
people dead	1	.8
roads destroyed	1	.8
Crops destr.+Road destr	3	2.5
Road destr+ Pastures	1	.8
Total	120	100.0

From the table above, 73.3 per cent of the respondents said that their crops were destroyed during the floods, 18.3 per cent of the respondents could not disclose their damages partly because they do not have farms in the marshland; 3.3 per cent of the respondents' houses were destroyed during the floods, and this is because people lived near to the rivers as they wanted to draw water easily and to have control over the farmlands. And 2.5 per cent said roads were damaged during the floods, 0.8 per cent of the respondents declared to have lost their family members during the floods. It was found out that the Ministry of Agriculture together with the Ministry of Defense have jointly constructed a water drainage system which helps to reduce the gravity of floods. Nevertheless, the existence of floods, coupled with soil erosion, is evidence of a lack of water-shed management.

Table 6.13. Any interest in off-farm activities

Interest in off-farm activities	Frequency	Percent
Yes	83	69.2
No	37	30.8
Total	120	100.0

From the table above, 69.2 per cent of the respondents showed high interest in having occupations other than farming, and 30.8 per cent of the respondents said they don't have interest in off-farm activities. However this group showed their concern for the lack of initial capital and low knowledge as the impeding factors in engaging in off-farm activities.

Table 6.14. Off-farm activities of interest to the respondents

Interesting off-farm activities	Frequency	Percent
None	9	7.5
Business	52	43.3
Farming	1	.8
Business+ Retail	2	1.7
Business + Handicraft	2	1.7
Business + Farming	3	2.5
Retail + Handicraft	1	.8
Retail shop	17	14.2
Handicraft + Farming	1	.8
Farming + Fishing	6	5.0
Live stock	6	5.0
Construction	5	4.2
Handcraft	10	8.3
Fishing	5	4.2
Total	120	100.0

From the table above, 43.3 per cent of the respondents showed their interest in business, and this group wished to engage in agri-business, that is selling agricultural output. They expressed their desire in business pointing to profits

and other advantages in this sector. And 14.2 per cent have interest in retail shops, which are not available in rural areas and which are profitable. Whereas 8.3 per cent of the respondents wanted to engage in handicraft making, and this group was led by women who are reaping rewards from this activity and would wish to continue doing so. It should be noted that water hyacinth, which affects water in the river, and other aquatics are used as input in handcraft making thus protecting environment as well allowing people to earn their income.

Table 6.15. Feeling about quitting farming on the marsh land

Feeling to quitting farming	Frequency	Percent
Yes	7	5.8
No	113	94.2
Total	120	100.0

From the table above, 94.2 per cent of the respondents would not like to stop farming in the marshland, and 5.8 per cent of the respondents would stop if they found a substitute. Basically the majority said they could not quit the marshland because it is the only source of income and the dry land is not productive.

6.5 Overview of the evidence

1. The valleys of the sub basin are a lifeline of the residents in the valley. Management of the use of the resources is closely related to their livelihoods
2. Demands from unexploited portions are unique and different from when the valley is exploited. It is therefore, thus not possible to think of substitutable goods and services. If possible some parts of the marshlands could be preserved for the environmental goods and services
3. The uses to which the marshlands were being put before opening for farming were multiple but at the moment agricultural farming seems to be giving more economic value to the farmers except perhaps for cultural

goods which used to dominate the utilization when the wetlands were pristine. However, consistent with 3 above means of getting maximum value from opened up areas should be sought through sustainable methods instead of opening up more land.

4. The types of crops grown are, however, still dominantly for food and no large-scale cash crop farming is seriously taken up except sugar cane in some parts of the valley. High value crops could give more value to the growers
5. In view of population growing up among communities depending on the river valley basin there has to be long term plan on how the valleys can be used without damage or exhaustion. Elsewhere there was evidence of falling levels of water but the users did not seem to be aware or care much.
6. The hypothesis of over dependency on agriculture has been moderated by the findings that the majority combine agriculture as such with another activity such as livestock and business. But that does not rule out over-dependency on the wetlands although strangely those over-depending on them seem to be relatively poorer in some areas.
7. The production is focusing on needs of the poor communities. But this is not an adequate meaning of sustainability. The incomes from the valleys, though able to sustain the people as opposed to be rented out or sold to private investors, are not enough. The standards of living of the people cannot be seen to rise from the meager incomes. Moreover sustainability includes how people care for the future users which did not appear in our findings except that the government and leadership is very much involved in determining who uses the wetlands and how.
8. There is no transboundary concern at community level and the effects on down stream users depend on the decision makers.
9. If business continues as usual in 25 years the picture will have changed. There will no longer be any pristine land and if no clear regulation or alternative strategy is laid more dry wetlands will result.

10. There is no clear link between policy and what is happening at valley level. Framers are told what to grow in the valleys by officials. It should be assumed that the officials have the capacity to advise on sustainable and transboundary uses but no evidence was tenable in the field.
11. From the observations it is clear that a Participatory Natural Resources Management needs to be considered seriously

7

Implementation Strategy – *Imicho* Approach

7.1. Introduction

The case of Rwanda provides a good case in the Nile Basin. Firstly there is evidence of institutions and efforts that are in place. In fact, regulations related to conservation and protection of the environment go back to the times of colonial rule. And yet there is also evidence of massive degradation of the environment. In the valley there was no evidence of a consistent and coherent policy to address the transboundary value of preserving the Kagera, at the same time feeding the communities living off its valleys. Since the environment lobby is almost universal every country in the Nile has taken some steps in enacting environmental laws and policies. The lesson we learn from our case study is that there is a gap between good policies and the mitigating reduction of degradation in a visible manner. It is clear then that the problem lies with implementation.

In this section is proposed a six stage approach to policy to reduce environmental degradation. The six stage implementation is an outline. Each could be detailed out and a full Toolkit developed for Nile country users. It is called IMICHO from the acronym but in Rwandan vernacular the word means behaviour or mindset. Although the issues of environment are physical issues the real strategy is changing the mindset and departing from the 'business as usual' assumption to action.

Stage 1. Integration
Stage 2. Mainstreaming
Stage 3. Inclusion
Stage 4. Coordination
Stage 5. Harmonize
Stage 6. Operationalise

7.2. Integrate (I)

Our focus is a transboundary river system and how environmental degradation can be reduced. But there cannot be two policies, one for the country's environment and another for the Nile Basin in one riparian country. It is imperative that an integrated approach enables the national policy-making mechanism to have one policy and laws that can address environmental issues in the country as well as impact the "blue" water in the Nile River or its tributaries. The integrated approach includes, both ""blue" and "green" water. By that approach watershed protection and ecosystems will be integrated into a holistic approach to reduce degradation. The phase is mostly likely characterized by capacity building in each of the member of the Nile Basin countries. It starts at technical level with training experts in concept and utilization of IWRM. After buying in an integrated approach at national level a platform has to be developed on which Nile Basin experts can engage national policy makers to ensure policy and laws in the Nile Basin as a transboundary asset that should cater for benefits at national level as well. The stage is based on the understanding that the starting point of the Nile discourse is the 'national interest'.

7.3. Mainstream (M)

What is apparent is that in Rwanda a large part of stage 1 is in place. The laws and policies are in place. What is wanted is how tools like IWRM and the Nile hotspots, especially the watersheds, are catered visibly. A major step is to ensure that policies and laws are mainstreamed in national development policies and plans. In most of the countries this is to ensure that policies to reduce environmental degradation are present in PRSPs or equivalent Poverty Reduction Strategies

Mainstreaming has often been taken to mean ensuring the words "reduction of environmental degradation appears" in policy. The World Bank (2002) and DFID(2005) are two major development partners that have attempted to define mainstreaming environment in poverty reduction strategies at each stage. The mainstreaming stage should include the following activities;

- Opening process of environmental "voices"
- Gathering data on environmental problems and opportunities
- Analyzing poverty-environment links
- Poverty reduction with environment in mind
- Prioritizing environmental management with poverty in mind
- Defining indicators and targets, monitoring outcomes.

7.3. Include (I)

Inclusion is a stage that should start parallel with the mainstreaming. It is essentially a step of ensuring environmental policies to reduce degradation are not 'top down', either from the national policy-making structures or Nile Basin technocracy. Community involvement is important in ensuring that those who are concerned with degradation are part of the solution.

Participatory practices have developed to an extent that these can be applied at conceptual, planning , implementation and monitoring and evaluation levels. The Nile Basin Initiative can take it upon its mandate to assist national governments of the Nile Basin to ensure stakeholders in the Nile Basin matters participate fully in the process

The inclusion has tended to mean poor communities as a way of ensuring policies are pro-poor, but it also means addressing the role of gender, the private sector, livestock keepers, other producers and the youth. In more technical terms inclusion will act as a safety valve to ensuring equity and rights in policy formulation and implementation.

7.4. Coordinate

A strong coordination mechanism on policy to reduce environmental degradation is necessitated by its broadness and cross-cutting nature. Environment is to be included in education, health, MDGs, governanc f e, in economic growth, investment, and each of the sectors of the economy at a national level. Coordination may be taken by a department in charge of the environment. The Nile Basin needs a link with water in the environment to be visible. The lesson we draw from

Rwanda's case is the formation of a semi-autonomous agency or authority that will look after issues of the environment. It is important the Nile Basin matters at national level be catered for clearly in any coordination mechanisms.

The current structure of NBI provides the existence of a NILETAC. The capacity of the committee should be enhanced to ensure that coordination that will be put in place will have the Nile Basin clearly on board.

7.5. Harmonize (H)

The countries in the Nile Basin are not agreed on the structure, institutions and modus operandi of the environment. In the past there have been efforts to agree on water policy only. Nonetheless the need to reduce environmental degradation means harmonization of policies, approaches and institutions need to a process that enriches the cooperative spirit.

The harmonization can be worked at both horizontal and vertical levels. The horizontal level ensures that there are structures in one country that can work with similar ones in another. The institutions, practices, tools and procedures that need to be at a minimum in each of the countries will be defined and put in the cooperative framework. These which are technocratic ally in general should be legally defined.

Vertically there should be a clear hierarchy of activities from the household level to the Nile Basin secretariat and the ratification of international conventions on environment. Below are international conventions that the Rwanda government has ratified. It is possible, however, to expand the list at Nile Basin level.

a. Convention on Biological Diversity (1995);
b. United Nations Outline Convention on Climatic Changes (1998);
c. United Nations Convention on Desertification (1998);
d. Vienna Convention for the Protection of the Ozone Layer (2001);
e. Stockholm Convention on Persistent Organic Polluting Agents (2002).
f. The Basel Convention on control of trans-boundary movements of hazardous wastes and their disposal;

g. Rotterdam Convention for the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade;
h. Ramsar Convention on the wetlands of international importance, especially as waterfowl habitats;
i. Cartagena Protocol on biosafety to the convention on Biological Diversity;
j. Kyoto Protocol to the convention on climate change;
k. Amendments of the Montreal Protocol on the substances that deplete ozone layer, adopted in London (1990), Copenhagen (1992), Montreal (1997) and Beijing (1999).

7.6. Operationalise (O)

Good policies and laws are known to be in place in many countries. Nonetheless degradation is also seen to continue. The ideas and policies have to be supported by movement of resources and outputs that will lead to desired outcomes. Budgets have to have minimum allocations to degradation reduction in each of the countries. Capacity building to oversee these policies is imperative in ensuring polices are put into action.

At this stage a strong Monitoring and Evaluation mechanism to ensure compliance with precepts of reducing environmental degradation and Nile Basin standards on reducing environmental degradation has to be in place.

As Lafferty, William M. and Hovden, Eivind (2003) put it;

> "One of the key defining features of 'sustainable development' is the emphasis on the integration of environmental objectives into non-environmental policy-sectors, and this entails a fundamental recognition that the environmental sector alone will not be able to secure environmental objectives, and that each sector must therefore take on board environmental policy objectives if these are to be achieved."

A lot more work will have to be put in designing and elaborating the approach. This will ensure prompt "buy in" by the different stakeholders, the government, civil society, donors and the communities concerned.

8

Policy Recommendations

8.1 Lessons for the Nile Basin

1 Environment is a cross-cutting issue that needs to be managed in a holistic manner

2 Taking the evolution of environmental management awareness during colonial, post colonial (1st and 2nd republics), and post genocide periods (1994 to date) and various initiatives that have been taken during these periods, environment needs to be taken as a priority in the national agenda to ensure its sustainable management for sustainable development.

3 There is a need for riparian countries to view the issue of environment in a common perspective that needs an integrated approach to its sustainable management.

4 Best practices in environmental management need to be shared among the riparians in order to achieve a shared vision *"To achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile basin water resources."*

5 Lack of necessary resources (e.g. funds) may lead to slow implementation of the policy. There is, therefore, a need to organize all the stakeholders to mobilize resources necessary for the implementation of environmental policy.

6 Community involvement in environmental protection and management is very important for sustainable development. It is thus important that the sustainable NRM be economically attractive so farmers can take them up.

7 Environmental education to a critical mass is highly needed to promote awareness and action towards environmental protection and management

8 Implementation of environmental policy requires proper mechanisms of monitoring and evaluation. Thus, environmental mapping and environmental data are highly required in order to be able to make a follow-up on environmental degradation/improvement progress.

9 Environmental policy itself is not enough to ensure environmental protection. Law on environmental protection and other by-laws are necessary to ensure that the policy is implemented

10 Environmental management and protection is highly related to land access and allocation of land that permits investment in land, which also includes land conservation and protection measures.

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Section B

The 'Brown Water' Concept and Soil Erosion in the Kagera sub Basin of the Nile: Causes, Costs, Consequences and Responses to Environmental Degradation with evidence from Rwanda

"Land losses in Rwanda are considerable and are estimated up to 557 tonnes/ha per year. These losses concern all types of losses, and the solid load of sediments carried by river Nyabarongo varies between 51 kg/s at Nyabarongo-Kigali, 44 kg/s at Nyabarongo-Kanzenze, and 26 kg/s at Akagera-Rusumo. The variation gap of these losses ranges between 33 and 288 kg of dry matter per second.". Rwanda Land Policy 2004

9

Executive Summary

The Brown Water concept introduced in this brief is not the problem but a symptom. The problem is massive soil erosion in the watershed of upstream countries of the Nile River Basin. Brown Water is not a static phenomenon but dynamic with causes, costs and consequences. It is generically applicable to the transboundary linkage between watersheds of the same river system, the Nile. It is therefore not a replacement but a complement to the Blue water concept. The Brown Water concept summarises phenomena consisting of long-term degradation processes that are readily linked to the conflicts and displacement of people in the countries. On the other hand, it is also true that Brown Water evokes issues of water quality and health and pollution such as the water hyacinth and industrial wastes along the path of Nile River tributaries.

The brief asserts that the traditional Blue water approach emphasizes the water in the Nile basin. The Green Water concept is used to emphasize the role of environment. The Brown Water concept underlines the dynamics of soil erosion and its link to poverty and even conflict in the upper Nile Basin countries of Rwanda, Burundi and DRC. The concept can readily be used in the Kagera side of Tanzania and Uganda and even in Mara of Kenya and Tanzania. The Brown Water is much more than the colouration of the water. It is the dynamic interrelationship between man, the watershed and the magnitude of degradation that can be accelerated by protracted conflict or excessive population pressure. The data from Rwanda explains the problem readily and more visibly.

Besides massive fluvial and dry erosion Rwanda has undergone high degrees of deforestation of natural forests. The villain of erosion and deforestation is not only relief but also human action and conflict. Less than 10 per cent of natural forests exist in Rwanda and 50 per cent of farms are subject to erosion. Tons of soil that could feed up to 40,000 people is washed through the tributaries of the

Kagera, the Nile Basin upstream sub basin. Erosion accounts for about 1.5.per cent of GDP and every hectare loses in excess of 550 tons. Rwanda alone loses to the rivers up to 10 tons of humus per hectare worth in aggregate more than 7 billion francs a year. The exhibit is the Brown Water of the Nyabarongo (Rwanda) Ruvubu (Burundi) Mara(Tanzania) and Kakoi(DRC). But Brown Water is also a compound of industrial effluents and water hyacinths that grow and nourish off the fertile soils being washed by Kagera.

The most important aspect of the dynamic is that the browner the water, the less fertile is the soil on the watersheds and the lower are the yields. The Brown Water is an exhibit of poverty in the midst of plenty of water carrying away a lot of nutrients from needy countries of the Nile Basin.

The answer to the Brown Water problem in the Nile Basin is not chlorination of the rivers. It is in the better management of the watersheds to reverse erosion and reduce flow of good soils to the valleys. It is about the use of fertilizers and waters in the rivers for higher production and for improving livelihoods in the countries. More water moves outside the countries even when its withdrawal can not compromise the sustainability of the Nile waters. The ultimate answer is a comprehensive approach, which is basin wide and is horizontally and vertically coordinated- the IMICHO Approach - Integrated, Mainstreaming, Coordinated, Harmonized and Operationalised.

10

Background

The traditional focus of interest in the Nile for many years was water in the water course. The focus on the water course which is rather narrow is regarded as consideration of 'Blue' water only (GWP 2003). A recent interest in integrated approach to transboundary river basin management has ushered in an interest in 'Green' water (GWP 2003). By virtue of the concept Green Water includes environment in the holistic inquiry about water and natural resources. 'Grey' water refers to waste water resulting from effluents and pollution. 'Virtual' water is that in agricultural goods and in traded merchandise. 'Fossil' is underground water. None has referred to the 'Brown Water' of Rwanda, Burundi, Tanzania in the Kagera and Kakoi of Eastern DRC.

The 'Brown Water' of the Kagera River is not about the colour of the water. It is a dynamic relation between the water and soil erosion due to human actions in the upstream watersheds of the Nile Basin. Brown Water dynamics denote massive transportation of water laden with rich humus because of massive soil erosion in parts of the basin where the rich soil is greatly needed. It also denotes an environmental management that has failed to arrest degradation and pollution and typifies poverty and low human development. Brown Water dynamics encompass causes, costs and consequences of soil erosion caused by ineffective policy to control degradation, and unsustainable use of natural resources. The state of degradation that has led to Brown Water is readily propelled by recurrent conflict and population pressure that either results in unsustainable uses of resources or in unplanned displacements of people dependent on the environment. Brown Water dynamics is a manifestation of the poverty and environment trap which is a vicious circle wherein degradation causes poverty and poverty causes destruction of the environment with a long term feedback. The feedback mechanism in the Poverty and Environment Trap is not confined to Rwanda, Burundi and DRC. It is a transboundary problem common in almost all poor countries of the Nile Basin.

Using data from Rwanda it is clear that 'Brown" water concept, as said, is beyond the colour of the water of the Nile tributaries in upstream countries but a visible testimony of manmade and natural break down of environmental management that need to be reversed for reducing poverty, promoting economic growth and human development. It is a sign of a bleeding environment resulting from severe and unhindered destruction

The first parts of the brief shows that the 'Brown Water' in Rwanda is a function of soil degradation where the causes, costs and consequences are the result of current practices. The second part of the problem is the link between the state of degradation and low agricultural productivity, on one hand, and poverty and low economic growth, on the other. The final part in recommendations and implementation strategy proposes that as a transboundary problem the response of Rwanda should be part of the vertical and horizontal integration of environmental policies embedded in the IMICHO approach, an acronym for Integration, Mainstreaming, Coordination, Harmonization and Operationalization that was introduced elsewhere under the policy study on reducing environmental degradation..

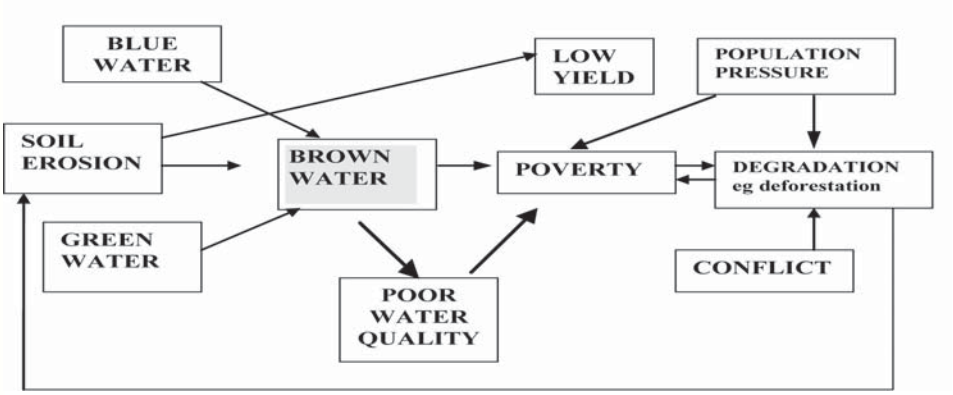
11

The 'Brown Water' Concept is the Epitome of a Vicious Circle

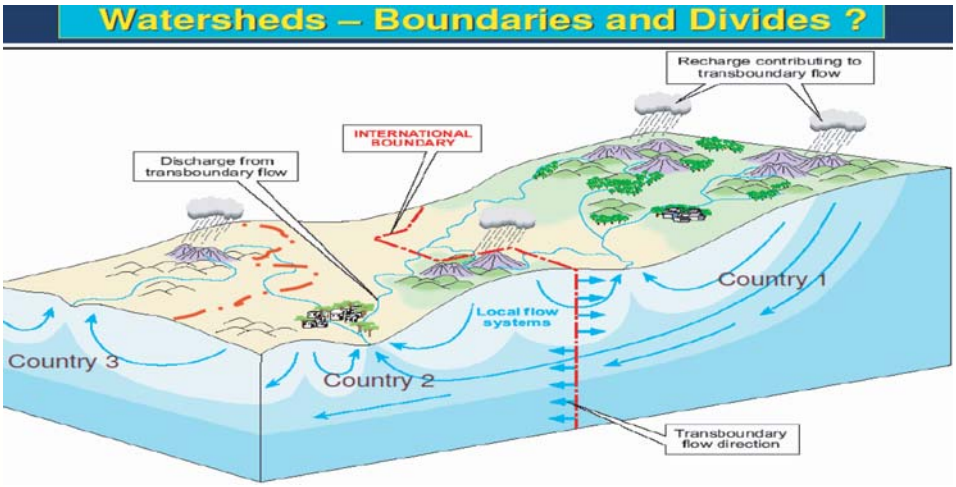
11.1 Vicious circle of poverty and environmental degradation

The poverty and environment cycle is based on empirical evidence that the poor damage the environment in their search for livelihoods because a majority of them depend on natural resources. When resources are degraded, contested, or inaccessible, the poor tend to be negatively affected, often driven even deeper into poverty (World Bank 1990).Lack of secure access to resources is also responsible for the damage of the environment. As a result of a degraded environment further poverty is created completing a circle. It is possible, as in our case of Rwanda, for any of the two to be triggered off by different factors. Population pressure in a situation of land scarcity results in over cultivation of land. Over-cultivation of land has become the major source of drop in productivity in agriculture that accounts for food poverty, as explained in the next section. The result is poverty resulting from intensive use of land that has involved use of even the most marginal land.

A second force has been recurrent conflict. Conflict in Rwanda (by extension Burundi and DRC) has resulted in massive destruction of the environment especially deforestation. Top soil is washed down river valleys in massive quantities to constitute the 'Brown Water' in water courses. The same phenomenon is caused by resettlements of large groups of people because of war or in the period after 1994, with the return of refugees. The latter also result in soil degradation that has accelerated erosion of the soil that flows into the rivers.



The spiral of environmental degradation continues to occur; people who depend on natural resources are continually forced to exploit less suitable land, trees, and wetlands to meet their minimum daily requirements. The cycle, as suggested in the figure below, becomes transboundary as Brown Water is moved from one country to another due to watersheds joining countries over one transboundary river system.



11.2 Causes and consequences of Brown Water

Brown Water causes

Proximate causes

Fluvial and dry erosion caused mainly by agriculture on steep slopes relief, lack of vegetation, soil characteristics and seasonal and tropical torrents.

Primary causes

Weak management of the environment over long period that results in massive and widespread degradation and composite transportation of soil and effluents particularly the following:

- massive deforestation for firewood;
- bad management of waste (collection, elimination, recycling, reclamation) and weak sanitation system;
- lack of a pollution management system and harmful effects generated by craftsmen, workshops and industries, from the point of view of the development of these activities (standards for emissions and ecological management, industrial location);
- mining and absence of appropriate measures for the rehabilitation of mines and quarries;
- natural disasters (establishment of an early warning system, and preventive measures and national response capacity);
- proliferation of the water hyacinth in the lakes and rivers;
- weak dissemination/lack of respect for the existing regulations and ratified International Conventions;
- low level of involvement of civil society, private sector, women and youth in environmental protection;
- insufficient resources for the transfer of technology;
- scattered population in rural areas and disorganized population in the cities;
- drying and draining of certain lakes;
- many developmental projects are not subjected to preliminary environmental impact studies;
- non-agricultural income-generating activities are insufficient;
- low capacity at the level of central and decentralized management.

Indirect causes

- protracted conflict in the Great Lakes
- massive movement and displacement of people
- long term effect of colonial rule laws

- population pressure raising density of the population, land-carrying capacity and multiple demand
- technological stagnation and continued dependency on bio-fuel by a majority of the population
- globalization and trade liberalization pressure

Results

Land losses are considerable and are estimated between 0 and 557 tonnes/ha per year. These losses are of all types and the solid load of sediments carried by river Nyabarongo varies between 51 kg/s at Nyabarongo-Kigali, 44 kg/s at Nyabarongo-Kanzenze, and 26 kg/s at Akagera-Rusumo. The variation gap of these losses ranges between 33 and 288 kg of dry matter per second

12

Environmental Degradation in Rwanda: Erosion as the primary cause of Brown Water

Rwanda case study evokes the need to recognize the dynamics of 'Brown' water as a concept that embodies 'blue" water in the Nile tributaries as well the effect of extensive degradation of the watershed in the upstream countries of Rwanda, Burundi and DRC. The 'Brown' water is used to denote a combination of soil eroded in the watershed; 'Grey' water from industrial wastes in their paths and 'Green' water seeping through the ground and above in valleys. The Brown Water is corroborated by three sets of findings from the case study presented in the rest of this section.

Firstly there is adequate amount of secondary data to show that there is a pervasive level of soil erosion in the Rwanda watersheds of the Nile Basin. The fluvial and sheet erosion account for the Brown Water in the Nyabarongo and Akanyaru, both principal tributaries of the Kagera River. Secondly, field data show a number of policy issues that vindicate unsustainable use of land and water in the Kagera River valley. Thirdly, a comparison of the exploited and unexploited parts of the valley suggests that unless steps to promote sustainable uses are taken the Brown Water phenomenon will continue to compromise water quality and also erode livelihoods of communities that have been depending on them for centuries.

12.1 Effects of massive soil loss

Massive soil loss causes 'Brown' water and lowers agricultural productivity**.** In Rwanda on average 27 per cent and cultivated land is undertaken on slopes of more than 20 degrees, 23 per cent on slopes between 10 and 20 degrees, 16 per cent on slopes between 5 and 10 degrees and between 0 and 5 degrees

cover 34 per cent (Clay and Lewis 1996). The result is massive dry, fluvial soil erosion that flows into the rivers. But soil erosion is not due to the relief of the country alone.

Loss of humus is to the tune of 10.1 metric tones per hectare and can go up to 36 metric tones per hectare on 5 percent of the soils and more than 68 metric tones on 1 percent of the soil. Clay (1998) states that soil erosion is moderate to severe on 50 per cent of the land surface of Rwanda. Rwanda is losing an estimated 14 million tones of soil per year due to soil erosion (GoR 2004). The erosion carries away an estimated 945,200 tonnes of organic matter, 41,210 tonnes of nitrogen, 280 tonnes of phosphorous and 3 tonnes of potash (MINITERE 2003).

Soil erosion is in turn related to fall in levels of land productivity in Rwanda. Table 12.1 shows that the levels of large decline in land productivity are related to an increase in slope of the plots.

Table 12.1: Slope and productivity decline on farms in Rwanda

Slope in degrees	0-5	6-9	10-14	15-20	21+
Productivity decline per cent of farms	9.8	6.9	10.8	15.8	16

Source: *Clay and Lewis (1996)*

Clay (1998), citing different sources, noted that in the north of Rwanda 80 percent of all sampled population observed, decline in soil productivity due to erosion. In Rwanda, one of every eight fields experience a sharp decline in productivity due to soil erosion.

Clay et al (1999) have shown that yield may be reduced significantly by soil erosion.

> *Land productivity on very eroded farms is 21 percent lower than on farms with little erosion. The most extreme case is for farms with a low share of high value crops such as coffee and bananas and a low share of cultivated area on which fertiliser or organic matter has been applied. The loss was estimated at about 36 percent (pg 83).*

A substantial amount of this soil erosion is therefore due to the unsustainable stripping of forest cover and lack of firm and continuous policies of protecting soil. These are general and empirical regularities.

There is lot of evidence to show that deforestation and forest services degradation constrain the economy and development options. Erosion on agricultural land is estimated to be 75 times greater than what occurs in natural forested areas.(Myers, 1993 in Gurrieri et. al, 2003). In agro ecosystems of Africa, Asia, and South America average erosion rates are around 30-40 tons /ha/year. An example from Nigeria approximates soil loss from a cassava field on a slope of about 12 per cent to be 221 tons/ha/ year. In other areas, sloping agricultural land under tropical rainfall loses as much as 400 tons per ha per year. In Rwanda, in mountainous areas that are intensely cultivated, this rate is expected to be higher as the slopes range between 30 and 80 per cent.

12.2 Soil erosion is costly to Rwanda

Using data and statements above and using the estimate of value of loss per hectare (Delpieere 1997) it is possible to state that the economic cost due to soil erosion is immense. As indicated in Table 12.2 below, the estimated loss due to soil erosion may be equivalent to almost 2 percent of GDP.

Table 12.2: Estimated loss from soil erosion

	Area in ha	Estimated area under erosion	Estimated loss per ha	Estimated total loss
Land under cultivation	1,144,300	572,000	33,000 RWF	18,876,000,000
			US$	34, 320,000
			As per cent of GDP	1.9

Source: *own estimates*

More current data collection, and estimates on soil loss need to be carried out. Secondly, the current figure of more than 14 million tones mentioned earlier has been said to be equivalent to loss of capacity to feed 40,000 people annually (GoR 2004). Failure to control erosion substantially has a high cost.

More sustainable use would reduce the number who fall into the category of under absolute poverty annually, and potentially increase production. Another responsible authority has estimated the loss to be about 7 billion francs a year.

The costs also include health problems related to poor quality of water. The costs also should include problems caused by water hyacinth which has been breeding well from the rich Brown Water of the Kagera. There is dearth of data on these aspects of the problem, and further study is recommended.

The 'Brown' water of rivers of Nyabarongo is a reminder of the extent of soil erosion and unless radical steps are taken and sustained, the exhibit will continue to point to the core cause of poverty and the cost of degradation to Nile Basin countries.

12.3 The Kagera River valley is under threat of multiple demand and use resulting in degradation

The first exhibit of massive degradation of the soil in the Kagera Valley is the Brown Water mentioned earlier. However, at a specific level, the degree of degradation varies from one point to another

- The upstream part of the Kagera River, the Nyabarongo, is not only Brown but demonstrates multiple demands to the land and water of the valley. Exhibits are a large-scale industrial brick-making factory, large-scale sugar cane farming and harvesting of natural grass for livestock as well as free-grazing. The same is demonstrated by intensive agricultural activities in Gashora and Rwabusoro where virtually all natural and wild goods have disappeared. Noteworthy, however, were potions of land in Gashora where the valley is still pristine supporting papyrus and other natural plants that provide environmental goods.
- Besides the Brown Water from soil washed down into the river system, the industrial and human activities of Kigali city dispose of some of their effluents into the Nyabarongo. At different points on the river Nyabarongo small hyacinth weeds can be seen in the early stages of their

development and early parts of their journey to down-stream areas of Kagera and Lake Victoria.

- Data from households show an increasing pressure on the land by large families. There is virtually no land which is free in areas like the valley of Rwabusoro where, despite seasonal floods, the area is under permanent cultivation
- The most important finding was a sense of diffidence on the part of people cultivating in the valleys. In both Rwabusoro and Gashora most of the activities are carried out through cooperatives. Provided they are allowed to cultivate some crops and given advice on farming they continue to use the valleys unhindered
- It is therefore important that the government agricultural officers and policy makers understand the need for sustainable use of the land and water of the valleys and get capacity building support
- The 'Brown' water phenomenon demonstrates that the solution to the problems does not lie in the valley alone. There is a need to have community awareness programmes whereby people living on steep valleys of the Kagera River can participate in erosion control activities, especially tree planting and terracing.
- Since 'Brown' water cannot be fully contained by reforestation at least in the short run, there is need to devise ways of ensuring good uses of the water in the valley and, in some areas, leave some portions to retain the advantages of ecosystem services.
- Besides providing wild goods there are opportunity to promote other activities that sustain livelihoods of people depending on the valley, such as fishing
- Promote long-term development of entrepreneurial activities, such as agro-forestry through sericulture, that reduce degradation and ease the population pressure on Kagera valleys
- Ultimately the whole idea is to promote the transboundary nature of the activities. To safeguard water levels of the Kagera for transboundary advantage of downstream areas should not mean full conservation of

the Kagera Valley, but promoting investments and activities that ensure long-term environment protection

In the study on reducing environmental degradation in Rwanda, it is argued that having good policies and laws on environment is necessary but not sufficient. For a country without regulatory and legal framework, this is a very important step. Rwanda is a case where the framework is in place but the extent of degradation is still a major concern. The explanation is manifold. The impact of efforts to contain degradation has a gestation period which is long. Secondly, there is gap between policy formulation and implementation. Participation of different stakeholders is important in ensuring sustainable use and addressing more pro-poor policies for poverty reduction and human development

13

Recommendations

The study has raised a number of policy issues that need redress

1) There is need to scale up activities of protecting the watersheds through reforestation and terracing, to contain erosion that accounts for Brown Water in the Rwandan and Nile river tributaries
2) Scaling up activities in erosion control efforts at transboundary level is possible when policy makers acknowledge the role of Green and Brown Water in the Nile discourse. A recommendation is training more policy makers in integrated approaches to environmental management
3) For sustainable use of resources, it is recommended to operationalize policies and mainstream in national policies for poverty reduction
4) Harmonization of policies on reduction of environmental degradation in the whole basin is important.
5) The Nile Basin will need to have institution, mechanisms and capacity to carry out environmental audits

14

Implementation

In relation to the above recommendation a number of steps can be taken;

1) Collect more data on nature and extent of degradation of the environment in Rwanda and the real value of loss through Brown Water
2) Establish a data bank of environmental statistics
3) Start Green Accounting in Rwanda
4) Start a transboundary master plan on sustainable use of Kagera River basin land and water resources

Section C

Entrepreneurship Investment Programme in Kagera River Basin-2009-2011 *Sericultre to Reverse Environmental Degradation (EIP-SERICULTURE 2009-2011)*

15

Background

The Kagera river basin is the largest river basin contributing to the Nile waters. It passes through four countries namely Burundi, Rwanda, Tanzania and Uganda. Many initiatives have been in place which are relevant to the Kagera river basin. They include Nile Basin Initiative's NELSAP, KBO, LVEMP and EAC initiatives. KBO was terminated due to its failure and its tasks were entrusted to NBI's NELSAP. NELSAP's Kagera Transboundary Integrated Water Resources Management Project (KTIWRMP) has done significant work on Kagera river basin's improvement.

Nile Equatorial Lakes Subsidiary Action Programmes have the objective of contributing to the eradication of poverty, to promote economic growth, and to reverse environmental degradation. Seven projects have been identified in NELSAP which include; enhancing agricultural productivity in five East African countries and the DRC; management of fisheries and environments of Lakes Albert and Edward; watershed management of (i) the Kagera, (ii) Mara, and (iii) Sio- Malaba-Malakisi river basins; Water hyacinth and water weed control in the Kagera; hydropower (Rusumo Falls and ranking and feasibility studies of 50+MW hydroelectric power projects); power transmission connections Kenya-Uganda-Rwanda-Burundi-DRC and support to NEL-CU.

Kagera river basin management is one among the three river basin management projects initiated by the NELSAP. The other two river basins include Mara and Sio- Malaba- Malakisi.

15.1 Kagera River Basin Transboundary Integrated Water Resources Management Project (KTIWRM)

KTIWRM has been oriented to develop tools and permanent cooperation mechanisms for the joint, sustainable management of water resources in the Kagera River Basin in order to prepare for sustainable development-oriented investments to improve the living conditions of the people and to protect

the environment. A sustainable transboundary joint management framework was established and procedures for EIAs were put in place. Pre-feasibility studies were carried out and a long-term investment strategy was established. Kagera River Basin Monograph details the results. The Kagera project staff were trained and community awareness was created about the impact of the project activities. Eight small-scale and five long-term investment projects were undertaken. They are broad-based and aimed at a macro impact on the Kagera river basin which may have indirect impact on the livelihood of basin dwellers in the long-term. It is felt necessary to infuse short-cycled projects which help the economic diversification in the Kagera basin to reduce the impact of population pressure on the wetlands and marshlands.

15.2 The EIP Sericulture (2009-2011) Project

On the basis of the current research on the basin carried out by the NBI-SDBS –RW –PI, it is felt necessary to address the issue of environmental degradation from a different perspective. The research shows that the causes for environmental degradation in the Kagera river basin are mainly poverty related. And as a result, there has been heavy reliance of population on the river for livelihood. Hypothetically, if the population is diverted from agriculture related occupations to non-farm activities through entrepreneurship promotional programmes, the pressure on the Kagera river basin can be reduced, and the reversal of environmental degradation could be realized. Accordingly, this investment programme is conceived as detailed in the following paragraphs.

16

Justification of the Investment Programme

The pilot study, the field trips made and the final survey results of the NBI-SDBS- RW-PI equivocally testified that the ill effects of population pressure on the Kagera river basin are clearly visible. The benefits from the river are over-exploited in terms of growing food grains, pulses and vegetables. The benefits beyond the river are also evidenced with the supply of materials to sugar industry, and the handicrafts industry, besides drawing heavily on the clay, road construction materials etc., through excavations. However, benefits to the river are constrained and limited. The river has been collecting silt due to irregular and irresponsible excavations undertaken in the catchments. The river and its constituent lakes have been experiencing a decrease in-flow of water due to reduced rainfall and the ill-planned and irrational cultivation of marshlands. Cyohoha Lake has dried up due to its over-exploitation for agriculture. These conclusions are based on the scientific survey carried out in the Kicukiro, Kamonyi, Bugesera and Nyanza districts of the Kagera river basin covering three important geographic locations of the river Kanzenze, Gashora and the Rwabusoro of the upstream Kagera.

The causative analysis indicates that the following are the major reasons for the dwindling condition of the Kagera river basin:

- Over dependence of people on agriculture for sustenance due to poverty
- Over dependence on agriculture was due to lack of education, lack of skills and lack of awareness of entrepreneurial opportunities
- Lack of awareness among people about the environmental effects of their activities
- Continuous increase of population in the water resource areas has been resulting in increased pressure on the marshlands and the wetlands
- Increased yield of economic goods from the river basin which has resulted in a depletion of the natural resources
- Changing climatic conditions and decreased yield of rains also added much to the problem

Against this background it is felt appropriate to implment an investment programme to ease the impact of population pressure on the Kagera river basin by creating an awareness programme for the people to educate them about the need to maintain the balanced use of river resources for their economic benefits and to institute an entrepreneurship programme with an action-research mode, to create non-farm self-employment which can reduce the dependence on agriculture.

The Mulberry cuttings brought from India during 2003 were planted in the four model farms in Rwanda at Nehanga (Umutara), Rusizi, Kibuye and Nyanza covering east, west, north and south zones respectively. It came about the result of four MOD officers' training in Korea. The trees are growing well in the soils of Rwanda, especially of Kagera basin, which can be witnessed in Nyanza district and Nehanga in Umutara district. The trees planted in a five hectare experimental farm in Kigali suburbs demonstrates that these plants grow well in the country and especially in the Kagera Basin area.

16.1 The proposed Investment Programme

Title of the Project: "Entrepreneurship investment programme in the Kagera River Basin- Sericulture to reverse environmental degradation"

Key areas of intervention: The suggested key areas of intervention include the following;

1 Creating awareness on sustainable agriculture
2 People to be removed from the wetlands and marshlands in a phased manner through non-farm entrepreneurial interventions.
3 Entrepreneurial awareness campaigns such that people can engage more in non-agricultural activities. Pre-harvest and post-harvest activities will be focused to make the new activities more complimentary in the short run by making input-output analysis.
4 Exploration of agribusiness entrepreneurship in a sustainable and eco-friendly manner.
5. Economic activity diversification to ensure environmental sustainability

6. Sustainable Business Incubation facilities: on-the-field business incubators, at least at the three river basin areas (Kanzenze, Gashora and Rwabusoro) to show case SERICULTURE in each
7. Entrepreneurship mentoring and monitoring to small and family businesses in the non-farm categories to the general public (in addition to the incubating sericulture businesses)

   Criteria: The criteria conceived for the execution of the sericulture investment programme are as follows:

   a. Poverty alleviation
   b. Women and youth participation
   c. Sustainable use of wetlands and other natural resources
   d. Pro-poor economic diversification programmes
   e. Best fit of social costs and benefits

Action Research Mode of Execution: The modus operandi of the programmes is driven by the action research as explained below:

Outline of the Programme: The programme is aimed to have the following steps in launching the sericulture project at the three designated locations:

i General environmental and entrepreneurial awareness
ii. Sericulture opportunity analysis
iii. Beneficiary identification
iv. Sericulture Project launching in the business incubation facility centres
v. Way forward (monitoring and mentoring) for sustainability

Actors to be involved: The following actors will be involved in the process of executing this investment programme:

1. NBI- SDBS- RWANDA – PI will be in the lead in conceiving, planning and executing the sericulture investment programme as a means to reverse environmental degradation in the Kagera basin.
2. KTIWRMP for providing assistance in execution of the programme and to render overseeing responsibility, and to translate the sericulture project in its operational areas across the borders.

3. REMA for ensuring the implementation of environmental regulatory framework and policy provisions in connection with the proposed sericulture project.
4. PSF for encouraging the active involvement of private initiative and to lure the potential investors and entrepreneurs to come forward to invest in the sericulture project in phase II.
5. LOCAL GOVERNMENT for the integrated and balanced way of implementing the programme objectives in tune with the national policies and district development plans. They also render assistance in identifying the beneficiaries and establishing the incubation facilities at the selected sites.
6. LOCAL NGOs working in the Nile Basin sphere under the umbrella of Nile Discourse Forum. They play a significant role in environmental protection awareness campaigns and use the mulberry trees as a mass agro/social forestry activity to plug the soil erosion in the selected areas.
7. UTEXRWA a local vertically integrated textile factory in the private sector to provide the cuttings of mulberry trees, training in farming mulberry trees as a means to arrest soil erosion , training in rearing the silkworms by feeding them on mulberry leaves, and to harvest cocoons. And then the company will buy back the output from the entrepreneurs and ensure proper payment schedules. It participates both in input and output stages. Thus the materials and marketing requirements are addressed.

This project idea was discussed with almost all the above stakeholders and each of them expressed their concern and support for the sericulture project.

16.2 Objectives

16.2.1 General objective

The general objective of this programme is to utilize the power of entrepreneurial awareness and development in the economic diversification in the Kagera river basin through the experiment of sericulture project in selected rural business incubators in the basin.

16.2.2 Specific objectives

The specific objectives of the sericulture investment programme are as follows:

1. To develop and launch an entrepreneurial and environmental awareness programme for sustainable livelihood in the Kagera basin in partnership with local governments, Business Development Services of Private Sector Federation and the NGOs of the Nile Discourse Forum.
2. To establish sericulture units at the three locations mentioned with the partnership of private sector (UTEXRWA), to help the farmers to start businesses to keep them off from agricultural activities in the Kagera river basin.
3. To offer training to selected prospective farmer-entrepreneurs on mulberry tree rearing, and silkworm and cocoon feeding.
4. To design and execute model sericulture plantations by getting the cuttings from UTEXRWA in the fields of selected beneficiaries with the help of NGOs working under the umbrella of Nile Discourse Forum.
5. To help the farmers to get the silkworms from the UTEXRWA and to feed them on sericulture leaves under the technical supervision and monitoring by the project staff and UTEXRWA expertise.
6. To assist the farmers in selling the value-added silk cocoons to UTEXRWA and help them reinforce the activity of sericulture with the multiple objectives of environmental protection, non-farm employment creation and ensuring a sustainable livelihood.
7. To assess the impact of sericulture projects in helping the people to diversify from agricultural activities in the Kagera river basin and increase their economic returns.
8. To assess and synthesize the results of the action research-based investment programme for wider applications in the transboundary basin and also to plan for the II Phase of large scale investment programme of establishing the reeling factories within the basin locations by working with the Private Sector Federation.
9. To verify whether the desired economic diversification is taking place in the Kagera river basin resulting in a decrease in the dependence on wetlands and marshlands and whether the sericulture project resulted in sustainable livelihood.

17

Sericulture Project Process

Mulberry Trees: Silk industry is very popular in Asia and Europe and it is present in the Americas. It is a high value-added industry. Silk industry is based on mulberry tress and silkworms. Mulberry trees are beautiful and easy-to-care requiring little effort on the gardener's part. There are two common mulberry tree species, the European red mulberry *(Morus rubra),* and the Asian white mulberry *(Morus alba).* The red mulberry reaches a height of about sixty-five feet with rough and reddish-brown bark. The white mulberry only grows up to forty feet tall, with rough, lighter, ochre-gray bark and spreading branches. Both species have roughly oval, toothed, alternate leaves 2-6" long. The red mulberry's leaves feel like sandpaper underneath. The white mulberry's leaves are smooth underneath. As the new leaves develop in mid-spring, tiny male and female flowers hang on separate small, slender, inconspicuous spikes. The male cluster is longer, the female rounder. If cared for properly, they produce large yields of sweet blackberry-like fruit. In traditional European medicine, the mulberry root was a remedy for tapeworms. The tree's inner bark (cambium) has been used as a laxative. The fruit, eaten in very large quantity, may also be mildly laxative. In India, mulberry leaves are used in treating diabetic patients.

There is solid evidence that the Asian species have been withstanding better the climatic and soil conditions of Rwanda in general and also the Kagera River. In 2001 UTEXRW made an experiment with 100 mulberry cuttings brought from India. Later, Thailand variety was also put under experiment. These cuttings were planted in UTEXRWA premises, ISAR farms and UMUTARA province. And the FAO sent an expert, Dr. Lee (Korean), to carry out experiment in 2004. It was a joint experiment of ISAR, UTEXRWA and FAO. Dr. Lee certified that Rwanda is excellent in its soil and climatic conditions for mulberry tree growth and the silkworm survival rate and growth. The experiment was carried out with Korean silkworms. He clarified that Rwanda

can do much better than Korea. And even compared to India also Rwanda can yield better in terms of mulberry growth and silkworm growth. In India it is possible to do 10 cycles of sericulture, a year while 12 cycles a year will be possible in Rwanda due to its good climatic conditions. Today, Indian variety of mulberry tree called Kanva -2 and Thai variety called K-2 are grown. Dr. Gulshath. M. I, Sericulture Consultant to UTEXRWA emphasized that the Thai variety is rich in the leaf yield rate, while the Indian variety is very good in quality. Now experiments are under way combine both the features to have a Rwandan variety on its own soil. Apparently there are no efforts to bring and try the European varieties of mulberry trees. Regarding the silkworms, as stated above, the experiments were initially tried with Korean variety of silkworms but currently ISAR and UTEXRWA are getting the Bulgarian variety of silkworms. Mulberry leaves can be harvested for feeding silkworms at an early stage of 10 months. The Mulberry tree has a commercial life span of 40 years.

In sericulture, only the young tender Mulberry leaves are used for the purpose of feeding the silkworms. So the young plants, starting from the age of 10 months on wards, can be used for harvesting the leaves for silkworm feeding.

Silkworms: Silkworm is one of the most genetically exploited animals. Silkworms were first domesticated during the 'Han Dynasty' in China about 5000 years ago. Since then silk production capacity of the species has increased nearly ten-fold. Silkworm is one of the few organisms in which the principles of genetics and breeding were applied to harvest maximum output. The major objectives of silkworm breeding are: Improving fecundity (egg laying capacity), improving healthiness of larvae, improving quantity of cocoon and silk production, for specific purposes based on cocoon and silk production, for disease resistance etc.

17.1 Silk Manufacturing Process

The silk manufacturing process includes two phases and in all has 7 stages:

Phase I

1. Farming Mulberry
2. Silkworm rearing
3. Cocoon production

Phase II

4. Reeling
5. Re-reeling
6. Twisting
7. Weaving

Phase I of sericulture can be undertaken as Entrepreneurship Investment Programme (EIP) in the Kagera basin. It can contribute to poverty eradication in the basin through intensive promotion of sericulture among the people below, poverty line, besides addressing the objectives stated above. Assistance will be given to poor families living below the poverty line in the Kagera basin areas for taking up self-employment which is away from working in the wetlands and marshlands. The farmers may take up the activity either individually or in groups, called associations.

Phase II is an industrial activity of establishing the reeling factory and yarn-making process. It would require an investment at least of 500,000 USD to start a small reeling factory.

Components of EIP under Phase I: The EIP Sericulture project includes five major components viz. assistance for establishment of mulberry nurseries, assistance to individual/group sericulturists, assistance to use mulberry to arrest soil erosion, establishment of silkworm rearing and input service centres, and cocoon harvesting. These five components are expected to complement each other and serve as a strong back-bone to the EIP by way of creating a congenial circumstance for wholesome development of the sericulture industry in the Kagera basin, and contributing to the reversal of environmental degradation.

Each unit of sericulture may consist of five beneficiaries together managing one hectare of mulberry cultivation and silkworm rearing. The lands available for the social forestry activities as identified by the local governments and the soil erosion spots will be used for mulberry tree plantations. Four units could be grouped together to form a Self-help group to reinforce their activities and to internalize and consolidate the best practices for wider adoption in the areas of environmental protection, entrepreneurial awareness campaigns and extending mutual help in the process of sericulture.

In each of the areas intended for launching the project, at least 100 hectares of land are expected to be put under mulberry cultivation thus having at

least 20 units working on the project and 5 self help groups attached to one rural business incubator. In all there will be 300 hectares of land in mulberry cultivation with the involvement of 500 beneficiaries with 100 units of mulberry growing and silkworm rearing which are aligned in to 15 Self-help groups. This will create huge employment opportunities and show contributes for the reversal of environmental degradation in the Basin.

As the mulberry cuttings will grow in 10 months to start giving the leaves for feeding the silkworms, it will be possible to rear silkworms in the second year of the EIP-Sericulture Project.

17.2 Economics of EIP Sericulture

1. Input Costs: Mulberry cuttings will be supplied by UTEXRW at the rate of 20 Rwf each to the farmers. Per Hectare it is required to have 10,000 cuttings. It would require 200,000 Rwf per hectare and for 5 hectares in a group it would be 1,000,000 Rwf. In later stages the multiplication will automatically be done with the grown mulberry tree. These trees will be planted so that soil erosion can be arrested, waste lands can be used and excess dependence on Kagera wetlands and marshlands reduced. These will be getting ready for use in silkworm rearing in 10 to 12 months.
2. Training of Trainers: The UTEXRWA Company will provide the training of trainers for the first batch free of cost. The training will be for 30 days in mulberry tree growth and silkworm rearing.
3. Training of Farmers: The trainees who passed through ToT will in turn provide training to farmers in the Kagera basin
4. Silkworm rearing: UTEXRWA supplies the silkworms at the rate of 10,000 Rwf per box which contains around 16 to 18 thousand of 8 day old silkworms. It requires having 5 boxes per hectare. Thus total cost will be 50,000 Rwf. Feeding and maintenance of silkworms should be done for another 20 days which requires minimal expenditure for hygiene care and supervision costs of 50,000 Rwf.
5. Cocoons: Silkworms start becoming a cocoon from the 28th day and then get ready for harvesting. The cocoon is made of a thread of raw silk

from 300 to 900 meters (1000 to 3000 feet) long. The fibers are very fine and lustrous, about 10 micrometers (1/2500th of an inch) in diameter. About 2,000 to 3,000 cocoons are required to make a pound of silk. These cocoons will be supplied to UTEXRWA. The Company will pay as per the existing rates:

Sort	Price per Kilogram in Rwf
Good quality –Sorted Green (Un-dried) Cocoons	1650
Good quality –Sorted Green (Fully-dried) Cocoons	3000
Unsorted Green (Un-dried) Cocoons	1100
Unsorted Green (Fully-dried) Cocoons	2000
Sorted Green (Un-dried) Not good /double Cocoons	700
Sorted Green (Fully-dried) Not good /double Cocoons	1200

It shows that nothing is wasted out of each of the cycle. Every item of sericulture has an economic value. Every farmer can have 10 cycles of cocoons in a year.

6. Net IncomeOn the average the farmers can have 2000 kgs of cocoons per hectare which will yield a net income of around 3,000,000 Rwf. This is a modest estimation with 10 cycles per year. Some farmers can go for 12 cycles. And if there is a good quality yield, then the net income will be on the higher side.

The EIP –Sericulture Project is not necessarily based on the fully-grown tall trees. As outlined above the small plants aged 10 months and above are used to harvest leaves. In Rwanda the experiment shows that the Mulberry Plants start giving the harvest from 8 months onward. There is a special way of harvesting the leaves and feeding the silkworms. The UTEXRWA expertise will be used initially to impart Training of Trainers. ToTs then diffuse that skill through the EIP project. The income is realized every 30 days. The silkworms start becoming cocoons on 28th day and start spinning and complete the process in 3 days. And after 6th day they will get ready for harvesting and selling. Then the Cocoons after sorting are ready for sale. Then the process is repeated. It depends on the activeness of the farmer in yielding the harvests. If the farmer

is capable and determined, he or she can have a continuous income repeatedly every month.

The estimated income for a small farmer for one year can be calculated as follows:

Farm Size: 1 hectare
Number of mulberry plants: 10,000
Expected yield in one cycle (Low estimate): 200 Kgs
Expected number of cycles in a year: 10
Average price per kg of Cocoons: 2.5 USD (Low estimate) First quality fully dried greens (5.45USD); In Rwanda the quality is rated high grade (Korean expert) Yearly income from 1 hectare farm: 5000 USD
Employment: Women are largely employed

Costs

Cost of cuttings: 10,000 x 20 Rwf = 200,000 40 years life	=	5,000
Cost of farming: 10 months = 10,000 average	=	100,000
Human Resource cost = 40,000x 10	=	40,000
Leaf Harvesting 30 x 500	=	1,500
Silkworms 5 boxes x 10,000 Rwf per box x 10	=	500,000
Maintenance and rearing of silkworms for 20 days x 10	=	500,000

1,456,500 or 2500 USD Per Year

Net Benefit

2500 USD (this is an estimate on thelower side and on the higher side with the possibility of getting a good quality yield of cocoons ,the net benefit may be 50 per cent more of 2500USD per year) + employment and overcoming dependence on agriculture and environmental benefits.

17.3 Period of Eip Sericulture Programme

The period of this action research-based programme is projected to be three years 2009-2011. The first year will be mainly devoted to inception, Training of Trainers, environmental and entrepreneurial awareness campaigns, and farmers training. Second year will be for silkworm rearing and sericulture. The NBI-SDBS-RW-

PI will monitor and execute the project with the cooperation of other players. The third year will be devoted for to the extension of the project to other Nile transboundary countries and to find other equally environment friendly projects to replace excessive dependence on the Kagera wetlands and marshlands.

17.4 Expected ResultS

The EIP Sericulture project is an experimental exercise based on sound theoretical framework and action research mode. The following results are expected from the project:

1. Environmental and entrepreneurial awareness among the dwellers of Kagera basin
2. The assessed state of selected areas of Kagera river basin in terms of environmental degradation and the willingness of dwellers to undertake alternative employment
3. Type and size of households dependent on agriculture and non-agricultural activities
4. Establishment of a model entrepreneur incubator with a focus on sustainable livelihood
5. Training of trainers and farmers training in sericulture
6. Output of empirical results through monitoring the performance of model sericulture enterprises and valuation of the economic and social benefits against the social costs.
7. Assessment of the impact of entrepreneurship in sericulture on economic diversification
8. Synthesizing the value of intervention and documentation
9. Recommendations for wider application

Section D

Cluster Report

A. General Information

Title Name: Water and Natural Resources Cluster

Institution: National University of Rwanda

Team Leader: Dr Herman Musahara

Contact: Dr Herman Musahara

Dates: January 15th to 30th December 2008

B. Content of the Report

18

Executive Summary

The water and natural resource management cluster consisted of Burundi, DRC and Rwanda. The study area for Burundi was the social and environmental cost of tourism services. DRC has studied water-shed management in the Bunia, Djugu and Mahagi areas of Eastern DRC and how they affect the River Kakoi. Rwanda studied policy to reduce environmental degradation in the Nile Basin. In addition to these policy briefs have been designed and an investment programme proposed for the NELSAP.

The thrust of the cluster activities was to execute projects that were evolved from scoping studies carried out in 2007. In these 5 countries of Burundi, DRC, Egypt, Ethiopia and Rwanda environmental degradation has been identified as a common concern and threat to livelihoods and growth. A priority area in the cluster was policy which has formed the bases of studies by the three countries.

The emergence of environment as a key area of concern does not over shadow water as the central resource around which the Nile discourse is situated. It, actually brings to the fore the importance of an integrated approach that links the water to the basin and watersheds that influence the water in the Nile and that shape livelihoods of many riparians. It links Nile Basin issues more closely to the basin concerns of poverty and human development. The cluster has argued a case for 'green' water to complement the importance of the 'blue' water in the Nile water course. It has further also proposed a 'Brown Water" concept for inclusion in the protection of the environment in national concerns of countries.

The cluster has been useful in identifying key policy issues and suggesting how to work with Subsidiary Action Programmes. There is, however, a need to disseminate effectively the findings and to develop the capacities of networking in the policy analysis arena. There is a need to create a platform for socio-economic analysis even after SDBS as a project winds up its activities.

19

Cluster background

By mid 2006 the Nile Transboundary Development Network had been put in place. In the course of planning each participating institution started evolving its plan based on the framework of the SDBS and in line with documents on the project, particularly the PID and PIP. In December 2006 in the Pre PSC meeting, the PIs agreed that scoping studies be carried out in clusters. The first Water and Natural Resources Cluster included Burundi, DRC, Egypt, Ethiopia and Rwanda. The scoping studies were completed in December 2007 and converged on environmental degradation as central issue across the cluster.

The Project Steering Committee (PSC) of the Socio-Economic Development and Benefit Sharing Project met in Entebbe in December 2007 and revised the cluster groupings. The Water and Natural Resources Cluster was reconstituted consisting of Burundi PI, DRC PI and Rwanda PI as the lead institutions. However, as part of the NTDN the work of each cluster is meant to be transboundary and for use by all the PIs. Other clusters include Cross Border Trade and Food Security and Poverty Reduction.

During the December 2007 meeting a priority area for the Water and Natural Resources Cluster was identified as Policy. The research proposals for each of the cluster members was thus on policy to control one form of degradation or another. Specifically the research topics which constituted the activities for 2008 were as follows;

1. **Burundi PI**. The reduction of social and environmental costs in the Nile Basin countries resulting from trade in the tourism sector
2. **DRC PI**. The enhancement of rural livelihoods through management of Bunia, Djugu and Mahagi watershed for conservation of River Kakoi, Lake Albert and Nile Waters
3. **Rwanda PI**. Reduction of environmental degradation and sustainable resource use in the Nile Basin countries

20

Analysis

Two conceptual issues are pertinent to the relevance of the cluster theme to Nile Basin discourse and the background to the cluster theme and activities. First is the link between environment and the waters of the Nile, and the second is environment, again related to the concept of benefit sharing and cooperation. The two issues are mediated by a number of emerging concepts that deserve elaboration.

From time immemorial waters of the River Nile have been a source of livelihoods to millions of people. There are about 160 million people in the Basin and about 300 million in the riparian countries. From its upstream countries of Rwanda and Burundi to the Mediterranean Sea it covers 6700 km. It is not only one of the largest river basins in the world but also has a unique ecosystem (World Bank 2006). It is linked to high mountains, wetlands, rivers, deserts, forests, water rapids that offer hydro-power potential, lakes and savannahs. In the 20th century, especially after 1930s, there was concern that water of the Nile could be a source of conflict among the riparians. Political effort, diplomacy and international initiative have mitigated the occurrence of 'water related' conflict. Instead, since 1999, with the formation of the Nile Basin Initiative more interest is, towards cooperation among the riparians and grounding interventions in the benefit sharing concept. This cluster theme and individual projects show that the cluster theme is close to the *raison d'etre* of creating the Nile Basin Initiative.

Secondly, the cluster proposals that are being concluded are relevant to most of the countries in the basin in view of current challenges in almost all of them. A majority of the countries are some of the poorest in the world with per capita incomes of less than US$ 250. In these countries are problems of population pressure, environmental degradation and threatened ecosystem services (World Bank 2006). The problem area is deeply related to deteriorating livelihoods, diminishing water flows and energy crises. All these are challenges

to the Benefit Sharing concept elaborated below. They are issues related to watersheds, water and natural resources in all riparian countries and most especially how they interface with livelihoods.

But at the same time all urgent need for rapid growth is required for economic development and poverty reduction. An emerging sector in most countries is tourism. There is, however, in a context of sustainable development, a need to establish the cost and benefit of developing the tourist sector as developed by Burundi.

The Nile Basin Initiative is currently involving PIs from 9 countries. These are Egypt, Sudan, Ethiopia, Kenya, Uganda, Tanzania, DRC, Burundi and Rwanda. In relation to their geography and disposition to the Nile River some are upstream riparians and others are downstream riparians. However, this is the reason the over-arching theme should cater for the differing priorities in watershed, water and natural resource management. In general it is clear that the projects have been transboundary and offer lessons to the rest of the riparian countries in relation to environmental policy and control of degradation.

Burundi PI offers lessons on the **social and environmental costs of tourism** in the NBI countries. Tourist services have been shown to be poor because, first, there are low investments in the sector. The underlying cause has been identified as micro and macro level poverty. The contribution of tourism to GDP is still very low. NBI countries have to identify mechanisms of promoting investments in tourism without destroying the environment and with minimum social costs such as promotion of sex tourism.

DRC's principal activity has focused on the enhancement of the livelihood of the rural people of Bunia, Djugu and Mahagi by the integrated management of water resources and the conservation of the watershed of river Kakoi, Lake Albert and the river Nile. The focus area is in Ituri District. Despite instability in the area the PI has made visits to the area and produced a draft final report. The major issues that offer lessons to the rest of the NBI countries are degradation of the environment and its effects siltation of rivers, degradation of infrastructure and degradation and health.

Rwanda PI has completed a study on **policies to reduce environmental degradation and sustainable use of resources in Kagera River Basin.** Major findings are pervasive levels and diverse forms of degradation. Soil erosion, deforestation and water pollution are related to the fall in productivity and poverty levels. Secondly, there is a considerable effort to appreciate and mainstream environment policy. However, there is a dearth of information on sustainable and unsustainable management of resources in Kagera River basin and in Rwanda in general. Collection of evidence from the field has been used to provide information on reducing environmental degradation that has national and transboundary costs and significance. Rwanda PI proposes a comprehensive policy package which is vertically and horizontally consistent with the need to reduce degradation in the Nile. We have appropriately called it IMICHO Approach for Integration, Mainstreaming, Inclusion, Coordinating, Harmonizing and, above all, Operationalising policy on environment.

Rwanda PI as the cluster leader has produced a policy brief which is contained as Section B of this report. In it a new concept of Brown Water is advanced which links the issues of water resources management and degradation of environment, especially soil erosion. Section C of the report also outlines an investment programme for Kagera River Basin which offers an answer to the problem raised. The entrepreneurial investment programme is important in linking up the NTDN activities with SAPs.In this regard the concerned SAP is NELSAP.

The relevance of the environment is closely linked to current evolutions in the state of knowledge on tarnsboundary water management. There is a clear extension of the concept of transboundary waters from 'blue' water only, to include 'green' and 'grey' water also. But we have now proposed an extension to 'brown' water as well. Finally is the link of environment to livelihoods and poverty reduction permitted by the ecosystems' approach to environmental analysis.

21

Procedure of Cluster Plan of Action January to December 2008

	Plan	Time	Comments
1.	To facilitate proposals that will foster collaboration among PIs and strengthen the NTDN	February - May	All proposals in the cluster approved by PMU
2.	To assist PIs move at the same pace in evolving work plans	February - October	PMU has monitored the cluster twice and assisted. Rwanda in April and Burundi in October.
3.	To ensure work plans are linked to the activities of SAPs	May - October	Rwanda has developed an Investment Programme on Entrepreneurship and Sericulture
4	To know what is already available in the Basin so as to avoid proposals that duplicate activities that are already in place	February - May	1 cluster workshop in Rwanda and 1 M+E meeting in Bujumbura controlled this and facilitated info exchange
5	To facilitate forward-looking planning and ensure work plans for 2008 are well detailed and informed	February - May	PMU has tracked the progress of PIs and Cluster
6	To build capacity to influence relevant policies in the individual countries and policy in relation to watershed and water resources management	February - December	One output is a policy brief on environmental degradation

21.1 Discussion

Discussing the Water and natural resources cluster activities can be briefly put into four major points

21.1.1 Concept

The cluster has advanced the conceptual frame of mainstreaming environment in major Nile Basin socio –economic discourses. The idea has been ideal and appropriate but is certainly not an easy one. Firstly, there is still the pull towards regarding Nile issues as those dealing with water, dams and engineers, on one hand, and, on the other, politics and international cooperation and dialogue. Secondly, as environment becomes more relevant its linkage to livelihoods becomes a wide concept. Very wide that again it can lead to differences in interpretations. One tends to believe our cluster was supposed to work on pollution and water hyacinth, another thought it was to do with watershed management while the conservationists prefer national parks and the preservation of the biodiversity. Others have tended to prefer emphasis on the link to PRSPs and issues like gender.

The cluster has attempted to argue a case for 'blue" as well as 'green' water. The cluster has thus advanced the effort to have a more integrated and holistic outlook to the Nile and its link to livelihoods and benefit-sharing. Nonetheless, to bring to the fore the special problem of degradation in the environment we have made a modest attempt to introduce a 'Brown Water' concept as an early signal on the problem, and the need for a better focus on soil erosion, pollution and how they are linked to poverty in the basin

21.1.2 Composition

The first level of cluster composition is the three centers of excellence in Burundi (CURDES), DRC (UNIKIN) and Rwanda (NUR). In these and others except UNIKIN (the leader is a natural scientist) thet has been a network involving economists or, at least, policy analysts. Indeed, the crucial issue is the relevance of what is being done to poverty reduction, to the equitable distribution of benefits related to the Nile Basin.

At the stage at which the clusters have reached it needs to use the network to develop another interface with multiple disciplines within the Nile Basin organization or within their national networks. A concept like 'Brown Water' requires more advanced analysis by soil scientists and hydrologists and our proposed mitigation needs inputs of agronomists and experts in watershed management. These require closer links and synergies within the Nile Basin and in national networks, but most likely capacity building in the prime and priority areas identified. But as seen there is need to have links with experts on gender and social development to complement what economists may find out as important to issues of human development.

Another aspect of composition is related to consolidating the ownership of activities by NTDN. It would not be in the good spirit of NBI if cluster activities are useful or relevant to cluster members only. The cluster grouping was to promote efficiency and to trouble-shoot problems using effective networking. The output are for the entire network and the geographical location of the members of PI should not suggest localization of the findings.

21.1.3 Value addition

A major concern with donors and government policy makers is usually the value added of policy studies. Ironically this was the concern also of the cluster and its 'raison d'etre'.. The value addition of the cluster studies can be seen through understanding what were the major concerns and what has been the output and what will be the outcome. The latter issue is the concern of SDBS at project level. At cluster level two pointers to value addition are handy.

One is identification of the problem in the area that was prioritized. On concluding the scoping studies it was noted across the studies that a major concern was policy. In the cluster two guiding principles were devised. That is, to identify whether there is no policy so that one can be devised, or to identify an implementation strategy where a policy is present.

The second has been to look at how the works of Subsidiary Action Programmes can add towards socio economic development. The clusters and, indeed, SDBS have had the important role of looking at how benefits can be intensified or costs minimized in Nile Basin investments. SDBS has thus started a process of demystifying the concept of benefit sharing and linking it to the real needs of riparian.

21.2 Recommendation

From the analysis and discussion it is recommended that

i. A strong dissemination strategy be devised to ensure that study result are useful
ii. A basin Tool Kit be constructed for addressing environmental degradation policy issues in the Nile Basin
iii. A platform be set up on which some of the issues raised could be further pursued when the SDBD project winds up
iv. Modality of encouraging and sustaining networks of like minded scholars in the basin be created
v. The 'Brown Water' concept be studied more comprehensively as a basis of knowing more forms and dynamics of degradation of the environment and how best to reduce it in the Nile Basin
vi. Capacity building in skills of carrying out environmental degradation be studied in national countries of the NBI

22

Annexes

22.1. List of Participants to Cluster Workshop

Cluster Workshop took place in Rwanda at the National University of Rwanda from 24th to 25th July 2008. The following is a list of those who attended

S. No	Name	Institution
1	Mugabo Benon	NUR
2	Bampabwire John Bosco	NBI/SDBS
3	Esperance Mukarugwiza	NUR/SDBS
4	Dancilla Mukakampi	ARECO
5	Peter Narende	NBI/SDBS
6	Dr. Baig M.S.A	NUR/ SEG
7	Frank Habineza	NDBF - Rwanda
8	Jean Baptist Habiyaremye	NBI- Rwanda
9	Dr. Innocent Naphi	NUR/FAS
10	Mbabzi Niyibizi Justine	CCM/ NUR
11	Mugisha Fred	Director /NURCB
12	Bararuzumfa Ferdinand	CURDES-IDEC
13	Tameue Tivuneh	SDBS
14	Jean de la Croix Nkurayija	NUR/ SPAS
15	Rukundo S.	NUR/CCM
16	Mpambaza Aionce'	REMA
17	Niyingabo Gilbert	CURDES/ University of Burundi
18	Nayituriki M. Aimee'	Izuba Risashe
19	Kwibumca Eugene	The New Times
20	Habarugura Patrick	Radio Salus
21	Dr. Herman Musahara	NUR- NBI/SDBS/PI Coordinator
22	Jocelyne Mutaganda	NUR- SEG
23	Theogene Uwizeyimana	NUR-SEG

24	Corrie	NUR
25	Noille Zimulinda	NUR
26	Rose Mukakibibi	NUR
27	Prof. Lwakabamaba Silas	Rector –NUR
28	Dr. Hellen Natu	PMU –NBI/SDBS
29	Uwimana Thiery	NUR
30	Nyandwi Elias	CGIS-NUR
31	Rurangirwa David	RDG/NUR
32	Akuzwe Christine	RIEPA
33	Birasa Nymulinda	NUR
34	Dr. Jonas Barayandema	NUR
35	Dr. AM.Jose	NUR
36	Prof. Gasogo Anastase	NUR
37	Dr. Martin Mugenzi	NUR
38	Ngabonziza J Bosco	NUR
39	Mutabazi Jean Pierre	NUR
40	Tumayini Emmanneul	NUR
41	Kaijakirwa Odilo	NUR
42	Byukusenge Claude	NUR
43	Kibibi Fred	NUR
44	Furah William	NUR
45	Karegeya Geoffrey	NUR
46	Kabenga Innocent	NELSAP
47	James Sano	Kitabi Training Center
48	Jackson Rwambuja	NUR

22.2 Field Instruments

Enumerator administered Questionnaires

1. HOUSEHOLD QUESTIONNAIRE FOR KAGERA MARSHLAND

QUESTIONNAIRE NO: .....

NAME OF THE ENUMERATOR……...……

I. LOCATION INFORMATION

DISTRICT: ..... SECTOR: .....

CELL: ..... HOUSEHOLD NO: .....

I I. PERSONAL INFORMATION

Head of household

1. Gender (01) Male ☐

(02) Female ☐

2. Date of birth .....(age): .....

3. Level of education attained.

(01) None..... (02) Primary……....…

(03) Secondary……... (04) Post Secondary…….

4. What is the size of your family?

(01) Children	
(02) Adults	
(03) Total	

5. What is your source of income?

(01) Agriculture

(02) Livestock keeping

(03) Salaried employment

(04) Business

(05) Others(Specify)

III. Income activities and other benefits from the wetland before its exploitation

6. Is your farm located in the Kagera marshland?

(01) yes ..... (02) No ...……

7. What is the approximate size of your farm?……..

8. When did you start cultivating in the marshland?……

9. Before marshland started being exploited, were you using it for:

Code	Attribute	Quantity /year
	Grazing	How many cows…….
	Basket making materials	Number of baskets ……...
	Water used at home	
	Clay for pot making	Number of pots……...
	fishing	Quantity of fish……
	Construction materials (Specify)	
	Other	

10. What was the approximate annual income (Rwandan francs) earned from activities carried out in Marshland?

Ranging from:

1000 and 5000

5100 and 10 000

10 100 and 15 000

15 100 and 20 000

Above 20 000

IV. Income activities and other benefits from the marshland after its exploitation.

11. What crops do you cultivate in marshland?

Code	Crop	Kg/year
(01)	Beans	
(02)	Sweet Potatoes	
(03)	Irish potatoes	
(04)	Maize	
(05)	Rice	
	Vegetables (specify)	
	Soya	
	Sorghum	
	Other (specify)	

12. Do you keep any animals?

(01) ….Yes (02)…..No

13. How do you feed them?

Zero grazing using grass from the marshland

Pasture out side marshland.

14. Have you experienced any floods?

(01) Yes…….. (02) No……

15. What were the damages suffered during the floods?

Code	Damages on:	Quantity
(01)	Houses destroyed …….	
(02)	Crops destroyed……..	
	Animals dead……..	
	People dead……..	
	Roads destroyed……..	
	Other (specify) ……..	

16. After Kagera was exploited, did any river which was used by the villagers dry up?

(01) Yes…… (02) No ……

17. Compared to the new river where you fetch water, did the walking distance from the river increase or decrease?

Code	Distance	By how much? Hours or Km
(01)	Increased	
(02)	Decreased	
(03)	The same distance	

Interview guide: Local authorities, Health center managers

1. If there is no mismatch between population size and land available (in Kagera valley)
2. If the local authorities sensitize the population on land use and environment protection
3. Health issue: whether there are illnesses related to use of water from the river
4. Education: whether children are sensitized on environment protection; if they all go to school or some of them dropped out to collect grass for the cattle
5. Drop out ratio
6. Gender, youth and environment:

    - How many women /children heading families have land in the valley
    - If they use natural resources from the valley
    - How women benefit from the river
    - If they are trained in environment protection
    - What kind of activities they can do apart from farming in the valley to reduce their dependency on the marshland

22.3 Check List for Data collection from the Local Authorities

1. Demographic details of the unit (District, Umurenge, Sector) : Population, Sex, Education, Occupation, religion other details
2. Population by income levels
3. Youth development activities
4. Gender-related specialties
5. Health facilities: water-bound diseases, malaria and other contagious ailments etc.,
6. Housing conditions

7. Access to electricity
8. Other energy sources: firewood, charcoal etc.,
9. Education: primary and secondary schools, colleges, training institutes etc.,
10. Cultural resources
11. Religion activities: Churches and/ or mosques
12. Agriculture: land under cultivation by size, crop and season
13. Non- agricultural services : hotels, restaurants , saloons, kiosks
14. Irrigation projects around
15. Marshlands
16. Water resources (lakes, streams, falls etc.,)
17. Industries
18. Handicraft units
19. Single "own account" enterprises
20. Pollution record
21. Roads: type, length, origsin and destinations
22. Means of transport: ORTPN buses, microbuses, bicycles, boats, trucks, tractors
23. Market days : commodities traded, coverage of area,
24. Cross-border trade details
25. Export-oriented production
26. Storage details
27. Money lending in the area
28. District/Sectors development plans