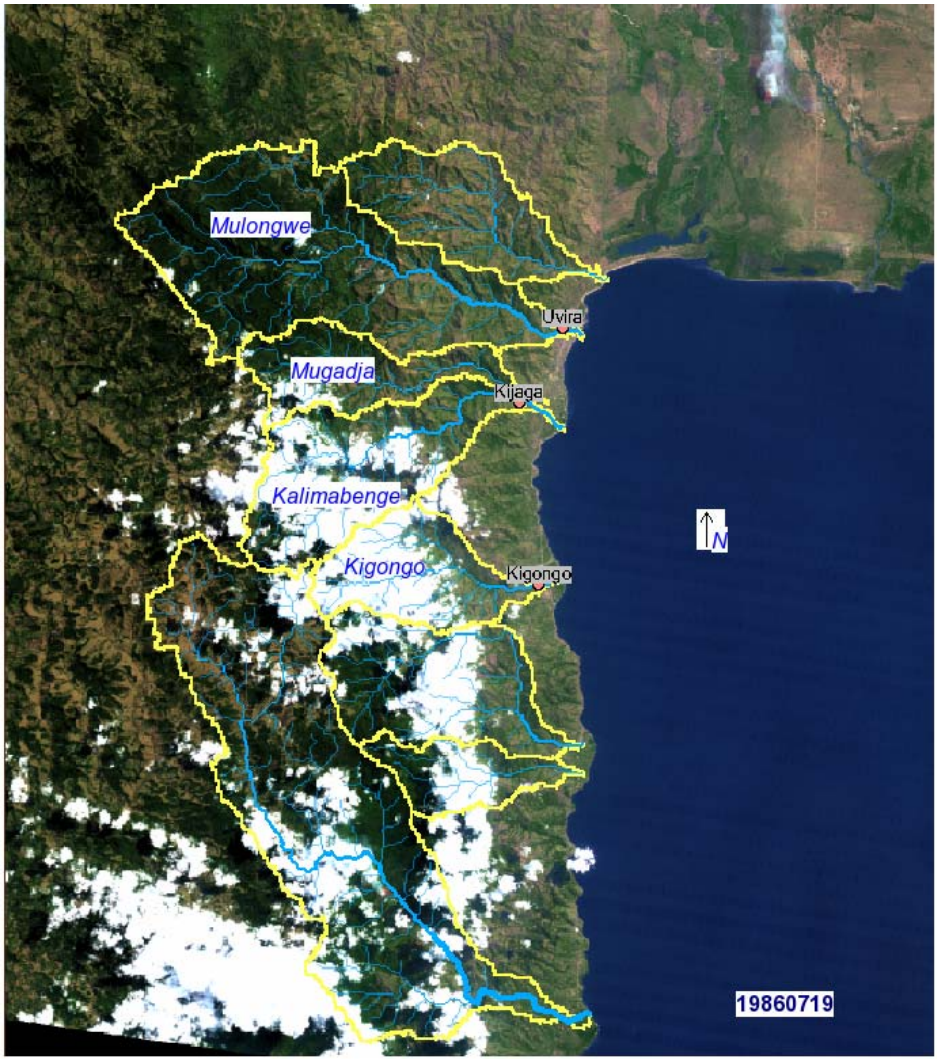
Workshop Report



UNDP GEF Project on Lake Tanganyika: DRC Erosion Risk Mapping and Site Selection Workshops, Uvira, Democratic Republic of The Congo, December 2010

World Agroforestry Centre (ICRAF)

ACRONYMS

ADB	African Development Bank
ATK	Agro-ecological ToolKit
CD	Compact Disc
CGIAR	Consultative Group on International Agricultural Research
CIP	International Potato Centre
DRC	Democratic Republic of Congo
DVD	Digital Video Disk
FPCT	Free Pentecostal Church of Tanzania
GIS	Geographic Information System
GEF	Global Environment Facility
GPS	Global Positioning System
GRP	Global Research Project
ICRAF	World Agroforestry Centre (International Centre for Research in Agroforestry)
INRM	Integrated Natural Resource Management
LTA	Lake Tanganyika Authority
LTB	Lake Tanganyika Basin
LTBP	Lake Tanganyika Biodiversity Project
LTMC	Lake Tanganyika Ministerial Committee
LTRIMP	Lake Tanganyika Integrated Management and Development Programme
MATEP	Msambara Agricultural Training and Empowerment Project
MCE	Multi Criteria Evaluation
MODIS	Moderate Resolution Image Spectrometer
MSc	Masters of Science
NAFORMA	National Forestry Resources Monitoring and Assessment
NCU	National Coordination Unit
NDF	Nordic Development Fund
NDVI	Normalised Difference Vegetation Index
NGO	Non-governmental Organisation
NPSC	National Project Steering Committee
PCU	Project Coordination Unit
PES	Payment for Environmental Services
PRESA	Pro-Poor Rewards for Environmental Services in Africa
PMU	Project Management Unit
RS	Remote Sensing
SRTM	Shuttle Radar Topography Mission
UNDP	United Nations Development Programme
USB	Universal Series Bus
VCDC	Village Conservation Development Committee

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1. EXECUTIVE SUMMARY

This Report summarises the proceedings and discussions arising from field site inventories, spatial analysis using GIS and from workshops held in Uvira by ICRAF and WWF and Congolese partners in sustainable land management.

The main goal of the Lake Tanganyika Integrated Management Project is to ensure that Lake Tanganyika and its catchment are protected and biodiversity in the basin is conserved through sustainable use of natural resources. The project is carried out simultaneously in the four riparian countries bordering the lake; Burundi, Democratic Republic of the Congo (DRC), Tanzania and Zambia. One part of ICRAF's (World Agroforestry Centre) role in the project is to assist in providing advice and training on catchment management and sediment control in the Lake Tanganyika Basin.

Based on field inventories, publicly available satellite imagery and other spatial data ICRAF and WWF selected 3 preliminary field and intervention sites in Uvira District, DRC, during a technical workshop held in Uvira, DRC, 1st - 2nd September 2010 (A list of participants is attached as Annex 1). The three sites selected for effective demonstration of effective agroforestry and related interventions to reduce sediment transport are: Kigongo sub-catchment (Kigongo village); Kalimabenge sub-catchment (Kijaga village); and Mulongwe sub-catchment (Uvira town).

These sites were selected based on high erosion rates, wide-spread deforestation, accessibility, and the potential for successful interventions. The sites were presented at the Inception Workshop for the DRC component of the Lake Tanganyika Project, held in Uvira, DRC 2nd November, 2010. A full site characterization was then later presented as part of the national site characterization workshop held in Uvira, DRC, 6th - 10th December, 2010.

2. INTRODUCTION

Lake Tanganyika is a globally significant hotspot of freshwater biodiversity, harboring more than 1500 species of plants and animals, of which over 600 are endemic to the Tanganyika Basin. The lake contains almost 17% of the world's surface freshwater and serves as an irreplaceable source of clean water, transportation, and economic opportunities for an estimated 10 million people in its riparian countries. The Lake Tanganyika ecosystem and its economically important resources are increasingly threatened by environmental problems including pollution, unsustainable fishing, degradation of natural habitats and climate change effects. One of the most pervasive environmental problems is sedimentation related to unsustainable agricultural practices and watershed deforestation. Efforts to monitor deforestation-related sedimentation and improve catchment management in the Lake Tanganyika basin have thus far been very limited.

On behalf of its partners, UNDP/GEF invited ICRAF (The World Agroforestry Centre) to assist in providing advice and training through a series of workshops on sustainable catchment management and sediment control in the Lake Tanganyika catchment basin, in the framework of the UNDP/GEF Project on Partnership Interventions for the Implementation of the Strategic Action Programme for Lake Tanganyika (hereafter referred to as UNDP/GEF Project on Lake Tanganyika).

3. PROCEEDINGS AND ANALYSIS

3.1 The Lake Tanganyika Basin

Lake Tanganyika has a surface area of 32 700 square kilometers. The lake basin is 7 times as large as the large, or about 240 000 square kilometers. Approximately 2/3 of the basin falls within Tanzania, with the Democratic Republic of the Congo having the second largest share of 16 % of the basin:

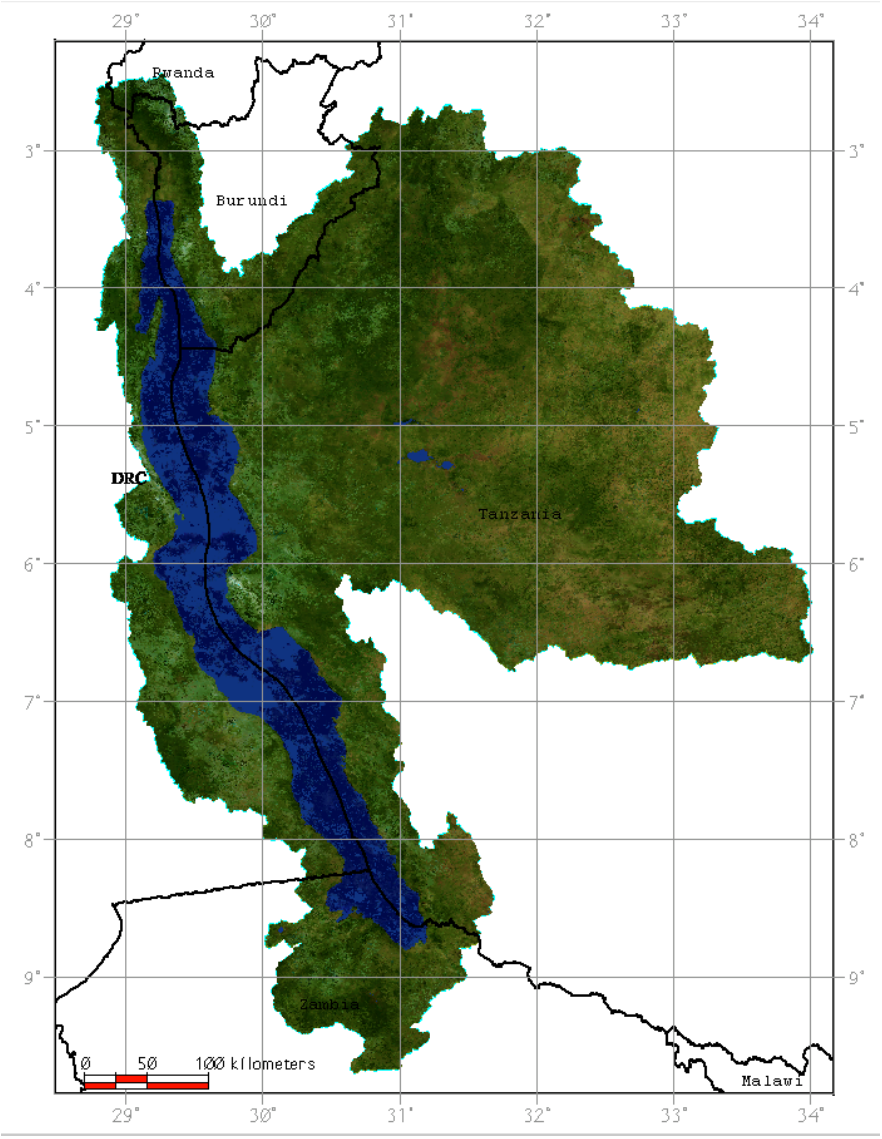

Figure 1. Lake Tanganyika and its Basin. Backdrop image shows average vegetation density for the period 2000 to 2009 as recorded by the MODIS sensor.

Vegetation types and land cover in the Lake Tanganyika Basin is a reflection of the rainfall gradient (figure 2). The northeastern part of the basin (Burundi, DR Congo) receives more rainfall and is naturally dominated by forests. Towards the eastern and south-eastern parts of the basin the conditions are drier, and the forests give way first to woodlands and then to savannah landscapes. Also the population density is related to the rainfall pattern, with higher population densities in the northeast. Large parts of the Lake Tanganyika Basin in Tanzania and Zambia are flat, but closer to the lake the terrain is usually rugged. The western shore of Lake Tanganyika follows the East African Rift Valley and the terrain is mountainous with very steep slopes.

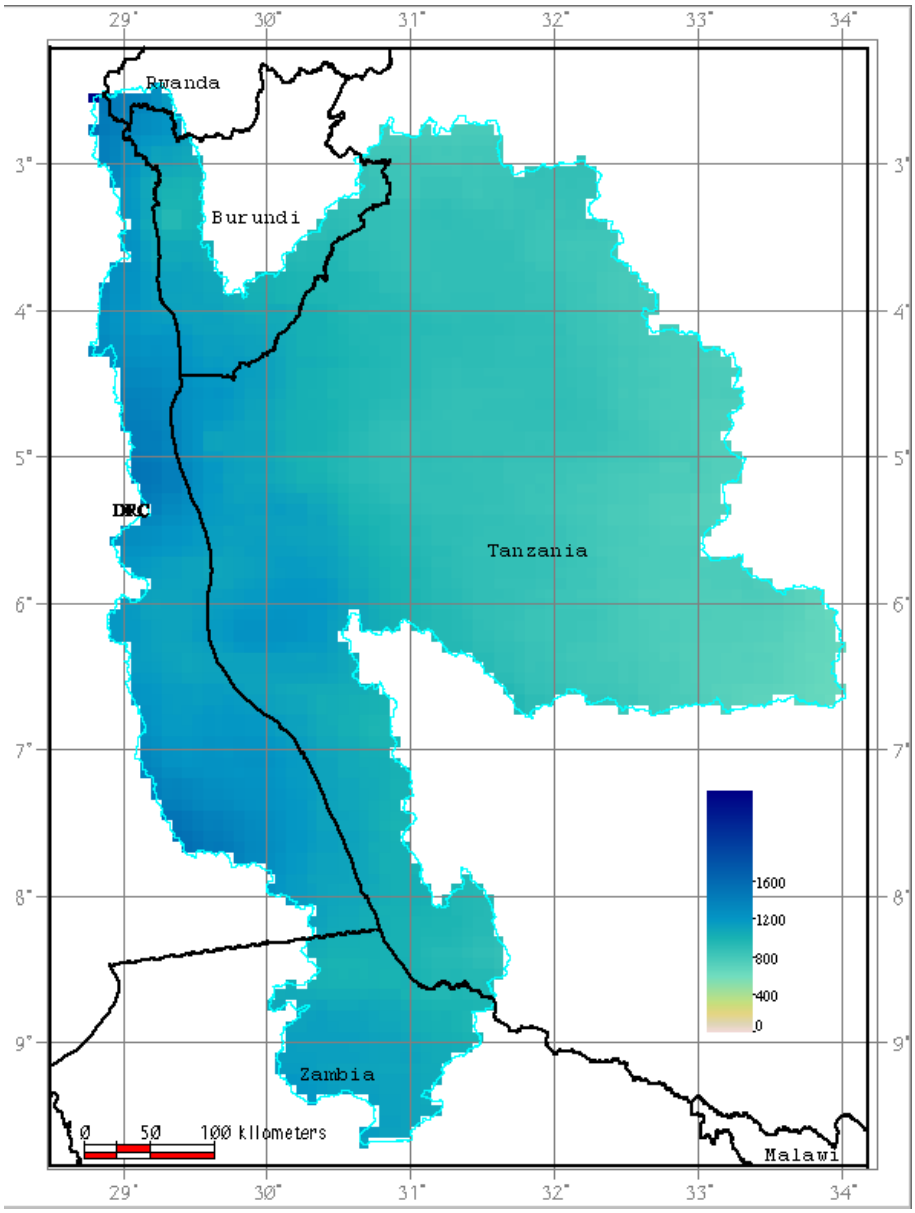

Figure 2. Average rainfall over Lake Tanganyika and its Basin for the period 1995 to 2009.

3.2 Regional Identification of Land Degradation

Preliminary studies using time series of moderate to low resolution satellite imagery point at loss of vegetation cover around the Rusizi River and adjacent areas in the northern basin as one likely major source of erosion and sedimentation to Lake Tanganyika (Figure 3). The analysis included two sets of satellite image sources: NOAA-AVHRR normalized difference Vegetation Indexes (NDVI) for each 10-days over the period 1982 to 2009; and MODIS Enhanced Vegetation Index (EVI) for each 16-days over the period 2001 to 2009.

Both time series were analyzed for the stability in vegetation production (Coefficient of Variation), and were also normalized for inter-annual variations in rainfall (see Appendix 1 for details). The map presented in figure 3 shows areas within the Lake Tanganyika Basin where all indexes show a negative trend. As is evident, large parts of the Rusizi River basin, draining the northern section of the Lake Basin, is identified as a land degradation hotspot area.

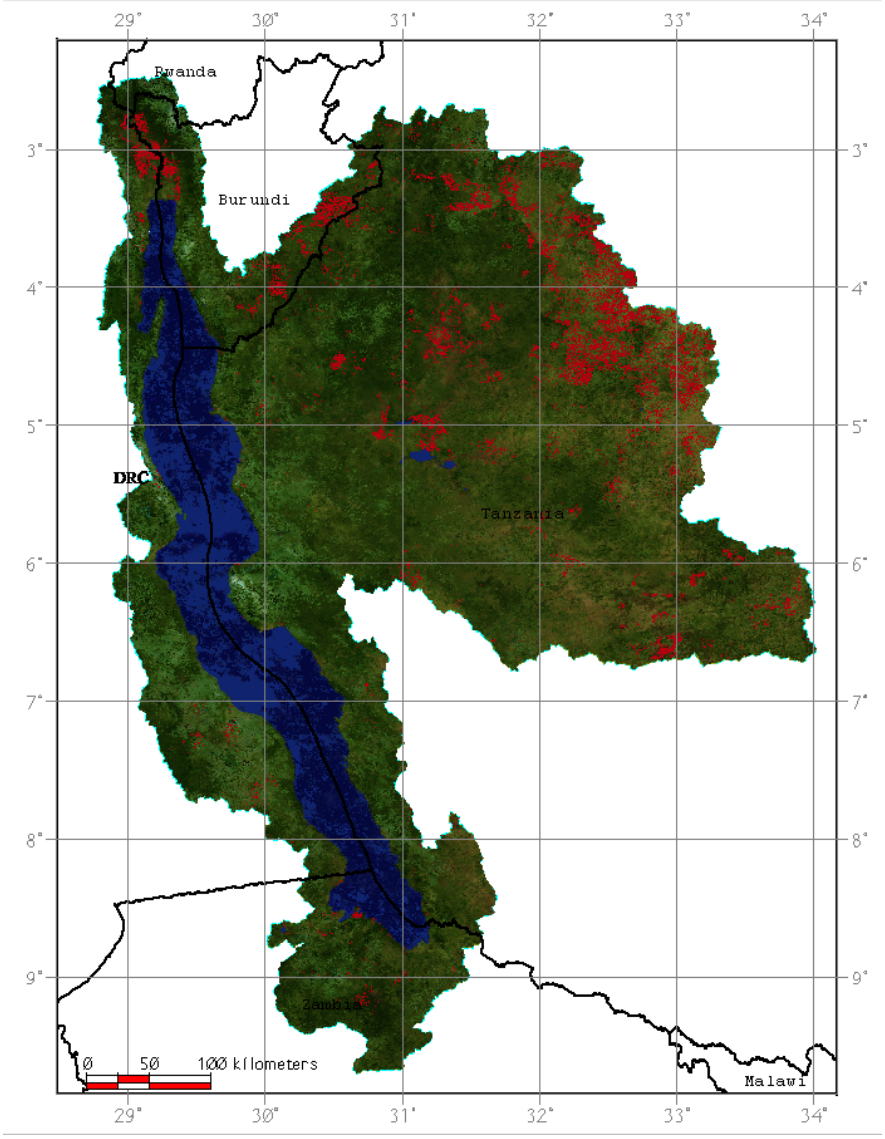

Figure 3. Hotspot areas of vegetation loss in the Lake Tanganyika Basin.

The red areas of Figure 3 are those which have shown a significant negative trend in vegetation production over the period 1995 to 2009 (after adjustment for variations in rainfall) and a large inter-annual variation in vegetation production. Backdrop image shows average vegetation density for the period 2000 to 2009.

The growth of the Rusizi Delta in Lake Tanganyika as recorded in high resolution satellite imagery (Landsat) indicating that the sediment load on the lake is high from the Rusizi River (Figure 4).

Figure 4. Growth of the Rusizi River Delta on the northern shores of Lake Tanganyika between 1986 (left) and 2000 (right).

Several factors are contributing towards the increased erosion susceptibility in the northern section of the Lake Tanganyika Basin (falling within DR Congo and Burundi), exacerbating the decline in vegetation cover. The rainfall is higher, the hills are steeper, population pressure is higher, and the use of fire as a soil management method is widespread. Figure 5 shows the upper catchment of the Rusizi River (a) and the Rusizi River and its plain (b). Figure 6 illustrates the wide spread use of fire (a) and the steep slopes reaching the lake shores (b).

a) b)

Figure 5. Aerial photo of the Rusizi River and its catchment, a) the upper mountainous part of the basin, and b) the Rusizi River meandering through the Rusizi Plain.

a) b)

Figure 6. Illustration of agricultural management practices and vegetation cover around Uvira, DRC; a) the use of fire is widespread as a practice, and b) photo taken from one of the few remaining forests showing the almost barren steep slopes and Lake Tanganyika in the background.

3.3 Selecting Sub-catchments in Uvira District

The focus area of the Lake Tanganyika project in DR Congo is Uvira, situated at the lake shore of the northern tip of Lake Tanganyika west of the Rusizi River Plain. The Lake shore is a narrow strip of land, seldom exceeding 1 km in width, followed by a steep rise in the terrain. The average slope is about 30 % and the watersheds draining into Lake Tanganyika are steep and small. The larger of these watersheds are just above 100 square kilometers in size. Some of the them form permanent rivers, but most of them give rise to ephemeral rivers.

Both Uvira town and the adjacent villages are more or less confined to the shore-line strip, with only a few scattered dwellings (mainly herders) further up the slopes. Cassava is the predominant crop, and fire is the prevailing management method used (Figure 6a). There is no natural vegetation left, apart from small encroached forests of insignificant size and importance. Tree cover is minimal in the entire area. Some few areas adjacent to the lake shore on the outskirts of the towns and villages have woodlots of mainly *Eucalyptus* spp. and *Senna siamea*. Remnants of natural vegetation were also found across this range. On visiting one of the "pristine" forests reported remaining, it was discovered that it is also heavily degraded, mainly as a result of uncontrolled fires passing through the understorey.

Fire is by far the greatest challenge facing vegetation cover in the area, and it appears to be the major practice used in farming preparation. Traces of fires were found in most areas, affecting even the planted woodlots. Tree plantations are frequently destroyed through fires getting out of control; this is a strong barrier to be overcome if introducing trees and agroforestry systems in this landscape. Other reasons for frequent fires were cited to be grazing and arsonists.

3.4 Local Identification of Land Degradation

Using a hand held GPS and a digital camera key field sites were recorded during a one day excursion, including a climb to one of the few remaining natural forests in the district. Using the tracks and waypoint derived from the GPS, initial maps of land cover and hydrography were generated (Figure 7). The hydrography was generated by using a Digital Elevation Model based on the Shuttle Radar Topography Mission (SRTM) data. The SRTM data was first corrected, and then used to determine sub-watershed boundaries and stream flow paths (rivers). The derived hydrographic map had much better resemblance to the field collected GPS data, compared to existing digital maps available over Uvira district.

All publicly available Landsat images covering the northeastern shores of Lake Tanganyika were downloaded from the internet. The images were then precision corrected both geometrically and radiometrically. Image pairs with anniversary dates were identified to allow a pair-wise comparison of changes in vegetation and land cover. The Uvira area is however frequently covered by clouds, and no cloud free suitable image pair could be identified. Apart from being cloudy, the non/cloudy parts of the satellite images are hazy, making it very difficult to reveal ground conditions without access to atmospheric data. As such data is presently unavailable for Uvira, the image analysis had to be restricted to visual interpretations (Figure 7).

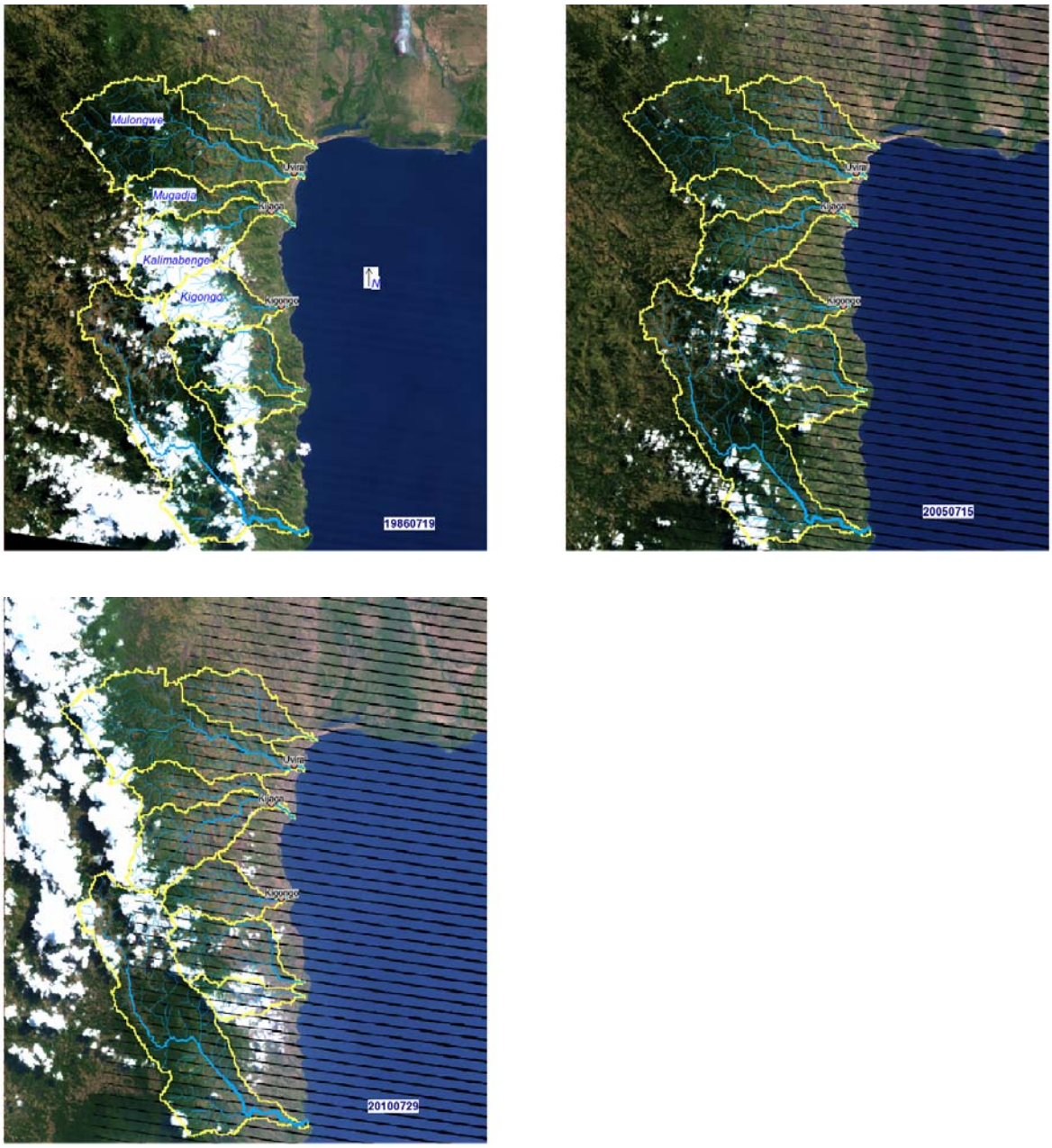

Figure 7 Time-series of Landsat satellite imagery over the sub-catchments draining the northwestern section of the Lake Tanganyika Basin (Uvira, DRC).

The cloud cover and haziness prevents a proper interpretation on the images, Landsat images acquired after 2003 are plagued by scan line errors in the sensor. The 1986 image (top left) shows the sub-catchments selected for interventions, and the position on villages involved in the project (cf. table 1).

During a meeting in Uvira on September 2nd, the selection of sub-catchments and village to use for field work and interventions was discussed. A list of key-factors were considered for selecting field and interventions sites:

- high sediment load
- accessibility
- forest cover
- potential for interventions
- administrative and political boundaries
- hydrology and topography

Based on the above criteria, the meeting concluded choosing three project sites: the sub-catchments of Kigongo, Kalimabenge-Mugudja and Mulongwe rivers (table 1, figures 8 & 9). The choice of these sites took into consideration their contribution to the lake sedimentation and areas that need intervention.

Table 1. Sub-catchments and towns/villages chosen as intervention sites.

Sub-catchment	Mulongwe	Kalimabenge-Mugudja	Kigongo
Village (Name)	Uvira	Kijaga	Kigongo
Area (km2)	113	93	38
Permanent (Y/N)	Y	Y	N

Figure 8. Sub-catchment and villages chosen for interventions ; a) Kigongo River at Kigongo village (photo by Jules Bayala), and b) Kalimabenge River at Kijaga village.

Figure 9. Mulongwe River at the market place just upstream of Uvira town. 360 degree panorama.

3.5 Site Characterisation and Data Needs

The selection of the three intervention sites (sub-catchments) were presented at the national inception workshop for the DRC component of the Lake Tanganyika Project held in Uvira, DRC on the 2nd November, 2010. During this inception workshop the materials available to WWF and ICRAF, and the methods used to identify interventions and erosions risk sites, were presented[1]. The lack of consistent climate and river flow data was highlighted. The actual site characterization will be carried during a national characterization workshop to be held in Uvira, DRC between December 6th - 10th 2010.

[1] Annex 2 Gives a copy of this presentation, Annex 3 a report on the Inception Workshop overall

ANNEX 1 – List of Participants

ANNEX 2 –Presentation on Erosion Risk Mapping and Site Selection

ANNEX 3 – ICRAF Report on DRC Inception Workshop