The conservation of aquatic and terrestrial biodiversity around Lake Victoria, Sango-bay region- Rakai district, Uganda

A Report submitted to Rufford Small Grants Foundation

By

Uganda project team

November 2007

ABBREVIATIONS

CBEWs:	Community Based Extension Workers
EIA:	Environmental Impact Assessment
GEF:	Global Environmental Facility
IRUCODI:	Integrated Rural Community Development Initiative
NEMA:	National Environment Management Authority
RSG:	Rufford Small Grants

DEFINITION OF KEY TERMS

Biodiversity: This is defined as the total variety of life on earth.

Conservation: The management of human use of the biosphere so that it may yield the greatest sustainable benefits to present generations, while maintaining its potential to meet the need and aspirations of future generation.

Participatory participation: Empowering people to mobilize their own capacities, be social actors rather than passive subjects, manage the resources, make decisions and control the acts that affect their lives. It involves people directly and actively in all stages of the management and decision-making process.

Sustainable development: Defined, as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development which conserves land, water, plant and animal genetic resources, is considered environmentally friendly and non-degrading, technically appropriate, economically viable and socially acceptable.

Ecosystem: An ecosystem is a system whose members benefit from each other's participation via symbiotic relationships (positive sum relationships). It is a term that originated from biology, and refers to self-sustaining systems.

Project summary

High human population densities and a reliance on subsistence agriculture are reflected in the heavy dependency of the neighboring community, on the Sango bay ecosystems. In particular, wetlands have been drained for sugarcane and food crop production, forests have been encroached on in search of more agricultural and settlement land, poor land management in form of bush burning, over cultivation and grazing continue to characterize the Sango bay area. This has had enormous impacts on the ecosystem in the area along with all that it represents, sustains or is sustained by. Human induced degradation is evident in the Sango bay region with little or no attempts of Human improvement. It is therefore not farfetched, to suggest that the Sango bay region continues to undergo serious environmental degradation that calls for immediate intervention. Emphasis must be centered on increasing communities' participation in planning and implementations of programmes aimed at conserving natural resources in their area to ensure sustainability and effectiveness of such programmes. This work emanates from research field work activities undertaken in the Sango bay area by a project team, supported by the Rufford Small Grant (RSG) Foundation.

This report, documents achievements by RSG funded project team in Uganda on planned activities in the Sango bay region over a period of 10 months, January to November 2007. The project was however planned to cover six months and the following activities were performed: (1) participatory action planning meetings, (2) community awareness and sensitisation on wetland/aquatic and terrestrial biodiversity values as well as the functions of the general environmental management, (3) Trainings in, participatory planning, monitoring and evaluation, project prioritisation, environmental management, environmental enrichment, natural resource management, biodiversity conservation, improved crop and livestock production, were done to build stakeholder capacity, (4) seedlings were developed in nurseries and were distributed to the selected individuals. This report covers 90% of the activity achievements. The proposed 3000 trees could not be achieved, as was projected in the activity plan, due to shortfalls resulting from inadequacy of the funds; therefore only 1500 seedlings were raised and supplied to the selected persons by the local council chairperson. Some of the areas have already raised healthy trees (Figure 10). Work was undertaken in a participatory manner, involving groups and communities, local leaders at various levels, key informants, opinion leaders and conservation organisations in the area.

1.0 Background

1.1 Setting and population

Sango-bay region is found in Rakai district, which is located in South-western Uganda (Figure 1). It has a population of 500, 501 (National census 2004) and is one of the least densely populated in the country. Rakai relies heavily on its natural resource base that includes forests, lakes, wetlands, rangelands and arable land. Agriculture is by far the main economic activity, and the main occupation of over 80 percent of the working population. Majority of the farmers are smallholders, who rely on domestic labour, traditional techniques and implements. Production is predominantly subsistence, with surplus produce sold for cash. Livestock production is the second most important economic activity. Communal grazing and pastoralist are still the dominant techniques of animal husbandry, particularly for cattle and other small ruminants such as goats and sheep. There are opportunities for non-farm development in fishing, and perhaps in minerals. The District appears to have experienced some recent agricultural income growth, but much less than in the main cash cropping areas further to the southwest. There has been considerable growth in the District's towns during recent but the vast majority of Rakai people live in scattered small farmsteads.

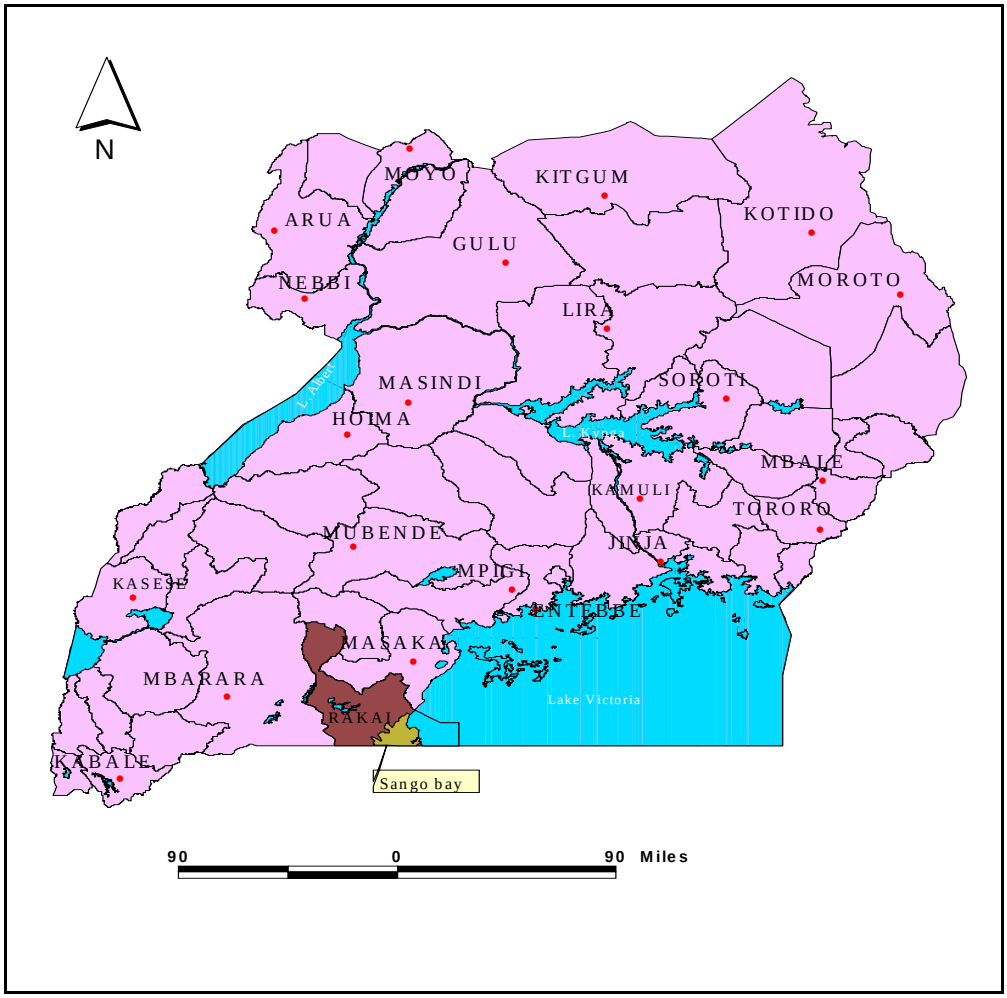


Figure 1: Sango bay in Rakai district

1.1.2 Site description

The Sango Bay area, north of the Uganda–Tanzania border, adjoins the Lake Nabugabo area to the north. The main road between Masaka and Mutukula at the Tanzanian border marks its western limit; its eastern limit is the Lake Victoria shoreline. It has a total area of 54000 hectares; central coordinates $31^0$35' East $0^0$55' South.

1.1.3 Biodiversity richness in the Sango bay area

There are grasslands, open water, forests and wetlands. Wetlands constitute approximately over 80% of the total area (Figure 2). In total, the forests within this site cover 15,000 ha. There are five Forest Reserves: Kaiso, Tero East and West, Namalala and Malabigambo (Figure 3). All are of a rather homogeneous nature, broadly classified as swamp-forest, formerly important for its *Podocarpus* timber species, most of which have been logged out over the past 100 years. The canopy is generally lower than that of medium-altitude mixed evergreen forest, although many of the component species are the same. The area is considered of biogeographic interest because it lies in the transition between the East and West African vegetation zones. There is evidence that the area was a Pleistocene refugium. The Malabigambo Forest is contiguous with Minziro Forest of neighbouring Tanzania. The site also contains a mosaic of wetland types, including permanent and seasonal swamp-forests, papyrus *Cyperus papyrus* swamps, herbaceous swamps interspersed with palms, and seasonally flooded grasslands. The Sango Bay wetlands are extensive, stretching along the shores of Lake Victoria from Kyabasimba in the south to Malembo in the north. In areas such as Kyabasimba, the shoreline is varied, with sandy shores, rocky shores, forested shores and a fishing village. The shoreline of the bay itself is fringed by papyrus, merging into the extensive flood-plains of the Bukora river delta. The bay is relatively unsheltered and experiences serious wave action. As a result, there is little fringing water-hyacinth *Eichhornia*, unlike bays in the Entebbe area. At Sango Bay itself, there is a small fish-landing site and an old disused pier, whose structures are important roosts for birds. At the mouth of the River Kagera, the shore is relatively exposed, with mainly sandy shores merging into papyrus swamp. The deposition of silt carried by Kagera river (Figure 3) has led to the creation of a wide shallow belt with a sandbar at the river mouth.

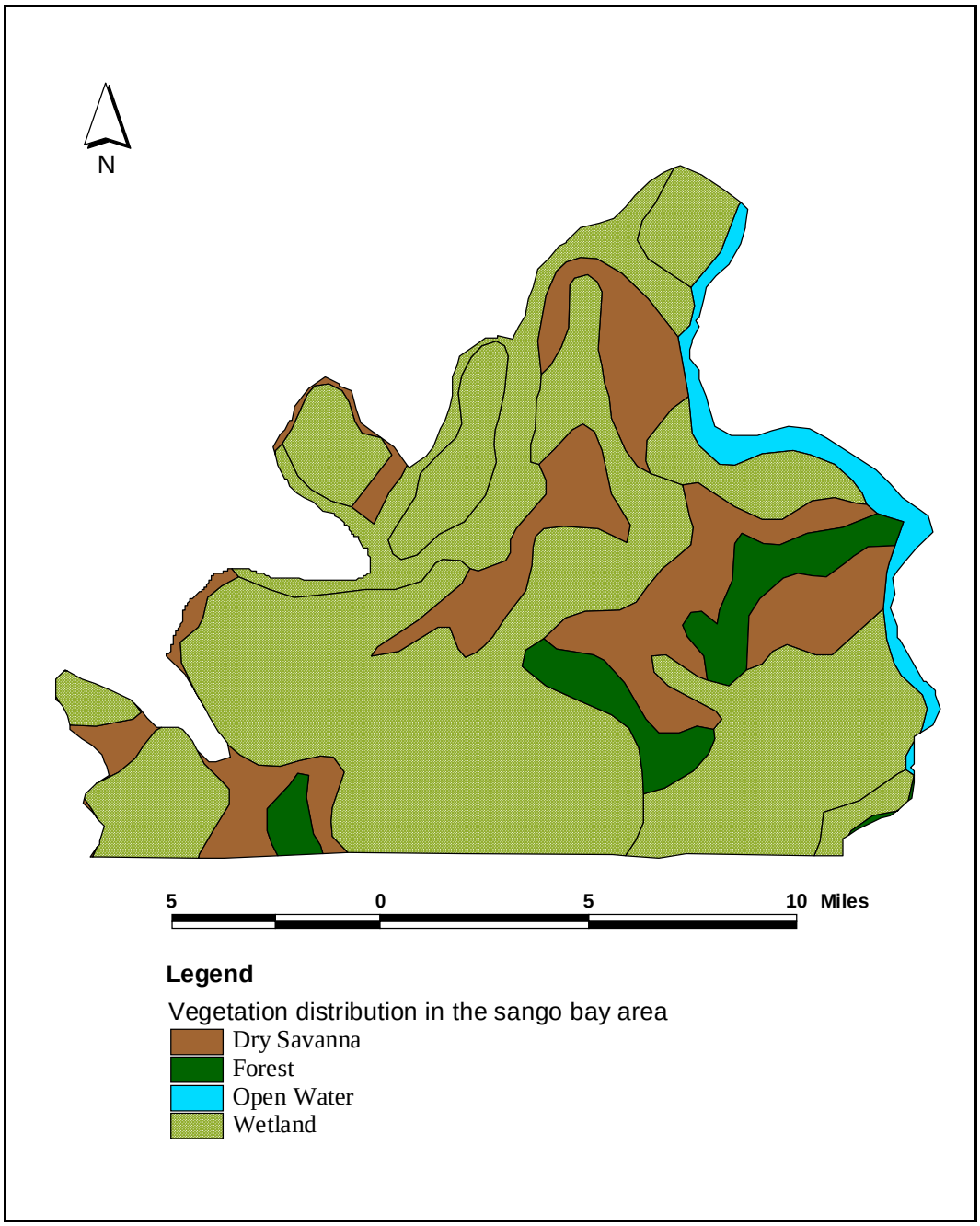


Figure 2: Biodiversity distribution in the Sango bay area

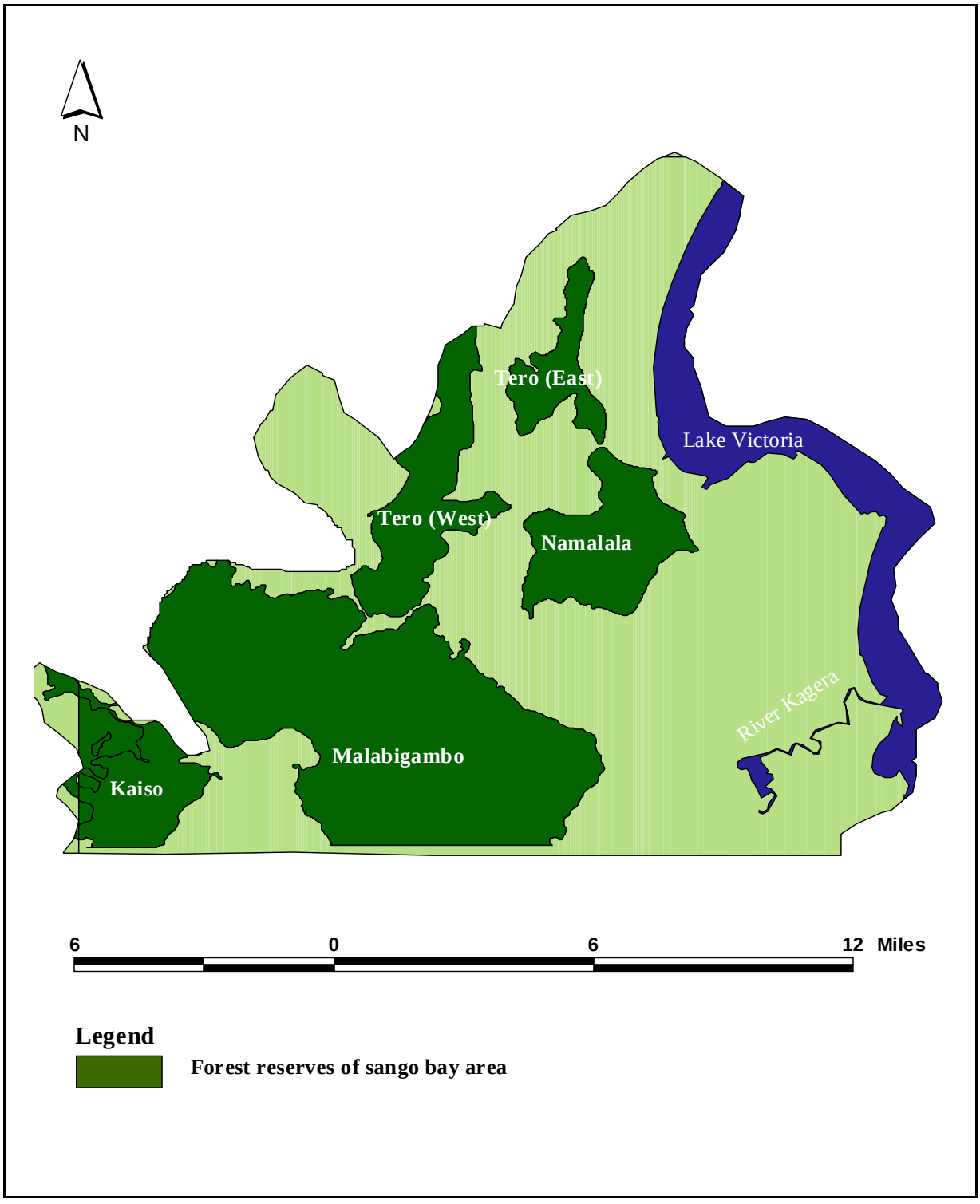


Figure 3: Forest reserves of the Sango bay area

1.1.4 Level of degradation

Natural resource degradation (or land degradation) is defined as 'any form of deterioration of the natural potential of land resources that affect integrity either in terms of reducing its sustainable ecological productivity or in terms of its native biological richness and maintenance of resilience' (GEF, 199). A GEF's degradation equation, adopted for this study, is presented below:

NetDn = (NatDn+HDn) – (NR+HI)
Where:
NetDn = Net degradation
NatDn = natural degradation
HDn = Human induced degradation
NR = Natural recovery
HI = Human improvement

GEF (1999) emphasizes that land degradation is as a result of two initial forces (NatDn and HDn in equation above) that comprise climatic change and socio-economic factors. More of the HDn than the NatDn factors have been at play in the Sango bay area probably over long periods of time and recent studies show that changes have been especially rapid in the last 50 years.

1.2 Objectives of the Project

1.2.1 General Objective

To promote, with the communities and local leaders at all levels, the conservation of aquatic and terrestrial biodiversity around Lake Victoria, Sango-bay region in Rakai district.

1.2.2 Specific objectives

- Undertaking participatory action planning meetings.
- Sensitising communities on wetland/aquatic and terrestrial biodiversity values.
- Training communities in participatory planning tools.
- Enhancing plant diversity through planting trees.

1.3 Justification of the Project

Unrelentingly, human beings have steadily reduced the natural environment and the biodiversity it contains. Population growth translates in increased demand for food, which traditionally entails opening more land. Ninety percent of the land surface has been disturbed to some extent, and five percent is burned annually. Tropical rainforests, believed to contain a majority of the species on earth, are being destroyed at the rate of 1.8% per year, twice the rate ten years ago. Global fishing interests are rapidly depleting the oceans of most of the commercially valuable species. This in turn, is affecting other species that depends on the fish such as sea birds and other aquatic organisms. This destruction of natural habitats translates into a phenomenal loss of biological diversity.

In Uganda, the proximate sources of biodiversity loss are habitant destruction and modification. In some cases, this is direct and deliberate, as with clearing for human settlement and agriculture while destruction in other cases is indirect and unintended, as with the consequences of

pastoralism, pollution, or introduction of alien species. The joint effect of human numbers and human behaviour in relation to the relevant natural environment account for not only immense loss of biological diversity but also economic impact of about 4% to 12% of the national GNP lost as a result of environmental degradation (Slade and Weitz 1991: NEMA 2001). As if this is not enough, land degradation is one of the fundamental issues confronting efforts to increase agricultural production, reduce poverty and alleviate food insecurity (Kisamba Mugerwa, 2001)

The project aimed at contributing to answering the big question of what can be done to conserve our biological diversity. Education, awareness, increased participation of local communities, information dissemination to make and adopt policies that promote conservation, strengthening institutions that promote conservation of natural resources and enhancing plant diversity are considered very important for this RSG funded project in the Sango bay area. The timing of RSG funded conservation project in the Sango bay area is therefore timely and will go a long way in contributing towards efforts aimed at conserving critical ecosystem in the area through a number of activities.

1.4 Themes

1. Local knowledge on impact of land use and management practices (deforestation, burning, over-cultivation, over-grazing, drainage of swamps, habitat destruction among etc) on water flow in rivers, water sources, soil fertility decline, soil organic matter, risk of erosion, micro climate, pest control and pollination.

2. Knowledge on awareness on biodiversity: Endemic species, medicinal plants, association of natural resources and pollinators, pests, diseases (beneficial vs non beneficial diversity).

3. Past, present and future endangered and disappearing species. Currently used, vs. historical use of agricultural crops, livestock and wild species of plants, animals, insects etc.

4. New crop cultivars/varieties. Their effects on local varieties/species, on food security/well being (poor or better).

5. Wild alternatives to locally available products. Loss of wild species for food and nutrition (fruits, nuts, roots, herbs, traditional medicines).

6. Importance of indigenous knowledge associated with conservation and sustainable use of biological resources for food and agriculture.

2.0 Activities carried out

A). Participatory action planning meetings were held, involving all stakeholders; i.e. community/group leaders, opinion leaders and key informants.

B). Communities were sensitised on wetland/aquatic and terrestrial biodiversity values and the functions of the general environmental management. Sensitisation meetings were held with Sub-county (S/c) leaders, Local Council leaders, key informants, opinion leaders, groups and communities. This awareness creation was aimed at changing community's attitude in order to motivate them to efficiently manage their eco-system.

C). Session trainings involved theoretical and participatory engagement in the following areas:

1. Providing information to enable policy makers come up with an amendment that calls for the conservation and sustainable use of environment and wildlife, without degrading or depleting the resources.
2. Training communities, environmental best practices and conservation of their biodiversity (both aquatic and terrestrial).
3. The project also involved trainings in, participatory planning, monitoring and evaluation, project prioritisation training for Community Based Extension Workers (CBEWs) and individual community groups, as well as group leaders.
4. Improved crop and livestock production advisory services were undertaken to build the participants' capacities.

D). Improved tree seeds were purchased and planted in nurseries and later supplied to selected individuals.

2.1 Study area

Rakai district has three counties, namely Kooki, Kakuuto and Kyotera. Sango bay covers parts of the two counties i.e. Kyotera and Kakuuto. There are many sub counties in each of the three counties. Kabira and Kyeba sub counties form the sango bay area and these are the ones close to Lake Victoria. Kabira S/c has 5 parishes (Ndolo, Kyanika, Njara, Bisanje and Bwamijja) while Kyeba S/c has 4 parishes (kanabulemu, Nangoma, Gwanda and Minziro).

The scope was two counties (Kyotera and Kakuuto), two sub-ounties (Kabira and Kyebe) and nine parishes for both the two sub-counties (Figure 4).

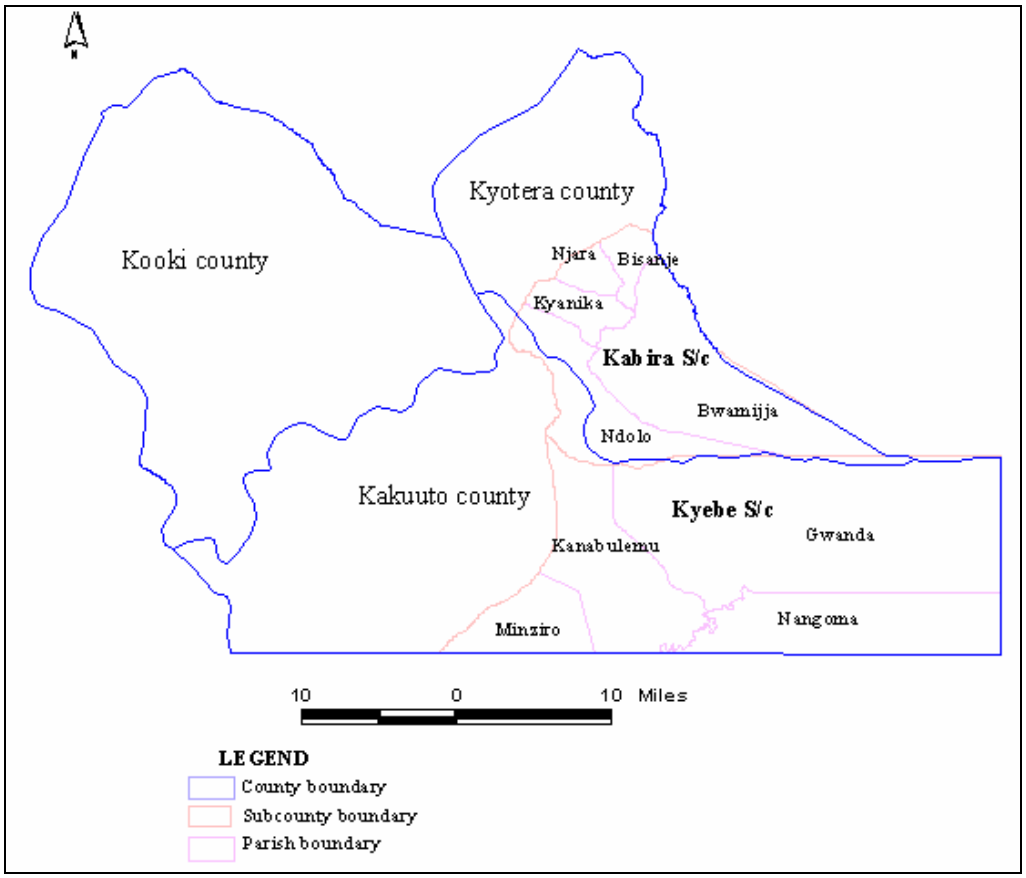


Figure 4: Sango bay area, counties, sub-counties and parishes

3.0 Achievements

3.1 Participatory action planning meetings

3.1.1 Visit to Rakai District headquarters

Firstly, the project team paid a visit at the Rakai district headquarters to meet Najuma Florence, the District Environment officer. On behalf of the district leadership and the people of Rakai district, she expressed gratitude to **Rufford Small Grant for Nature Conservation** for having funded the project and was delighted with the timeliness of the project, in view of escalating problem of natural resource degradation in the Sango bay region. She appreciated the content of intended project activities and was helpful in giving the project team background information on the Sango bay area an area she described as "one of the most important biodiversity – rich area not only in Rakai district but the country and the region at large". She later officiated as chief guest on the project's first participatory planning meeting.

3.1.2 Community participatory planning meetings

Following a successful visit at the district headquarter and with initial information acquired from the district Environment Officer, the project team planned for subsequent community meetings. Meetings were held in nine parishes adjacent to Sango bay to minimize on distance to be travelled by participants and to maximize on outreach in terms of coverage. All stakeholders (Sub-county leaders, community/group leaders, opinion leaders and key informants) were involved (Figure 5 and 6). The project team members were successfully introduced to the project area and a convenient programme was developed together with the local authorities and community groups. Community planning meetings comprised of the project team members, representatives of locals at all levels, representatives of conservation organisations operating in the area, opinion leaders and other stakeholders.

The following among others constituted the agenda for the community participatory planning meetings:

1. Representative of local council welcomed all participants in the area.
2. Team leader introduced members on the project team.
3. Team leader gave highlights on background information, rationale for the project, objectives and purpose of the project.
4. Each team member highlighted on his/her roles and responsibilities.
5. Introduction of community groups and individual participants.
6. Communities shared their expectations from the project.
7. Head of field work activities on behalf of project team members highlighted on what is expected of communities with emphasis on community participation.
8. Assistant head of field work activities on behalf of project team member highlighted on methodology to be used in the study with emphasis on sensitisation meetings, training sessions, transect walks and Focus Group Discussions.
9. Committees were formed at every parish level to act as contact persons between the project and communities while at the same time helping in mobilisation.
10. Project team members together with communities in a participatory manner planned for sensitisation and training programs. Dates, venue, number of representatives, topics to be covered set for every parish.

In summary, three meetings were held with the local authorities to discuss the possibilities of advocating for new village policies on sustainable environment and wildlife management the local council (LC) leaders agreed to include this option on agendas of upcoming meetings at the district level, and promised to push it to the national level. Some of the major issues agreed upon were;

- to encourage the government and other well wishers to construct eco-san toilets
- relocate people that are living very close to the wet lands
- Campaign for the cut one tree, plant three phenomenon to be compulsory for all those people that will cut any tree in the forest.
- Tree harvesting has to be licensed and only in areas with large tree cover.

A committee was formed composed of five women and ten men, this committee will be responsible for organising debates on key environmental issues, awareness raising, source for local funds to maintain their immediate environments like garbage control and waste water management.

3.2 Sensitisation of communities on biodiversity values

Communities were sensitized on a number of conservation issues pertaining the Sango bay area. Sensitisation meetings targeted natural resource users (local communities and leaders) in an attempt to enlighten communities and increase their awareness on conservation values, functions, challenges and suggested solutions and best practices. The Composition of membership was representative enough covering all age and social groups. Though we had planned to have each sensitisation meeting of about 50 representatives, attendance most of the time exceeded 100 participants (Figure 5 and 6) as it was very difficult to stop some persons like children and friends of selected representatives from attending.

Figure 5: Attendance in one of the community participatory planning meetings

Figure 6: Attendance at another community participatory planning meeting

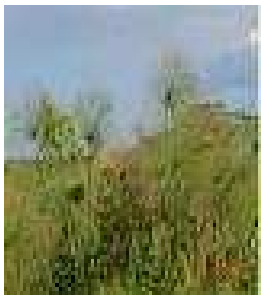
3.2.1. Knowledge on natural resources definition

It was very necessary for both the project team members and participants to understand the concept of natural resources. After a thorough discussion and analysis, an agreement was reached on the definition of "Natural resources" as stated below:

> "Naturally occurring substances that are considered valuable in their relatively unmodified natural form. A commodity is generally considered a natural resource when the primary activities associated with it are extraction and purification, as opposed to creation. Examples given by participants include forests, wetlands, lakes and natural grasslands among others"

3.2.2. Identification of key natural resources

During participatory meetings with community members and leaders, an agreement was reached to have a transect walk of about 1 kilometre to verify some of the examples of sites they feel represent natural resources. This seemed very easy for all members having participated in natural resource definition exercise. Example of identified sites are shown in Figure 7(a)-(d)




7 (a) Wet land 7 (b) Savannah 7 (c) Lake 7 (d) Forest

3.2.3. Communities' understanding of the importance of Natural Resources with reference to Sango bay.

In all sensitisation meetings, when this question was put to participants, responses were limited to direct extraction purposes on which over 90% of the population in the area depends on for their livelihood (Table 1).

Table 1. Communities assessment of the importance of selected natural resources

Natural Resource	Attached importance by the community	Estimated %age of people it supports	Addition importance generated with contribution of project team members
1. Forests	Source of wood fuel and charcoal	90	Water shed
	Medicinal products from roots, leaves, back, fruits, seeds and stems	60	Rain fall formation
	Source of construction materials: polewood, thatching grass, timber and ropes	100	Cultural values
	Source of raw material used in carving handcraft, making bee hives, mortars and pestles, instruments and tools.	80	Eco-tourism
	Source of foods including honey, vegetables, mushrooms, fruits and termites	70	Clean air
	Source of grass for grazing and fodder	75	
	Hunting areas for wild meat	50	
	Others: crop stakes, sand, fertiliser	80	
	Forest land converted to crop farms	90	
2. Wetlands	Building materials	70	Regulation and conservation of water by acting as sponges
	Hand craft materials	80	Water purification
	Grazing land	75	Climate modification
	Fish food	60	Habitant for flora and fauna
	Thatching grass	75	Flood control
	Source herbal medicine	65	Tourism
	Drained for crop gardens	95	
3. Savannah (Wood-grass mixtures of different densities)	Grazing land for both wild and domestic animals	80	Tourism industry in form of game reserves and national parks
	Source of herbal medicine	70	Habitant for both ground and below ground biodiversity
	Building materials: polewood and thatching grass	80	Flood control
			Act as water catchment areas
4. Water bodies including lakes	Fishing	90	Hydro electric power
	Water for domestic use	100	Tourism
	Transport	75	Water for agricultural and industrial use
			Habitant for flora and fauna
			Climate modification

Results in table 1 show communities narrow perception on the importance of natural resources with majority of community members (70-100%) only aware of direct and economic values of key natural resources in their areas characterized by extraction.

3.2.4. Broader awareness created encompassing other values of natural resources

Ecological, social and cultural roles of different natural resources were also put into consideration. These among others included natural resources playing a key role as water catchment areas, contributing towards rain fall formation, acting as habitant for fauna and flora, holding tourism potential in form of especially eco-tourism tourism and helping in water purification for domestic, industrial and agricultural use. Most important was the fact that Rakai district gets its piped water from Lake Kyijanibarora (Figure 8). Members were educated on the importance of conserving water bodies in the area in order to get purified water and to help the district incur less expense in water treatment.

Figure 8: Rakai district water treatment plant which pumps water from Lake Kyijanibarora in the foreground before it is treated and supplied for domestic, industrial, trade and agricultural use.

3.3 Training communities in participatory planning tools

Communities were trained in the following key areas:

- Wetland and terrestrial biodiversity values,
- Environmental enrichment,
- Pollution control and Environmental hygiene,
- Climate change mitigation measures,
- Eco-system restoration , and
- Environment and development
- Policy formulation – hence to come up with an amendment that calls for the conservation and sustainable use of environment and wildlife, without degrading or depleting the resources.

The project also involved trainings in, participatory planning, monitoring and evaluation, project prioritisation training for Community Based Extension Workers (CBEWs) and individual community groups, as well as group leaders. These people will be the ones to ensure that the project is sustainable (Figure 9). They will carry out follow up and report to the project team.

Figure 9: Focal Group Discussion session

3.4 Tree planting campaign

Stakeholders were given information on the importance of tree planting and forest conservation. In addition, improved tree seeds were purchased and raised in nurseries (Figure 10 a and b). Seedlings were distributed to the selected individuals and planted (Figure 10 c – g)


Figure 10 (a and b): Celsus (left) and Eka (right) tend to the seed beds - Improved tree seeds were purchased and planted in Nurseries

Figure 10 (c): one of the tree seedlings planted field

Figure 10 (d): Celsus inspecting the planted field

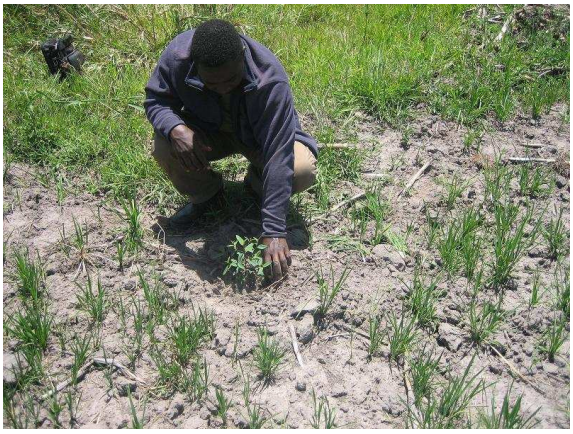


Figure 10 (e): Celsus inspecting the field

Figure 10 (f): Farmer watering his orange tree plants

Figure 10 (g): Farmer shows off his latest development of nim and right is a developing orange tree.

4.0 Other Findings

During the project period, some information regarding knowledge, attitude and opinion of the stakeholders relating to environmental protection was collected.

4.1. Why we should manage/conserve natural resources

With communities' enlightened on the different values of natural resources, we indulged in a discussion focusing on why we need to manage natural resources with focus on conservation. The following were listed as important reasons:

1 To maintain the ecosystem balances that are essential for the maintenance of cycles
2 To maintain genetic diversity and in a sense biological diversity this can be done through establishment of gene banks, and managing rare and endangered animals
3 Control of exotic species to avoid scenarios where the balance of the ecosystem is shifted in the favour of the exotic specie or a few indigenous species and the biological diversity may be lost.
4 Protecting biodiversity holding rare, endangered or valuable species that could be useful both to us, and the ecosystem as a whole.
5 Control or mitigation of problems associated with problem animals originating from protected areas.
6 Protection of aesthetics and geological site values.

4.2 Causes of natural resource degradation in the Sango bay area

Table 2. Socio- economic parameters in Sango bay

Socio-economic parameter	**Category**	**(%)**
1) Economic base	a) Agriculture	80
	b) Petty trade	0.8
	c) Civic servant	3.2
	d) Others	16
2) Scarcity of land for:	a) Cultivation	60
	b) Pasture	40
3) Source of energy (fire wood)	a) Own land	4
	b) Communal land	26
	c) Forest reserve	65
	d) Others (e.g. purchasing)	5
4) Cattle keepers who:	a) Move in search of water and pasture	55
	b) Graze on communal land	45

Result in Table 2 show agriculture as the major economic activity in the Sango bay region accounting for 80%. Participants also reported scarcity of land for both pasture and cultivation forcing 55% of cattle keepers to move in search of water and pasture. 65% of the population depends on forests for firewood. The scenario in both tables 2 and 3 has had both direct and indirect impact on the natural resource base of the Sango bay area. When project team members probed more on direct impacts, participants mentioned deforestation, overgrazing, bush burning, drought, encroachment and drainage of swamps for cultivation and grazing land as examples of

rampant human induced activities in the area contributing to degradation of both terrestrial and aquatic resources. This finding point to the fact that Human induced degradation (HDn) is significant in our GEF (1999) modified and adopted equation. Without significant recovery (HR) and absence of Human improvement (HI), it is concluded that that natural resource degradation in the sango bay region is still at large. This situation has increased pressure on natural resource base of the Sango bay area leading to ecosystem conversion: destruction of natural resources (e.g. deforestation), replacement of resources by other resources (e.g. wetlands replaced by crops) and modification (changes in the ecosystem structure).

Figures 11(a)-(c) illustrate the three types of human induced processes that contribute to natural resource degradation in the Sango bay region.

Figure 11 (a): Savannah and forest in the Sango bay showing signs of destruction (bush burning and deforestation)

Figure 11 (b): Part of forest and Annet Nakyeyune amidst a wet land showing signs of replacement by crops in the sango bay

Figure 11 (c): Dickson and Annet - Wet land and dry savannah showing signs of modification by Sugar cane and communal grazing

4.3 Impacts of natural resource degradation

With communities broadly enlightened on numerous aspects of natural resources (definition, examples, causes of degradation etc) participants were in a good position to point out some of the impacts of degradation. These include loss of soil fertility leading to low crop yields, contamination of water bodies causing an increase in water related diseases, drought leading to diminishing grass lands for animal grazing, rampant periodic floods lasting five months between October and January (rainy season), increased disease out break especially malaria due to temporary pools of water forming in rainy season which facilitate mosquito breeding among others. All these result in food insecurity, low standards of living due to rampant ill health, threatening desertification and poverty. Some of these impacts are shown in (Figure 12(a)-(f)

12 (a): Maize farm submerged by flood water

12 (b): Dark/dirty contamination water on L.Victoria edges

12 (c): Resultant poverty and low standards of living

12 (d): Diminishing grazing pasture

12 (e): Threatening desertification

12(f): Temporary pools of water that aid mosquito breeding

4.4. Best conservation strategies developed together with communities of the Sango-bay area in a participatory manner.

Participants recognized and agreed on the need to conserve aquatic and terrestrial biodiversity in the Sango bay area due to ecological, economic, social importance of such biodiversity. All the four broad categories of natural resources (water bodies (lakes), wetlands, forests and savannah) were given great importance. Communities requested the research to expound on each of them giving more information on its importance, challenges and proper conservation practices.

5.0 Importance of Lakes.

Lake Victoria part of which makes the Sango bay region was used as a reference point. In a participatory manner, a through analysis was made on its importance, threats and how it can be conserved alongside the biodiversity it contains. The interdependence of the sango bay region and lake Victoria was also emphasized where by it was pointed out that the Sango bay ecosystem act as water reserve and sink for lake Victoria. The lake serves as a valuable resource to the region providing potable water, hydroelectric power, inland water transport, and supports many different industries such as agriculture, trade, tourism, wildlife, and fisheries. It is estimated that the basin serves as a major source of employment for some 30 million people, of which approximately 3 million people are engaged, directly or indirectly, in subsistence and commercial fishing and more than 80 percent of the populations engaged in agricultural production, with the majority being small scale farmers and livestock owners. The main crops produced are maize, beans, sorghum, millet, paddy rice, and cash crops such as sugarcane, tea, coffee, cotton, and meat. In addition, in land water transport on the lake serves as alternative transport routes for movement of passengers and commodities such as fuel, cotton, and grains, with main ports located at Kisumu, Kenya; Mwanza and Bukoba, Tanzania; and Entebbe, Port Bell and Jinja.

5.1. Threats to Lake Victoria

Despite the enormous importance of Lake Victoria, the Lake has of recent been undergoing a number of threats with its water volume dropping tremendously in the last 3-4 years (registering a sharp decrease in its water level, currently at 2 meters). Communities also reported presence of dark and dirty water (figure 12 (b) which is a threat to their lives and their animals since over 95% of commmunity members depend on lake water for domestic and agricultural activities including drinking water for their livestock.. This has emanated into increased outbreak of water born diseases affecting both humans and their domesticate animals. All participants foresaw a big need to have clear and forward-looking environmental management policies to ensure that the lake resources not only in Rakai alone but the country and region at large are conserved to sustain both the present and future generations.

5.2. How Lake Victoria can be conserved and protected against further threats

5.2.1 Need for one voice and concerted efforts

After communities being enlightened on how important the lake is in terms of the number of people it supports, they rose up their voices very high and called upon everybody including their fellow community members who never participated to join hands in conserving the lake. They promised to be change agents charged with the responsibility of preaching the gospel and actively participating in upcoming conservation programmes whenever called upon

5.2.3 Increasing outreach of awareness campaigns of conservation education

Both community leaders and members were very happy with the package of the training session covering Lake Victoria. Their emphasized the need to increase coverage of our conservation education campaigns for other members of the community to benefit. They advised the project team to consider going to schools, markets, churches and community gatherings to educate people on how to conserve Lake Victoria and other natural resources. The importance of considering schools was re-emphasized by the Headmaster of Kabonela primary school in attendance who reported that it is very crucial for children to be empowered with conservation education for the to grow up as conservers of such natural resource.

5.2.4 Proper land use management practices

It was argued that these would contribute greatly towards conservation efforts of important natural resources in the Sango bay region. Discussion emphasised the need for community individuals and groups to embark on practicing fallowing to restore fertility in “tired” pieces of land, restoration of organic matter and nutrients, bio-control of pests and diseases, soil and water conservation, agro forestry and erosion control as their personal contribution to conservation goals. Participants were called upon to train other community members beginning with their own families such good practices.

5.2.5 Strong conservation policy and increased vigilance in its implementation

Contrary to the existing situation, participants called upon the government through their local leader representatives to put in place not only strong conservation policies but also increase vigilance on their implementation. They criticized Government’s moves towards giving out land to investors, which is located in catchment areas of the Lake. Cases sited include decisions to establish factories, industries, farms, and settlements in wetlands, which have been acting as water sinks for Lake Victoria in places like Kalangala, Butamira, Namanve and Mabira. Accordingly, Government need to be advised against undertaking/supporting projects that undermine ecological and environmental sustainability and security

5.2.6 Enhancing plant diversity in and around both riparian and agricultural areas

Tree planting in and around riparian and agricultural land was identified as a short term but very important possible intervention that would help in conserving majority of the natural resources in the Sango bay region. Tree planting would reduce pressure on wetlands, rain forests and savannah in search of firewood and charcoals, building materials, materials for crop stakes among others as already pointed out in both tables 1 and 2. Tree planting would also improve soil fertility through controlling soil erosion by preventing soils from being washed off slopes and deposited in nearby water bodies and supplying nutrients to fields in the form of litter through falling tree leave. This was found well fitting in the objectives and upcoming planned activities of this Rufford funded project. Communities were very happy to learn that this was part of the project's planned activities in their area and pledged total support and commitment to activities related to tree planting.

5.3. Importance of wetlands

Communities were enlightened on wetland related aspects of importance beyond what they were informed of before commencement of this project as depicted in table 2. Sensitisation on wetlands was given importance not because communities requested for this, but also due to the fact that they make the bigger portion of the Sango bay area. Information on their definition, values, challenges and best practices (Table 3) was shared in an attempt to empower local communities with knowledge and skills on how to sustainable use and conserve wetlands. Information included in Table 3 on best practices can be reinforced by solutions given in part four in relation to conserving and protecting Lake Victoria. Many of these were found cross cutting in efforts to conserve all important natural resources in the area i.e need for one voice and concerted efforts, increasing outreach of awareness campaigns of conservation education, strong conservation policy and increased vigilance in its implementation and enhancing plant diversity in and around both riparian and agricultural areas.

Table 3: Wetlands - values, challenges and best practices, in Uganda

Wetland definition, category and extent	Values	Challenges	Best practices
Definition Ramsar Convention, defines wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water, the depth of which at low tide does not exceed six meters. Furthermore, wetlands may incorporate riparian and coastal zones adjacent to the wetlands, and islands of water bodies of marine water deeper than six meters at low tide lying within the wetlands. The National wetlands Conservation and management Programme in Uganda (NWCMP) defines wetlands as "an area that stays wet long enough for only certain plants and animals to grow even when there is no rain" Category Uganda's wetlands can be categorized as papyrus swamps, swamp forests, riverine wetland, lake edge, flood plains, damboos and	**1.** Regulation and conservation of water by acting as large sponges which absorb water directly from precipitation and run-off from catchment areas and release it steadily through evapo-transpiration into the atmosphere and by gravity drainage into rivers and streams. This water holding capacity and buffering effect ensures that rivers and streams continue to flow during the dry season and that groundwater supplies are sustained. Simply put wetlands in the Sango bay act as granaries of water. Sediment and nutrient trapping especially from the effects of soil erosion, industrial discharges, and use of agro-chemicals. **2.** Water purification. Wetlands act as natural filters for runoff and help in cleaning the water. If water is not cleaned it moves with a lot of organic matter and substances rich in nutrients which when not purified by wetlands cause lake eutrophication and its associated effects on the lake. Thus wetlands are natural protectors or shields of larger water bodies. Wetlands perform a vital function of purifying water; on which city dwellers, factories and industries depend. This saves the Government US Dollars 1.7 millions annually, that they would have spent on Chemical Purification. **3.** Climate modification through evapo-transpiration. **4.** Acting as a habitat for flora and fauna: tree species like papyrus, palm trees etc animal species like the sitatunga, otter, bushbuck and wild pigs are common, bird species like crested crane, shoe bills, ducks, a variety of fish species like the cat fish, lung fish, wild fish among others, common amphibians like snakes, frogs tadpoles etc. These species are	1. Sango bay wetland is facing a threat of total destruction due to high population. 75% of wetland area has been significantly affected by human activity and about 13% is severely degraded according to community members. 2. Residential development: Building construction is one of the main factors that is leading to the degradation of Sango bay wetland. 3. Pollution of Sango bay wetlands due to poor maintenance of drainage channels, irresponsible solid waste disposal and many other poorly regulated activities have significantly impaired it. The wetland pollution is nutrient enrichment originating from urban sewage and industrial area. 4. Modification through drainage for crop production like sugarcane, yams, and vegetables. This is very vivid in the Sango bay where many swamps have been drained for agriculture in form of grazing land and crop production. This has reduction its size and thus hinders the wetlands to function to	1. Nine months rotation in the harvesting of papyrus 2. Proper disposal of waste. No solid or liquid waste should be disposed in wetlands.

artificial wetland. The current Ugandan position is that the term "wetland" should include all those areas where plants and animals have developed in association with temporary or permanent flooding. Extent There has been inconsistent information on the extent of wetlands coverage in Uganda but the most recent comprehensive data on the extent and size of wetlands is that of the National Biomass Study, carried out in 1993-1994 using Remote Sensing and Geographical Information Systems (GIS) technology. According to the findings of the study, Uganda's wetlands occupy an area of 30,105 sq. km. Wetlands are found throughout Uganda; the greatest concentration is in Soroti district and the smallest in Kampala district.	endangered because their habitats are destroyed under intensive destruction **5.** Flood control: wetlands play an extremely important in reducing the harmful and costly effects of water flows by slowing down the speed at which water passes through waterways. Wetlands in the Sango bay area absorb and channel surface water into Lake Victoria. **6.** Papyrus and similar plants that have traditionally been harvested for every day necessities such as thatching, weaving mats and baskets; palms and smaller-sized trees are harvested for structural building materials. **7.** Fishing between a swamp and open water, which is a highly productive but complex part of the wetland ecosystem. It provides food, refuge and breeding sites for commercial fish including tilapia. **8.** Parts of the wetland where the soil is permanently or seasonally moist have been used for cattle grazing, particularly during the dry season. **9.** Clean water supply by acting as a filter, cleaning water supplies for human consumption. Wetlands perform such a function for the water supply of many areas including Rakai district. Without the filtration function of the wetland, Rakai town would have to install expensive water treatment facilities. **10.** Tourism. The diversity of wetlands has a potential for earning tourism income.	capacity. Created channels could over drain the area destroying habitats, which may lead to loss of species. Breeding habitat for fish is lost leading to reduction of fish stocks. It also causes loss of valuable water, which would otherwise be important for plant growth. This leads to disruption of the food chain. 5. Other destructive human activities common in the Sango bay wetlands include brick making, sand extraction, papyrus harvesting, burning of swamp and hunting. 6. Compaction of soil as a result of construction of settlements, and roads do necessitate filling and compaction, which interfere with the natural water flow paths and infiltration resulting into flooding whenever it rains. 7. Political interference in the allocation of wetlands to people for settlement and cultivation through patronage and as political rewards is a big challenge in Uganda and has greatly contributed to the destruction of wetlands.	

6.0 Community participation emphasised

The project team recognized in advance that like in many other areas, conflicts in the Sango bay area between interest groups are crippling conservation efforts, yet local communities are often the most dependent on the utilization of the resource, and consequently suffer the most negative impacts of its degradation through loss of soil fertility and decreased crop yields. Ideally, participatory participation focuses on involving people directly and actively in all stages of the management and decision making process:

> *"…empowering people to mobilize their **own** capacities, be social **actors** rather than passive subjects, **manage** the resources, **make decisions** and **control** the acts that affect their lives" (Wells and Brandon, 1992: p.42)*

Ecosystem conservation can only be achieved through a coordinated and cooperative approach involving all the concerned people and organisations including local communities. For this project, local participation was considered a crucial factor to ensure success and sustainability. Efforts were made to create awareness of conservation and disseminate social and economic benefits of existing ecosystems in the Sango bay area in an attempt to gain the support of local communities for local conservation activities while at the same time enhancing sustainability aspects.

Presentations were made on topical issues that include:

1. Evolution of Participatory Research Methods
2. Definition of community participatory surveys or research
3. Methods used to undertake Participatory Research
4. Key elements conducive for community development and sustainability
5. Project diagnostic tools: Problem analysis tool, stakeholder analysis tool
6. Project identification tools: analysis of objective tool, analysis of alternative tool
7. Project logical framework matrix: Narrative summary, verifiable indicators, means of verification
8. Other important tools of participatory Research

- Bio physical and socio-economic of communities using mapping
- Prioritization of given options using preference ranking, matrix scoring and prioritization matrix.
- Analysis of institutional relationships using venn diagrams
- Transect walks and participatory transect
- Use of Focus Group Discussions

9. Participatory Research methods in relation to empowerment of communities
10. Data collection
11. Data management and analysis
12. Monitoring and evaluation of projects
    - Working vocabulary of M&E and the benefits of high quality M&E.
    - Measuring results
    - Data gathering and preparations

6.2 Projects' contribution towards conservation policy changes.

The information generated and shared with participating stakeholders, went a long way in enhancing efforts directed towards advocating for a replacement of paramilitary approaches with initiatives, which encourage the cooperation and involvement of local communities. Discussions with institutions responsible for the management of protected areas in the Sango bay hinged on the need to demonstrate a very positive attitude towards such shift and to initiate community-based management of resources through increased participation in decision making.

7.0 Assessment of progress made

Efforts were made to ensure that all planned activities are implemented according to schedule. Efforts and commitment of project team members, community members and their leaders greatly contributed to this. Communities and local leaders at all levels showed immense support for this project, which they pledged to continue supporting even after the end of RSG funding. The tasks involved however, were underestimated. In particular, the extent of the Sango bay region that needed to be covered, nature of infrastructure in the area, availability of services, climate conditions of the area and time needed to undertake field work activities were found more wanting and costly contrary to what was expected and planned for. However we did the best we could subject to our financial and man power abilities. It must be noted that projects that involve communities through increased community participation including planning and training are very costly, need time, proper handling and require a lot of preparation and consultation. This however is offset by the tangible benefits such projects yield in terms of impact and sustainability.

7.1 Planned Future Activities – the way forward.

As already mentioned, we under estimated the financial requirement of the project. We plan to apply for a second RSG:

- to complete planned activities which will among others include continuation of sensitisation meetings covering the remaining natural resources in the area especially forests and savannah. The community also demanded special education of the primary and secondary schools students on issues of biodiversity.
- As noted, the demand by the community for a broader analysis of each of the important natural resource was not planned for. But when the matter was raised in participatory planning meetings, everybody agreed for that approach and out put can be measured by considering work done on wetland and water bodies.
- Remaining work on forests and savannah is equally demanding but worth the effort. With sensitisation completed, we shall embark on the other major activities; namely: enhancing plant biodiversity through planting more trees through **farm forestry.** (Details of this will be included in the application for a second RSG together with a final report.

We continue to appreciate RSG's noble cause of funding projects like this one and others at large, aimed at conserving worlds' ecosystems.

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APPENDICES

APPENDIX 1: Project team

The disciplinary orientation of the project spans the project requirements. Not only do we have environmentalists, socio-economists, gender specialists, environment scientists, GIS specialist who helped us come up with included maps, we also have committed members of the communities and local leaders at all levels that have provided useful guidance and indigenous knowledge. Core project team that is committed to the success of this project is shown in table below.

Composition of Uganda project team

Position	Name	**Role and responsibilities**
Project leader	Dr. Celsus Senhte, BVM, MSc Makerere University	Coordination of project activities Participatory Research Methods Environment impact assessments Report writing
Theme Leader	Byaruhanga Chris Dickson BDVS, MSc Makerere University	Head of field work activities Participatory Research Methods GIS analyst Environment and conservation strategies Report writing
Theme Leader	Tusiime Loyce BSc, PGD Makerere University	Assistant head of field work activities Participatory Research Methods Gender and development consideration Database management and report writing
Researcher	Ms. Annet Nakyeyune BDVS, MSc Makerere	Participatory Research Methods Environment and sustainable development Project Planning and management Information Communication Technology Application