

**Environmental Management and Biodiversity Conservation of Forests
Woodlands and Wetlands of the Rufiji Delta and Floodplain**

**Rufiji River Basin Upstream Downstream
Linkages - Report of the Workshop held at
Morogoro on 26 – 28 March, 2001**



Lake Ilu, Rufiji District



**Flooding occurs periodically at the Ndundu
Settlement by the Rufiji River in the lower floodplain**

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Technical Report No. 30

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¹ The Rufiji District Council implements Rufiji Environment Management Project with technical assistance from IUCN – The World Conservation Union, and funding from the Royal Netherlands Embassy.

Rufiji Environment Management Project – REMP

Project Goal: To promote the long-term conservation through ‘wise use’ of the lower Rufiji forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area’s inhabitants are secured and enhanced.

Objectives

- To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and Floodplain.
- To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on wise use principles.
- To promote awareness of the values of forests, woodlands and wetlands and the importance of wise use at village, district, regional and central government levels, and to influence national policies on natural resource management.

Project Area

The project area is within Rufiji District in the ecosystems affected by the flooding of the river (floodplain and delta), downstream of the Selous Game Reserve and also including several upland forests of special importance.

Project Implementation

The project is run from the district Headquarters in Utete by the Rufiji District Administration through a district Environmental Management Team coordinated by the District Executive Director. The Project Manager is employed by the project and two Technical Advisers are employed by IUCN.

Project partners, particularly NEMC, the Coast Region, RUBADA, The Royal Netherlands Embassy and the Ministry of Natural Resources and Tourism, collaborate formally through their participation in the Project Steering Committee and also informally.

Project Outputs

At the end of the first five –year phase (1998-2003) of the project the expected outputs are:
An Environmental Management Plan: an integrated plan for the management of the ecosystems (forests, woodlands and wetlands) and natural resources of the project area that has been tested and revised so that it can be assured of success - especially through development hand-in-hand with the District council and the people of Rufiji.

Village (or community) Natural Resource Management Plans: These will be produced in pilot villages to facilitate village planning for natural resource management. The project will support the implementation of these plans by researching the legislation, providing training and some support for zoning, mapping and gazetttement of reserves.

Established Wise Use Activities: These will consist of the successful sustainable development activities that are being tried and tested with pilot village and communities and are shown to be sustainable

Key forests will be conserved: Forests in Rufiji District that have shown high levels of plant biodiversity, endemism or other valuable biodiversity characteristics will be conserved by gazetttement, forest management for conservation, and /or awareness-raising with their traditional owners.

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1 Introduction

A River Basin is the entire area that contains a river, its tributaries and its watershed including all the ecosystems therein, such as mountains, forests, woodlands, wetlands, pastures, agricultural areas and urban concentrations. The main connection between the lower and upper reaches of a river basin and its component ecosystems is **water**. Water flows from the upper reaches of the catchment across the lands to the tributary streams, to the main arteries and then the main river channel to its outlet at the ocean (or wherever it ends). At the same time energy and trade and influence flow up and down the river basin as people use the water resources and interact with each other and as products of the riverine systems move around the basin. Those who live and work at the downstream end of a river basin depend upon the good conduct of those who use the upper reaches to ensure that adequate quantities and quality of water percolates from the upstream reaches to the downstream users.

The Rufiji River Basin in southern Tanzania is the largest in the country and the most important for many activities, goods and services associated with water and its uses. At the downstream end of the river basin is the lower Rufiji Floodplain and the Rufiji Delta where IUCN is working with the Rufiji District Council to develop and implement an environmental management plan to secure the natural resources of the area for the use of local people and for posterity. While working on this process it became clear that the lower Rufiji programme would need to know what is happening in the upper and middle reaches of the Rufiji Basin in order to plan properly for changes that may occur upstream and have influence downstream. At the same time the actors in the upper areas of the Rufiji Basin should know what is happening lower down the same system and even out into the Indian Ocean where the river still has some influence.

In this regard, IUCN-The World Conservation Union Eastern Africa Regional Programme (IUCN-EARP) held a workshop to bring various actors in the Rufiji basin together to build and strengthen links and share information about respective activities and niches in the basin.

The two-and-a-half-day workshop was well attended by 50 participants from government agencies including the Ministry of Agriculture and Food Security, Ministry of Natural Resources and Tourism, Regional officers from Morogoro, Mbeya, Singida and Iringa and The Rufiji District Council. The Planning Commission and Tanzania National Parks Authority were also represented. Project staff attending the workshop included those working on the River Basin Management Smallholder Irrigation Improvement Project (RBMSIIP), Sustainable Management of Usangu Wetlands and its Catchment (SMUWC), the Kilombero Valley Integrated Environment Management Project, the Uluguru Mountains Biodiversity Conservation Project, The Matumizi Bora Ya Malihai kwa Idodi na Pawaga (MBOMIPA) project, the Rufiji Environment Management Project (REMP), World Wide Fund for Nature (WWF) Tanzania and The Hifadhi Ya Mazingira (HIMA) Programme.

The University of Dar es Salaam, Sokoine University and Boston University had participants at the meeting as did key stakeholders such as the Tanzania Electric Supply Company (TANESCO), Rufiji Basin Development Authority (RUBADA) and the Rufiji Basin Water Office. The meeting was enriched by the presence of the private sector, the Kilombero Sugar Company and the Kilombero Valley Teak Company. Finally the meeting benefited from the presence of the Wetlands and Water Resources Programme of IUCN Headquarters in Gland, Switzerland, who were able to provide the participants with experiences from other River Basins around the world.

This report is organized in the following manner. **Part 2** provides the rationale for the workshop. Acknowledgements are contained in **Part 3**. Thereafter in **Part 4** is a summary of the main resolutions agreed upon by participants regarding communications, interactions and information exchange between actors in the Rufiji Basin. **Part 5** is a summary of the presentations made by each of the participants who presented information on their theme of work in the Basin. Interspersed in the summary presentations are boxes that contain participants' perspectives in reaction to presentations made. The next section, **Part 6**, looks at experiences from other River

Basin - in West Africa and in other countries. Closing remarks are contained in **Part 7**, followed by conclusions in the final section.

2 Why This Workshop?

The IUCN-World Conservation Union East African Regional Programme has had an interest in the lower Rufiji Floodplain and Delta for the past ten years. The initial years were planning years, resulting in the funding of the Rufiji Environment Management Project, which became operational in July 1998 in partnership with the main implementing partner of the project, the Rufiji District Council. One of the objectives of the project was to promote resource information at various levels including at the national level. In working toward an environment management plan for the lower floodplain and delta, it was necessary to understand what other activities were being undertaken in the river basin which would require information exchange and communication between the various stakeholders. REMP identified all the participants and make arrangements for the workshop to take place. The 'Upstream Downstream' workshop was planned to be a smaller event. After preliminary discussions with institutions and projects, it soon became apparent that there was need to expand the invitation list to involve each major initiative in the basin if there was to be meaningful discussion and benefit to users and other stakeholders up and down the basin.

The objectives of the workshop were thus to:

- Review and share information about various activities and project interventions that have taken place in the basin during the last decade including information and data availability and requirements;
- Share key hydrological, ecological, economic and socio-political issues in relation to basin wide management and in particular highlighting upstream-downstream linkages; and
- Examine controversies, synergies and options for integrated river basin management (policy objectives and conflicts) in the Rufiji basin.

Participants held fruitful discussions to this end. After presentations from the various participants (see Part 5), groups were formed to discuss information and communication issues. A summary of the main resolutions **agreed** upon by participants regarding communications, interactions and information exchange between actors in the Rufiji Basin, are presented in the next section.

3 Acknowledgements

Preparations for this workshop began many months before with much of the groundwork done by the REMP team consisting of Francis Karanja, Rose Hogan, Olivier Hamerlynck and Albert Jimwaga. The REMP team's assistance continued during the workshop, with special mention to Albert Jimwaga and Olivier Hamerlynck for assistance during the workshop. We would especially like to thank Barnabas Mgweno at the IUCN office in Dar es Salaam for assisting with logistical preparations for the workshop.

Thanks also goes to Washington Mutayoba for support prior to and during the workshop.

Our gratitude goes to the Government of Netherlands through the Royal Netherlands Embassy (Ministry of Development Cooperation) for funding this workshop.

IUCN EARO would like to show appreciation to Professor Raphael Mwalyosi, (IRA) for effectively facilitating the workshop and for ensuring that smooth and fruitful deliberations took place. June James carried out the crucial task of recording notes during the workshop. Abdul Rahman Issa (IUCN-EARO) ensured that the workshop was officiated in the appropriate manner and handled matters of protocol graciously and effectively. Geoffrey Howard guided and managed the entire process with cheer and professionalism. We are grateful to Jean- Yves Pirot and Ger Bergkamp of the Wetlands and Water Resources Programme at IUCN HQ. Their presentations demonstrated that the aspirations for the Rufiji Basin are an extension of a common vision shared globally and that similar issues are being faced in other regions.

Last but not least, this workshop could not have taken place without the participants' interest and concern for the Rufiji River Basin. The presentations and active involvement in all sessions of the workshop ensured all for the need of this type of a forum and rendered the entire process useful and worthwhile.

4 Resolutions and The Way Forward

Organizations were invited to make presentations. After these were conducted in plenary, participants broke up on day two and day three into four groups to discuss communications and interactions and information exchange mechanisms respectively. After each group session, the participants regrouped into a plenary session and presented the findings of each group. The (four) presentations were then synthesized and the wording and language edited in a plenary session. The final results of these discussions are presented below. It was noted that the discussions and recommendation from the workshop need to be packaged and communicated to policy makers.

4.1 Communication and Interactions

4.1.1 Consolidated Recommendations

- General Principle: There should be communication and pathways for exchange of information at all levels within the Rufiji Basin. These should include all stakeholders and enable them to be aware and involved in discussing (and planning) developments in the basin.

The group recommended the following mechanisms for putting this principle into action:

1. Forums (including workshops such as the Upstream-Downstream meeting in Morogoro) should be held at least once in two years – “The Rufiji Stakeholder Forum”. These could encompass different topics or themes and be held at different levels.
2. A web site should be developed on the Internet for the purpose of communication and exchange of information about the Rufiji Basin. IUCN could be requested to facilitate this. Institutions will provide updated information to the Website. Links to be inserted in the Website to other Rufiji web pages.
3. Exchange visits should be organized and facilitated to enable stakeholders to appreciate issues in different parts of the basin and to interact and exchange ideas - sub-basin to sub-basin, site to site community to community.
4. A Rufiji Basin Newsletter should be launched (“Rufiji Basin News”) in both Kiswahili and English. This could be facilitated by World Wide Fund (WWF) for Nature and the Journalists Environmental Association of Tanzania (JET). Institutions should provide information for the newsletter.
5. A Reference and Document Center should be developed in the long-term. Meanwhile, recognizing that there are existing collections of documents, publications, maps, videos, etc. in several institutions, an inventory of such references and documents should be made – led by Rufiji Basin Water Office. (Capability and resources are available from RBMSIIP for the compilation of the inventory).
6. There should be focused meetings on specific issues in the basin when required including mechanisms developed for conflict resolution and discussion of all stakeholder opinions – on topics of relevance to the basin. Topics could be sub-basin issues, water issues, thematic issues, development issues, etc. and these should be available to different levels of stakeholder involvement.

In regards to information needs in the basin, the following was resolved:

4.2 Information Needs

4.2.1 Summary of Findings from the Group Discussions

The four groups came up with many and varied needs for information necessary for understanding the legion of issues and aspects of the Rufiji River Basin. These included:

- Hydro-meteorological information – real time and historical
- Forecasts of meteorological conditions affecting the basin
- Water supply and water demand estimates and predictions
- Land-uses and developments
- Anthropological information
- Socio-economic summaries and details basin-wide
- Current and future development plans and development opportunities
- Cost benefit analyses and Environmental Impact Assessments
- Identification of all stakeholders in the basin
- Traditional knowledge about the function and use of the basin
- Future support possibilities for basin activities – industry, private sector, donors, etc.
- Gaps in land laws and the legislative framework governing natural resources.

The difference between data, knowledge and information was made clear during the discussions and it was agreed that there is a real need for responsible institutions to enable the existing data to be transformed into usable information – for distribution through the mechanisms mentioned in the recommendations from the previous working group.

Information about water is of utmost importance as this is the resource that makes the basin into an integrated ecosystem for management.

Standards, guidelines and data processing procedures should be developed in due course – based on the information available and the needs for management.

There is need to compile information about the Basin in a systematic way. (Documents dating from 1905 exist on agricultural development, power and irrigation and there are a myriad of Masters, Ph.D. doctoral theses and research publications. There are a number of recent documents prepared by the different projects and institutions. Some are contained in Appendix One. (Technical Reports).

5 Presentations and Discussions

Each of the participating institutions attending the workshop was invited to make a presentation about themselves and their work in the Rufiji Basin.

Presentations by participants are summarized and divided into three main parts; introduction, issues and activities; responses; and discussion.

5.1 River Basin Management and Small Scale Irrigation Improvement Project (RBMSIP)

5.1.1 Introduction, Issues and Activities

The formulation of this Project goes back to 1993 when the then Ministry of Water, Energy and Minerals (MoW) carried out the Water and Sanitation Sector Review (WSSR) and made an assessment of the country's water resources - Rapid Water Resources Assessment (RWRA). The latter study heralded a strategy shift towards comprehensive water resources management. The assessment included several key sectors whose primary functions depend on water resources; i.e. agriculture, hydropower, water supply, environment including wetlands and biodiversity, fisheries, forestry and public health. The assessment contained recommendations around pollution control, reduction of water related diseases, water resources monitoring and the need for increased cross-sectoral coordination.

While MoW was in the process of assessing the national water resources and preparing its water resources management strategy, The Ministry of Agriculture had requested the World Bank for financial support for rehabilitation and improvement of traditional irrigation schemes within irrigated agriculture as recommended by the National Irrigation Development Plan (NIDP). The NIDP attributes the poor sector performance to lack of an adequate basin-wide framework for water resources management. The Bank and the Government saw the close linkage between the proposed project in MoA (rehabilitation and improvement of traditional irrigation schemes) and that of a comprehensive water resources management as proposed by MoW (strengthening water management activities in the two priority basins), and hence combined ideas into one project.

Tanzania has adopted a participatory river basin management approach, which is very commendable but difficult to actually implement. RBMSIIP seeks to work on the following:

- to strengthen the government's capacity to manage its water resources and address water related environmental concerns both at the national level, and in the Rufiji and Pangani river basins; and
- to improve irrigation efficiencies of selected smallholder traditional irrigation schemes in these two basins.

While carrying out these objectives the project would improve and strengthen: -

- stakeholder participation in basin management and irrigation scheme operation;
- the institutional, policy and incentive framework for basin management;
- national water resources management by adjusting the regulatory framework to include stakeholder participation in river basin management;
- the water rights concepts and management;
- both the regulatory capabilities, and the information and resources monitoring capabilities at the basin offices in the Rufiji and Pangani; and
- rehabilitation of the hydrometric network in the Rufiji and Pangani Basins.

The project began in 1998, has a six-year life span and a mid-term review has just been completed. One of the activities of the project is to strengthen the Rufiji River Basin Water Office.

5.1.2 Responses

In summary RBMSIIP does the following;

- Water management in the Rufiji Basin
- Irrigation efficiency in the Rufiji Basin
- Institutional and legal policy review including water rights.
- Review of water resources
- Strengthen capacity for water monitoring (Quantity and Quality) and Environment Impact Assessment
- Participatory water resources management
- River basin as the planning and management unit.

We said:

Clarifying roles and responsibilities.

Institutional mandates should be clear; a separation of management roles from development roles with respect to river basin management should be effected so as to avoid conflicts of interest.

5.2 Sustainable Management of the Usangu Wetlands and Its Catchment (SMUWC)

5.2.1 Introduction, Issues and Activities

The Government of Tanzania set up this project to deal with the concerns that the Great Ruaha River is drying up. These concerns first surfaced when water shortages were experienced in the Mtera reservoir in 1993. Then the river began to dry up every year in the Ruaha National Park. The project was funded by the UK Department for International Development (DFID) in 1999 to improve management of Usangu's resources by providing people with a clear understanding of what is happening and why, involving and committing people and working towards a shared vision of the future.

It has been established that, contrary to popular belief, analysis of river flows shows that the contribution the Usangu makes to water levels at Mtera has not on average changed greatly over the years. Nor has rainfall decreased. What has changed is the dry season flows which have been reduced, pools cannot be maintained and there is no fresh water in the Ruaha National Park during the rainy season contributing to serious water use conflicts, human-wildlife conflict due to displaced animals, and decreased revenues from tourism in the Usangu Game Reserve and the Ruaha National Park.

There is little doubt that the missing water is going into the irrigation systems on the southern alluvial fans of the Usangu catchment. Over the last 30 years the amount of irrigation has greatly increased. Dry season water is being diverted into the irrigation areas. While these changes have resulted in gains for irrigation farmers, households, gains for Mbarali district through taxes on rice exports and from national rice production revenues there have been costs downstream. Pastoralists have lost much of their pasture to agriculture and water on their lands in the dry season is not enough. Pastoralists then move to where water is available, in the swamp (ihefu) or into the cultivated area. Downstream rice growers lose as those upstream use most of the available water. The District loses through revenue from cattle taxes and tourist revenues. Fisherman have reduced catches in the ihefu and local villages lose money from hunters as less water and grass is available to support wildlife.

There are many other issues that result in conflicts in the area and these demonstrate the complexity of sub catchment management.

5.2.2 Responses

SMUWC has embarked on an extensive and ambitious community engagement programme in six villages to pilot mechanisms of working with local stakeholders and to help them manage their land and other natural resources. The project is formally located within the Ministry of Water, but the District is the key institution concerned with natural resource management, so the project is located in Mbarali District, the largest in the study area. The Project is mandated to work within the whole of the Usangu catchment area, covering 21,000 kms² (and parts of seven districts) upstream of the outlet of the Utengule swamp at Ngirima.

We said:

The River Basin covers more than 74,000 kilometers square. There are practical problems in adopting the river basin as a planning unit. Sub catchment approaches such as the SMUWC project are an example of breaking up the Basin into more manageable areal units.

One of the most striking changes in the River Basin is the flows to Ruaha National Park from 35 cumecs to 0 in the dry season. Flows downstream of Usangu annually do not show a decrease (records from 1957). Therefore water flowing into Mtera Dam is not being altered by changes in water use in Usangu, since annual flows have not decreased. The abstraction of water for irrigation is the main cause of these problems in the dry season. (Not deforestation, pastoralism or decreased rainfall as previously thought).

The design, operation and management of dams are very important to mitigate their negative impacts. The Mtera dam may also be suffering from management and design problems rather than actual inflows of water.

It was noted that in some Sahelian countries dry season flows are critical and therefore water boards set different prices for wet and dry seasons abstraction.

5.3 Rufiji Basin Development Authority (RUBADA)

5.3.1 Introduction, Issues and Activities

The Authority is a parastatal organization currently under the Ministry of Agriculture and Food Security (although it should be under the Ministry of Development Planning). Its mission is to promote, regulate, co-ordinate and facilitate sustainable long term ecological and socio-economic development activities in the sectors of energy, agriculture, fisheries, forestry, tourism, mining, industry and transport in the Rufiji Basin. Two other functions feature prominently in the Act, these include construction of hydroelectric works and to undertake flood control measures.

One of the largest resources of the Basin is in hydropower development. RUBADA and Norconsult (Norway) undertook a Rufiji Basin Hydropower Master Plan in 1984 and identified eight major potential sites for hydropower. These include Stiegler's Gorge, Mpanga, Ruhudji, Mnyera, Iringa, Lukose, Kihansi and Kilombero.

Currently the basic load is being met by three hydropower projects already constructed, Kidatu, (200 MW), Mtera (80 MW) and Kihansi (180 MW). With increased demand for power and the possibilities for export, the economic impetus to develop Stiegler's Gorge is increasing.

Irrigation is another planned activity, RUBADA estimates that the area suitable for irrigated agriculture is estimated at 622,400 ha in the Kilombero Valley, Lower Rufiji Valley, Usangu Plains and the Little Ruaha.

Other potential activities are in Tourism, there are three game reserves, (Rungwe, Selous and Usangu Game Reserve, and two national parks, Mikumi and Ruaha.). There are 92 forest reserves in Rufiji Basin, which is also an important wetland ecosystem. About 8% of Tanzania's prawn production comes from the Rufiji Delta.

Despite RUBADA's mandate, it has not been able to carry out its functions because of inadequate financial resources.

There is need for an organization to play a coordinating and integrating role.

5.3.2 Responses

RUBADA wishes to carry out environmental impact assessments and to have a land and water use master plan. Through this, it would play a regulatory (policing) role, by controlling water use and minimizing pollution, providing safety standards and regulating access to the Basin's resources to 'unauthorized' persons.

We said:

RUBADA cannot be placed under one Ministry as it is clearly a multi-sectoral body. RUBADA has not publicized itself adequately. The public are ill informed about its activities and the extent of its operations. Why, for example, is RUBADA's offices located in Dar es Salaam and not closer to the Rufiji District?

In the beginning of March, RUBADA held a workshop for potential investors and energy users who would be interested in developing hydroelectric power and irrigation in Stiegler's Gorge. It is precisely the sharing of this type of information that enables river basin management planning to take place in a concerted manner. It was felt that from a hydrological point of view, more data is needed to better estimate flood peaks and rating curves. Emphasis also needs to be placed on the design of the dam after an EIA has been conducted to look closely at mitigating constraints and considering alternatives.

5.4 Frontier Tanzania – Kilombero Valley Integrated Environment Management Programme (KVIEMP)

5.4.1 Introduction, Issues and Activities

Frontier Tanzania is a collaborative output between the Society for Environmental Exploration, a UK-based NGO, and the University of Dar es Salaam. The name of the project is the Kilombero Valley Integrated Environment Management Programme.

The Kilombero is a diverse area, the largest low altitude wetland in Tanzania, part of the Greater Selous Ecosystem and the Rufiji River Basin System composed of the Kilombero River, the floodplain area and the surrounding Miombo woodland. It contains 70% of the world's Puku (*Kobus vardoni*) population, the only viable population of Puku in Tanzania. Puku is an atypical floodplain antelope and is not represented in any existing National Park or Game Reserve. The wetland is a braided channel floodplain.

Pressures on natural resources include teak plantations that have replaced the Miombo woodland, timber logging of *Miletia excelsa*, wildlife hunting and overfishing in the Kilombero River. Frontier Tanzania feels that despite the significance of the floodplain and its impact in the Basin, little is heard about the Kilombero Valley and that it presents particular challenges in the field of community based conservation.

5.4.2 Response

The project combines applied research with community participation in environmental management in an attempt to develop an integrated approach to the conservation of natural resources. Research programmes address priorities identified by the local District Councils and other stakeholders. They are designed and supervised by permanent science staff, and carried out by overseas volunteers who are trained in the field, alongside local experts, (e.g. game guards and fisheries officers) and the University of Dar es Salaam students. Community based activities address needs identified by local people and are carried out in conjunction with the District Councils, Village, Ward and Divisional Governments and external trainers.

It was noted that it is important to ensure that the new projects have enough capacity i.e. local capacity to ensure that they progress even after the donors or funding institutions have withdrawn from funding.

We said:

The Kilombero Valley is bigger than the lower Rufiji. It contains the only braided channel and a large population of Puku. A potential Ramsar Site.

5.5 Sokoine University of Agriculture

5.5.1 Introduction, Issues and Activities

This University has the highest concentration of expertise in agriculture, livestock development, forestry and nature conservation In Tanzania. The Faculty of Forestry and Nature Conservation have conducted the following which has relevance to watershed management; Catchment forestry training courses for forest officers; monitoring vegetation change at Kimani Forest Reserve using aerial photography; evaluation and selection of wetlands of international importance in Tanzania as per the Ramsar Convention; high canopy forest management in Tanzania; and training of mangrove forestry staff in participatory forest management. A study was also conducted in the Rufiji Delta on the commercialization of mangrove poles, rice cultivation in mangroves and shrimp farming.

5.6 Mangrove Management Project

5.6.1 Introduction, Issues and Activities

Total area of Mangroves in Rufiji Delta 53 200 ha.

Other non-forested areas 17 200 ha.

Total Forest Reserve area 70 400 ha.

The largest area of mangroves is found in Rufiji Delta (equivalent to 46% of all mangroves in Tanzania).

The Rufiji Delta Mangroves extend inland for approximately 23 kilometers in Rufiji District. The north-south extent is about 65 kilometers.. There are eight common species of Mangrove trees in Rufiji Delta:

1. Avicennia marina;
2. Bruguirea gymnorhiza;
3. Ceriops tagal;
4. Luminitzera alba;
5. Sonneratia alba;
6. Rhizophora mucronata;
7. Xylocarpus granatum; and
8. Heritiera littoralis

Management of mangroves in Tanzania was started in 1898 by the colonial German administration who set up the first forest reserve in Tanzania in the Rufiji Delta. After independence, management was carried out by local governments until late 1980s when the Forestry and Bee Keeping Division of the Ministry of Natural Resources and Tourism intervened. The legal status of mangrove forests are gazetted forest reserves, owned by the Government of Tanzania. (Forest Policy of 1998 (revised)). The law defines the mangrove forests as the land lying between high water mark and the low water mark of the Indian Ocean where the eight species of mangrove occur.

The majority of the residents of the Rufiji Delta subsist on fishing, cultivation and extraction of mangrove poles for commercial purposes. Local people have rights to utilize mangroves at a subsistence level. (Government Notice No. 330 of 15/9/1961). The prawn industry in the Delta is based upon the presence of the Mangroves.

The distribution of the mangroves depends on the frequency of floods, the duration of floods, salinity, the rate of siltation, degree of erosion and soil compaction, (firmness)

5.6.2 Responses

The Forest and Bee Keeping Division engaged in preparation of the mangrove management plans for all mangroves in Tanzania. The exercise was completed in 1991. The Mangrove Management Project was formulated to implement the plan. It started in 1994 with part funding from NORAD and the Ministry of Natural Resources and Tourism.

The overall objective is to enhance the contribution of the mangrove ecosystems to the local and national economy of the country in a sustainable way. The mangroves have been zoned accordingly; Zone I – Forests which receive total protection (16576ha), Zone II - Forests put under production e.g. Harvesting (13,522ha), Zone III- Degraded area – require recovery (4,437 ha) and Zone IV- Development Zone (718ha)

As a way forward the project is thinking about the promotion of alternative income generating activities in the mangroves and about sharing these benefits over time. The benefits and uses of Mangroves are wide and include both economic and environmental. The economic benefits include export of prawns; generation of foreign currency source of wood and poles; as fishing grounds; a habitat for bees and other animals,. environmental benefits include the protection of coastline from erosion, preservation of water purity, absorption of pollutants from upstream, wind protection and contribution in recycling and fixing CO₂ in the atmosphere.

We said:

Information is needed on how much water (from upstream) is needed to maintain the integrity of the mangrove systems, - what quantities and quality of water is required, what are optimal the sedimentation loads?

5.7 Tanzania Electric Supply Company Limited (TANESCO)

5.7.1 Introduction, Issues and Activities

TANESCO is a parastatal organization under the Ministry of Energy and Minerals and is responsible for generation, transmission, distribution and sale of electricity in Tanzania. Since the 1970's TANESCO has been developing the sites in the Rufiji Basin for power production. The generated electricity is transmitted through the grid connection to various parts of country. 73% of the Power comes from hydropower, while 27% is generated from thermal power.

Tanzania has extensive hydroelectric resources in different river basins amounting to about 3800 MW of which only 561 MW has been developed. The Rufiji Basin contributes 464MW, 60% of the total power generation and 83% of the total hydropower generation capacity.

In the late 1950's and early 1960's, while searching for irrigation water sources, FAO identified about twenty -one hydropower potential sites in the Rufiji Basin. At the moment electric power is generated from two tributaries of Rufiji River. They are Great Ruaha River at Mtera and Kidatu and Kihansi River (at Lower Kihansi) (total or 464MW). Three planned sites for development are on Kihansi (Upper Kihansi), Mpanga and Ruhudji River. There are feasibility studies for the Stiegler's Gorge site.

Availability of reliable water flow in rivers and reservoirs in the basin is vital to TANESCO's power production. The power rationing which has occurred in the recent years (1990's) has been due to shortage of water in the largest water impoundment, Mtera, which is located in the Rufiji basin.

5.7.2 Responses

In order to ensure that reliable water supply is available for power production, TANESCO has been conducting Environmental Impact Assessments (EIA) and supporting catchment management programs for its major projects including those in the Rufiji basin. The Company has pursued mitigation measures and monitoring programs as recommended from project EIAs.

In addition TANESCO, has been collaborating with other stakeholders to work out plans for sustainable utilization of resources including water. Concerns of all stakeholders are respected, considered and incorporated in the activities particularly under the EIA process.

TANESCO's mission statement is "to generate, transmit, distribute and supply electricity in the most safe, reliable, cost effective and environmentally friendly manner". This mission statement forms the background to TANESCO's previous and present-day standing on environmental matters.

Despite the efforts made by TANESCO to conserve the environment around the project area and in the catchment, by guaranteeing a reliable water supply, water shortages probably due to water abstraction coupled with land degradation upstream of the Mtera reservoir continue to occur. Study findings show that unreliable water flows into the Mtera reservoirs might be a result of excessive water abstraction for irrigation purposes and land degradation.

We said:

There are thoughts under the East African Power Interconnection of developing Stiegler's Gorge. Plans for the development of the Stiegler's Gorge are underway. Concern was manifested by participants that the development process takes into account all downstream needs and adhere to ecosystem management principles.

In view of reduced government and increased private sector control over resource management, we need to regulate activity, many will build dams and block the sources that other people or activities depend on at the other end of the river! Monitoring of water uses is being done by RBMSIIP and dams will require surveys and a water warrant to begin construction. Through the present policy framework on water, the whole process will be monitored and controlled for safety in order to ensure that all stakeholders are thought of in the process. We also need to look outside our national borders to learn lessons and gain experiences from other countries.

Participants noted that, in the past, environment impact assessment statements were not sufficiently comprehensive nor properly conducted. They did not regard the use of water by other activities.

5.8 World Wide Fund For Nature

5.8.1 Introduction, Issues and Activities

WWF has supported conservation projects and programmes in East Africa since 1962, consolidating its activities into a sub-regional programme with the opening of the East Africa

Regional Programme Office (EARPO) in Nairobi in 1986. EARPO was originally responsible for all WWF projects within the sub-region. However, given the size and importance of the programme in Tanzania, a Country Programme Office was opened in Dar-es-Salaam in 1990. This office is responsible for all WWF conservation activities within Tanzania, except for those which are of a more sub-regional nature e.g. the East African Marine Eco-regional Programme.

Currently WWF-TPO is working within the Ruaha/Rufiji basin directly or indirectly with the following five projects: These include conservation and management of the eastern sector of the Selous Game Reserve, which involves reserve development, elephant and rhino conservation and support to community wildlife conservation; support for Udzungwa Mountains National Park which involves park development and management, community development, socio-economic and ecological monitoring; coastal forest conservation; and Mafia Island Marine Park. Two others which relate to the Rufiji Basin include the National Environmental Education Programme and the support to the Journalists Environmental Association of Tanzania (JET) to raise public awareness on wetland conservation problems and solutions.

5.8.2 Responses

The Rufiji river has three major tributaries i.e. Luwegu, Kilombero and Great Ruaha. Of the three major tributaries, the Great Ruaha river is the most impacted river in terms of conservation and socio-economic aspects.

In recent years there has been a significant increase in economic activities along the Great Ruaha River. These are unsustainable farming on the catchment slopes of the Great Ruaha river; establishment of three large rice irrigation schemes (Madibira, Mbarali and Kapunga) and the irrigated sugar cane estates of the Kilombero Sugar Company; increased livestock rearing in the Usangu wetlands and in the Great Ruaha floodplains; establishment of the Usangu Game Reserve, Ruaha and Udzungwa National Parks; and the establishment of hydroelectric power stations at Mtera and Kidatu.

Parallel to the above economic activities, there has been a marked decrease in the dry season flow of the Great Ruaha river. Since 1990 the river has dried up completely in some sections for a period of a few weeks. These dry spells have increased and in 1999 111 days were recorded without any flow. Conflicts have been noted in the presentation by SMUWC. It is interesting to note that SMUWC research findings show that the recent prolonged drying of the Great Ruaha River is not due to climatic change or variation.

It therefore, appears likely that the principal problem (and perhaps the solution as well) lies in and around the Usangu wetlands. Whilst the overall water supply to Great Ruaha river would appear to be constant, it is probable that the seasonal distribution of flow may be changing over the years, due to irrigation practices and perhaps as a result of depleted water retention in the catchment slopes of the Kipengere mountains and Uporoto escarpment. Therefore, the Great Ruaha river and its catchment including the Usangu wetlands have been identified as priority areas for WWF's Freshwater Programme in the next 5-10 years.

WWF believes that it can reverse the increasing duration of the Great Ruaha's dry period as measured at Ruaha National Park by collaborating with all relevant stakeholders of the Great Ruaha River in implementing sustainable land-use practices on two fronts:

- Usangu floodplain and its associated wetlands and
- Kipengere/Mpanga catchment and the Uporoto escarpment.

Besides the above planned WWF initiatives, the Rufiji River Basin has also been identified as one among the three priority River Basins of Africa under the auspices of a partnership amongst GEF, IUCN, WB and WWF. The objective of the partnership is to demonstrate how integrated

approaches to land and water resources (catchment) management can incorporate ecosystem considerations.

We said:

How much water is needed for wildlife, mangroves, etc. Measuring and determining water requirements for various uses is calculated using available data, using the minimum amount of water as a base. In the past not enough attention was given to environmental flows. RBMSIIP notes that a workshop is being held on how to measure environmental flows of water in order to monitor water use and provide licenses to institutions based on standards.

5.9 University Of Dar es Salaam (Botany Department)

5.9.1 Flora of Selected Forests in the Rufiji Flood Plain

A floristic study was conducted in selected forests in the Rufiji floodplain for the Rufiji Environment Management Project (REMP) in February 2000, in order to ascertain the biological status of the vegetation in these forests. The forests surveyed included Kichi Hills forest, Weme, Ilu, Ruge Ruge, Mtanza and Kihingo. Results indicated that all forests in the Lower Rufiji River basin have suffered considerably from human-related disturbance which include selective commercial logging of timber trees, fire episodes, expansion of agricultural land on forest land, and other extractive activities such as charcoal burning, log carving and collection of building poles. The evidence of continued human disturbance is manifested by the presence of entangling masses of lianescent climbers in these forests, and the rather unstable population structures apparent in the three forests of Kichi, Weme and Ilu. There are not enough seedlings of the important tree species that are necessary in the rehabilitation process of these forests.

The important ecological parameters of these forests are

- Kichi Hills recorded a total number of 1533 stems and had a species richness (S) of 143 trees per 2.75 hectare sampled.
- Weme forests recorded a species richness of 144 trees per 2.9 hectare representing a total of 1573 stems.
- Ilu forest had the lowest species richness of 90 trees per 1.2 hectare with a total of 636 stems.

The Kichi Hills forest showed the highest species richness of juvenile trees and saplings per unit area sampled. This suggests that Kichi Hills is a forest in its mid-succession stage and is a potentially self-sustaining ecosystem in terms of regeneration capability compared to the other forests.

To effectively manage these forests and in order to safeguard the biodiversity of the area, it was recommended that an assessment and audit be made of bio-resources in these forests and after gazetttement, a community-based forestry scheme should be introduced in the area.

In the floodplain, Zanzibar-Inhambane phytochorion is endowed with 3000 plant species, 27 described endemic genera and 6 unknown taxa. 42% of the 190 forest tree species at present in the floodplain are known Zanzibar-Inhambane endemics (White 1983); and 5 of them are found in the Rufiji Flood plain. These include *viz.* *Lamprothamnus**, *Letowianthus*, *Ophrypetalum*, *Pseudobersama* and *Schlechterina*. Near endemics are common.

5.10 River Basin Water Office (RBWO)

Discussion

Water flows from different uses is being discussed in the water policy deliberations. For example, the policy reflects a precautionary principle using minimum flows in the ecosystem over time to allocate water for environmental flows. The 1981 Water Policy gave priority to water supply and

now it is necessary to think of many other uses such as for example, The Kihansi sprays which creates the habitat for the Kihansi Toad.

Another challenge is to disseminate enough information about standards so that water users are aware of what is going on and can integrate values based on proper information about water availability, quantity and quality into their planning and prioritization of activities. Information on standards and guidelines are not readily available (from the Gazette). Similarly, there is need for the review of effluent standards in a participatory manner. Various methods including legal and incentives for compliance are being discussed. RBMSIIP is trying to package the information so that the water users can understand the different values of water. In addition the actual service of water provision has to be conducted in an efficient manner.

There is need to monitoring sediment loads in the river. This information is part of the hydrological data that needs to be understood in order to allow for example, for the mangrove system flourish. Foresters need this information.

It was noted that the RBWO should have an interest or policy on waterweeds such as Nile Cabbage and Water Hyacinth. Nile Cabbage was found floating in Mtera reservoir. There was need for technical assistance in this regard, in order to prevent these from becoming major problems.

Cost and benefit sharing. A question around costs and benefit sharing resulted in a discussion about a mechanism to compensate those who incur costs.

It will be useful to analyze these issues from an ecosystem perspective to assist in water pricing and use policies.

Water is increasingly becoming a source of conflict and some authors predict that the next world war will be over water. Water is no longer a 'free' resource. There will be controls and checks and monitoring and safety mechanisms. In addition, we need to have the allocation of water rights. Tanzania has the most cross border water than any other country in Africa. The whole question of water rights is linked with property rights regimes.

5.11 Tanzania National Parks (TANAPA)

5.11.1 Introduction, Issues and Activities

Tanzania National Parks (TANAPA) is a parastatal Organization under the Ministry of Natural Resources and Tourism. It was established under the Act of Parliament, Cap. 412 of 1959. TANAPA presently manages 12 National Parks, namely Arusha, Gombe, Lake Manyara, Mahale, Mikumi, Katavi, Kilimanjaro, Serengeti, Ruaha, Rubonde, Tarangire and Udzungwa. TANAPA's policy is "to manage and regulate the use of areas designated as National Parks by such means and measures to preserve the country's heritage. This encompasses cultural and natural resources; both tangible and intangible resource values including flora and fauna, wildlife habitat, natural processes, wilderness quality and scenery therein and to provide for human benefit and enjoyment of the same in such manners as will leave them unimpaired for future generations."

The Rufiji River Basin forms part of this vision because the Basin encompasses some of the major areas of importance that include the Great Ruaha Ecosystem and the Greater Selous Ecosystem.

The Ruaha National Park's drainage forms part of the Rufiji Basin which is the largest and most important system covering about one quarter of the country's land surface. It is composed of 3 major river systems of which Great Ruaha sub-basin covers about half of the area (approximately 84,000 km²) but accounts for less than a quarter of the flow. Problems associated with water depletion at Ruaha National Park include loss of endemic fish, (from the Zaire system; before the formation of the Rufiji Valley, Ruaha drained into the Zaire Basin but the geological upheaval of rift formation changed its direction), protected spawning and nursery areas in the Ruaha Rufiji

(REWMP report, 1995). Wildlife – livestock interactions have led to the spread of livestock diseases in wildlife and revenue from tourism has decreased.

The newly formed Usangu Game Reserve is made up of The Usangu/ Utengule Swamps in the Usangu Plains. The Plains are poorly drained and seasonally waterlogged, forming wetlands. The Usangu Plains receives water from the Buhoro Swamp and from Mbarali, Chinala and Great Ruaha rivers resulting in a total annual inflow from the river of 839 million m³/year. (average flow of 27 cumecs) However, in subsequent years, the lowest flow recorded was 0 cumecs in the dry season into the swamps

The West Kilombero Scarp Forest Reserve forms part of the Udzungwa Mountains National Park. A number of rivers flow into the Kilombero Valley Agricultural area and north into the Lukosi catchment, which feeds into the Great Ruaha (Kidatu Dam). Approximately 65% of the water in the Rufiji River originates from Kilombero. The floodplain acts as an important flood and sediment retention system, which is crucial for agricultural development and fisheries downstream (WWF-Tanzania, 1992).

The Greater Selous Ecosystem consists of the Selous Game Reserve and surrounding game control areas, Mikumi National Park and Udzungwa Mountains National Parks

5.11.2 Responses

TANAPA noted that there was need for

- An integrated land use plan for sustainable utilization of resources
- A system of channeling back the water to the rivers from irrigated farms
- A water rights system
- A system to oversee and monitor water use
- An inventory of water sources outside the protected areas
- Wildlife Management Areas established by local communities to enhance conservation and improvement of livelihoods.
- TANAPA to expand its outreach programs for more awareness on conservation

In conclusion, Usangu Game reserve is the lifeblood that drives the dynamic ecological processes of the Great Ruaha Ecosystem and controls the viable survival of the Ruaha National Park and its surrounding protected areas and buffer zone.

We said:

TANAPA was questioned about the above recommendations, and to whom they were directed. TANAPA is one of the downstream users and needs to bring stakeholders together to discuss community-based conservation and to keep water flowing in the Ruaha during the dry season. A suggestion was to pump water from ground sources into the river from the eastern wetland ((which loses water very fast by evaporation anyway) and take it over to Ruaha. This would be expensive but possible and the wetland may not be affected.

It was noted that the problems faced by the Ruaha should be publicized so that other international funding agencies can be involved.

5.12 The Water Resources Engineering Program (WREP) of the University of Dar es Salaam

A desirable water management strategy for the Rufiji Basin is to optimise benefits from agriculture, forestry, fishery, tourism and hydropower development under the constraints that environmental degradation is minimized and ecological balance is maintained. A precondition for the formulation

and implementation of such a policy is the availability of good quality data and the expertise to analyse the data.

WREP's Experience in the Rufiji Basin includes the Usangu Basin Modeling Study. The objective was to investigate the reduction in Usangu Basin Outflows. The conclusion was that the predominant cause seems to be dry season abstraction and not a number of 'myths' that were in circulation.

Hydrological Data includes river flow information. In order to carry out analysis of river flows, reasonable data is required. Currently, the quality of information is questionable, rating curves and key stations are missing. These include out flow from the Swamp, inflow into Mtera, inflow into Kidatu Stiegler's Gorge & D/S Stations. Climatic data for Luwego is limited and sediment data is virtually non existent, topographic data is old and of poor resolution.

In 1994, the Mtera Kidatu Reservoir system failed and was investigated by WREP. The conclusion that was met non -optimal release policy. Other work that WREP is now carrying out is a flood warning model of the Lower Rufiji Flood Plain and Delta.

WREP's vision for Rufiji River Basin

1. Comprehensive Data Base located in one place.
2. Expert analysis of the available data to arrive at an optimum management policy.
3. Methodology for design of various elements of Water Resources Development.

Legal Framework for implementation of the agreed management policy and the agreed design methodology.

5.13 The Rufiji Environment Management Project

5.13.1 Introduction, Issues and Activities

Rufiji District is located in the Coast Region and has its district headquarters at Utete. It harbours largest tidal (mangrove) forest on the eastern coast of Africa. These mangroves produce a large proportion of Tanzania's poles and provide the nursery grounds for a nationally important shrimp fishery. Rufiji district also harbours other forest and woodland associations – many of which are influenced by the floods from the Rufiji River. The floodplain is intensively used for agriculture and there are 13 permanent lakes connected to it.

Over 150,000 people inhabit the Rufiji delta and floodplain, the majority of whom subsist on fishing, cultivation, and extraction of forest, woodland and wetland products. There are some very valuable dry coastal forests in the uplands, which contain biodiversity of local, national and probably international importance – such as Kichi Hills forest and the Nyamuete-Namakutwa, and Mchungu Forest Reserves. The Western floodplain borders on the Selous Game Reserve, one of the most important wilderness areas of the world and increasingly a tourist attraction.

Over the last 15 years the Rufiji forests, woodlands and wetlands have come under increasing pressures from a wide variety of factors, including population growth, unsustainable harvesting of both timber and fish resources, the conversion of mangrove areas for cultivation and the use of riparian forest and woodlands for fuel. In the past a proposal was put forth to develop a large semi-intensive shrimp farm, that would threaten the integrity of the mangrove forest ecosystem.

The mangroves, floodplain, forests and freshwater wetlands are also encroached upon by developments within the district such as the improvement of the road network (including a bridge over the Rufiji River), oil exploration activities, as well as by upstream development activities that include the construction of hydroelectric dams and water extraction schemes.

Management interventions to address these pressures have been hampered by a lack of ecological and socio-economic information, inadequate inclusion of all stakeholders, inadequate data on the

extent and scale of land-use changes, and insufficient capacity for long-term integrated planning and management at the district level.

It is against this background that IUCN, in collaboration with the Rufiji District Council and other stakeholders at both regional and national levels, developed the current project phase I of the Rufiji Environmental Management Project. The Rufiji District Council implements the project, with technical assistance from IUCN. The Netherlands government is supporting the first 5-year phase of the project, starting from July 1998.

5.13.2 Responses

The goal of the Project is to promote the long-term conservation through wise use of the lower Rufiji River forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably, and the livelihoods of the area's inhabitants are secured and enhanced.

5.13.3 Project objectives

- to promote the integration of environmental conservation and sustainable development, through Environmental Management Plan within the Rufiji delta and floodplain (and other important areas for biodiversity) of the Rufiji District
- to promote sustainable use of natural resources by implementing participatory Environmental Management Plan at district and community level.
- to promote the sustainable use of natural resources and improving standard of living by implementing sustainable development activities based on the principle of *wise use* particularly in the wetlands.
- to promote awareness of the importance and values of biodiversity, forests, woodlands and wetlands at all levels
- to facilitate and strengthen the integration, coordination and capacity of Rufiji District Council for environmental planning and management.

5.13.4 Expected main outputs

- an integrated plan for the management of the ecosystems and natural resources of the project area (300 000 ha).
- village natural resource management plans for 4 selected pilot villages
- a number of sustainable wise use activities researched, developed, piloted and tested
- improved awareness and capacity of key stakeholders and local institutions for natural resource management

5.13.5 Achievements to date

- Socio-economic and environmental data have been collected (see attached list of technical reports), land-use maps have been produced from a 1999 aerial survey and a documentation center established.
- Awareness has been raised through a variety of techniques such as drama, posters, workshops on various subjects such as gender, monitoring and evaluation, legal aspects of community-based management, etc.

- Participatory techniques for planning have been introduced and used at village and district level and the pilot villages have developed their management plans and started to implement them.
- Stakeholders been actively involved in defining the issues the project area environment management plan should address and have discussed several options for management interventions.
- Capacity building has been done through formal training, such as for beekeeping, forest surveillance by village scouts, tree growing, organic farming, poultry, stove making, water pumps, handicrafts, sustainable fisheries but also, especially for district staff, through a lot of on-the-job practical activities.
- New partnerships have been developed and some wise-use activities such as beekeeping have been taken up at a level were they are self-sustaining.

5.13.6 Natural resource management in the lower Rufiji

Time and again it has been found that the annual flood is the engine that makes the ecosystems of the lower Rufiji floodplain and delta function. It determines the harvests of rice, maize and other crops, the productivity of the fisheries in the lakes, floodplain and delta, the health of the mangrove and floodplain adjacent woodlands, etc. In years were the floods fail there is suffering and famine.

Though the district government derives 75% of its income from natural resources the management of those is often less than optimal and in many cases not sustainable.

The best agricultural lands are in the floodplain and therefore often far from the villages that were created in the seventies. As most children accompany their parents to work in the fields, school attendance is low. Around the villages dryland agriculture, mostly for cashcrops such as sesame and cashew, has been promoted but the results have been disappointing and many plantations are abandoned.

Fishing is mostly done with fine-mesh gillnets and without any limitation of effort, nor closed areas or seasons. As a result of some of the lakes are biologically dead.

Forests are therefore turned to as the prime provider of income, both for the communities and the government. However no prior estimates of sustainable take-off levels existed and from REMP's research harvesting has far exceeded natural regeneration in the woodlands and forests. Some hardwood species, *Melicia excelsa* (Mvule) and *Pterocarpus angolensis* (Mninga) have become so rare that they are on the brink of extinction and the loggers are now targeting other species. The remaining trees, and more and more also the *Swartzia madagascariensis* (Mgoso), *Dalbergia melanoxylon* (Mpingo) and *Afzelia quanzensis* (Mkongo), are crooked or diseased. These are unattractive to loggers but, as they will be the only ones to produce seeds, their dominance in the gene pool erodes the genetic capital of the species.

The mangrove forests in the southern delta are relatively well managed for pole production but still over harvested for charcoal, salt making and lime burning. In the northern delta mangrove is being cleared for rice production. These areas are only productive for 5 to 7 years and then abandoned. Moreover DDT is used to kill the crabs in the rice fields and may therefore have contaminated the food chain.

The pressure on wild animals for bushmeat is very high and optimal harvest levels are exceeded. Woodland and bush are continuously set on fire by poachers trying to attract grazing animals, with negative consequences for woodland regeneration. On the other hand the present land use practices

of haphazard clearings, widely spaced out farms and lack of pruning of fruit trees has favored the populations of baboons and vervet monkeys, warthogs and bushpigs that are raiding the crops.

5.13.7 Constraints

A series of constraints prevent the district from achieving its full development potential. The main ones are:

- Awareness on environmental issues is low and, as the education system only reaches a small proportion of the population, original methods for awareness raising, requiring a lot of human and other resources have to be developed to overcome this hurdle. Moreover, the lower Rufiji has weak infrastructure and many communication problems contributing to the difficulties of exchange of information between the traditional users, who possess subtle knowledge of their ecosystems, and the technical departments and research institutions that could help them use this knowledge for improved livelihoods.
- The capacity of local government is too low to effectively manage the natural resources in a sustainable way and the legal framework for community-based management has not yet been established.

5.14 Kilombero Sugar Company

5.14.1 Introduction, Issues and Activities

The Kilombero Sugar Company is situated at Kidatu, Kilombero. There are two factories based either side of the Great Ruaha river, Msolwa Factory, known locally as Kilombero on the southern side which falls in the Kilombero District and Ruembe Factory, that is Kilombero 2 on the northern bank in the Kilosa District. The Msolwa (K1) factory was commissioned in the 1961, and the Ruembe (K2) factory in 1975. Kilombero Sugar was privatized in 1998 and the Illovo Sugar bought the majority shares.

The Estate and the factories are located at the base of the escarpment, which is formed by the Gologolo, Migomberani and Udzungwa Mountains. From these mountains flow a number of important rivers the most important to Kilombero Sugar being the Great Ruaha, Mbalwa and Ruembe Rivers. These all ultimately flow into the Kilombero and then into the Rufiji River.

At present there is a deficit of sugar in the country as local producers cannot meet national demand. The Company's primary role is to produce sugar for the Tanzanian market and to reduce the deficit by increasing outputs. The Factories have the capacity to produce 100,000 tons of sugar from approximately 1,000,000 tons of cane and this will be the goal in the 2003-crushing season. At present, the production is 61,000 tons of sugar. The Sugar cane for this sugar production is to come from both the estate and from outgrowers. These outgrower farmers are seen as the future of KSC's business and their cane is critical to the factory production (therefore the Company's advertisements in the press calling for businessmen or farmers to grow cane in the vacant land).

Kilombero Sugar itself has over 7,000 hectares of land under sugarcane. Of this, 4,500 hectares are irrigated. The rainfall distribution is such that only supplementary irrigation is required.

The major concern is that the water supply will dry up during the dry season. We are at peak water demand during this dry period as we are at full overhead irrigation capacity and both factories are crushing. So we require a constant flow in the great Ruaha River. This becomes an issue when the level of water in the Kidatu storage dam drops and TANESCO want to stop producing hydroelectricity and thus releasing water, which is utilized by Kilombero Sugar.

The Company's water entitlement is 8.57m³/s from the Msolwa River for overhead irrigation of sugarcane through 6 pressure pump stations and in the factories where steam drives the mill trains and turbo alternators, which generate electricity. The Company will contribute electricity to the

national grid in the coming crushing season . The third use for this water from the Great Ruaha is for potable water that is filtered for domestic consumption. The capacity of this plant is 50m³/hr

5.14.2 Responses

The concern at Kilombero Sugar Company is the blatant disregard for conservation laws. This is most evident in the continuing de-forestation of the Vidunda Mountains. This is done primarily for crop cultivation and charcoal production. Deforestation results in soil erosion during heavy rains and siltation further downstream.

Kilombero Sugar is trying in partnership with local authorities to prevent this practice by producing 1,000,000 indigenous tree seedlings per annum in the tree nursery for planting. However the Company needs assistance to see that this initiative is expanded and becomes operational. The Company also purchases local hardwood timber for burning in the boilers and now rails in firewood from TANWAT, Njombe (Encrypts). Wood is only used for factory start-ups, thereafter bagasse is used as fuel.

The Company has planted trees for future needs; factory tail water from both factories is now recycled into the irrigation systems. Molasses, which is a byproduct of the milling process, has previously been exported successfully. However over the last two years this market has collapsed and prompted two actions. First it is used to create a hard surface on the gravel roads which reduces dust, and prevents it from being dumped into the rivers. Secondly, a joint venture with Tanzania Distilleries Co. to build a distillery on site to utilize excess molasses to produce potable alcohol is underway. *Vinasse* (Potassium-rich) a by-product of this process will be applied in the fields as fertilizer.

Another point to note is that Kilombero Sugar has recently invested a significant sum of money in building a low-level bridge across the Great Ruaha River. This is to facilitate cane supply between the two factories. This bridge is designed to be overtopped during the floods but it is vulnerable to excessive build-ups against its base i.e. tree trunks.

It is essential for the Company to maintain good communication with TANESCO and the water authorities so as to ensure a gradual release of water during the long rains. If not the company fears a crisis in the Mtera-Kidatu system similar to the Kariba / Cabora Bassa saga.

Water is the lifeblood of Kilombero Sugar Company. If the supply were to be insufficient or to stop, the operations would come to an end. The impacts on the industry and the 4,000 people (and their dependents) who work for it, would be phenomenal. The water requirement is therefore a steady constant flow during the dry and wet seasons.

5.15 Kilombero Valley Teak Company

5.15.1 Introduction, Issues and Activities

The Commonwealth Development Corporation (CDC) is investing 29 million pounds in equity and loans in the development of the Kilombero Valley Teak Company (up to peak financing in Year 26), a private sector venture. The objectives are to grow 10,000 hectares of Teak (*Tectona grandis*) and to undertake natural forest management over a further 18,159 hectares in Kilombero and Ulanga District in Morogoro Region. The Tanzania Forest Action Plan specifies the need for private sector investment in the development of high quality hardwood plantations. Since the project's inception in 1992, the company has planted 3,644 hectares of Teak. Research has shown that of the total area, only 7,000 hectares of the land is suitable for Teak . Teak takes about 30 years to mature and the products are saw logs, veneer, and transmission poles (in 15-20 years).

Other ways to use the land include rice cultivation, community based management of natural forests, wildlife and community bee keeping activities. Villages have allocated land to the company for Teak development purposes and in return there is a KVTC Social Development Fund.

Trials of other tree species have been undertaken to assess their viability. Forest certification is being explored.

We said:

Participants were concerned about the amount of water used by the plantation and the effects of chemical (non-point source pollution) used on the plantation. The KVTC is undergoing an environment impact assessment study in collaboration with Frontier Tanzania to assess the effects on land and water. The assessment will look at the water needs of the exotic teak as well as the changes in micro-climate and ecology.

5.16 Mafia Island Marine Project

The Rufiji River mouth and its distributaries enter the Indian Ocean at the Western Margin of the Mafia Island Marine Park at the western buffer zone. The environment of the area is characterized by critical coastal habitats including estuaries, mangrove forests, beaches, coral reefs and sea grass beds. These have significant ecological and economic functions including protecting shorelines, supporting fisheries, providing opportunities for tourism, preventing siltation of coral reefs and absorbing pollutants. They are important habitat for marine life such as turtles and dugongs.

The Mafia Island Marine Park was gazetted in 1995 and encompasses 820 kilometers square of land and sea. Dynamite fishing and coral mining prior to this period had caused substantial damage to the environment. The most affected areas include the marine corals close to the mouth of the Rufiji river. In addition the use of insecticide by rice farmers, mismanagement of farmlands and cutting of mangroves has resulted in threats to the integrity of the Rufiji Basin environment.

5.16.1 Responses

- Trawling nets size are regulated along the Mafia Island Marine Park waters. Fishing effort and gear is controlled
- Dynamite fishing is banned
- Sea Coral exploitation has been stopped
- Monitoring and control of mangrove destruction in collaboration with Mangrove Management Project and others.
- Beaches are conserved (breeding ground for sea turtles)
- Alternative income generating efforts to reduce pressure on marine resources.
- Zoning and control of use of marine and coastal uses with assistance of local communities
- Water quality considerations especially chemicals from rice farming
- Efforts to understand the water requirements for the coral and sea grass beds.

5.17 Ministry of Natural Resources and Toursim (Wildlife Division)

Biodiversity Conservation aspects in the Rufiji Basin.
Wildlife Conservation and Wetlands Management.

5.17.1 Wildlife Conservation

This presenter talked about initiatives around community wildlife management in areas that are important for biodiversity (Wildlife Management Areas) and the Selous Conservation Project. This conservation paradigm facilitates community involvement in wildlife management. The objective is to provide economic benefits to communities (76 villages) which exceed the costs of wildlife conservation in these WMAs, covering about 37,000 kms². There has been much experience from these community based WMAs in Morogoro (17 villages) and in Pawaga and Idodi through the MBOMIPA project. The lessons learnt from these projects will be used in the other areas that have less temporal experience with WMAs. If this concept does not work there will be little hope for conservation in this country.

In some villages, technical expertise is needed in the following areas.

- Economic incentives, benefits over costs. (taxation issues, hunting, loss of revenue (45%) to government when WMA are turned over to villages,)
- An understanding of the legal framework
- Working with the private sector
- Sustainability versus short term gains; how do communities survive in the first few years before benefits have been realized
- WMA regulations and guidelines
- Managing of revenues by the Village natural resource committee
- Land use patterns in game controlled areas (Institute of Resource Assessment is presently studying this).

5.17.2 Wetlands Management

The Ramsar Convention, of which Tanzania is a signatory, requires the designation of Ramsar sites. This does not imply that the area is totally protected but that the wetland is wisely developed. Potential sites in Tanzania include Malagarasi-Moyowasi , the Kilombero Floodplain and Lake Natron.

5.18 Sustainable Use of Wild Resources in Idodi and Pawaga (MBOMIPA)

This project is under the Ministry of Natural Resources and Tourism. Its precursor was the Ruaha System Wildlife Management Project which began in 1992-1996 and initiated work with communities. These two projects are a collaborative activity between TANAPA and the Wildlife Division, with funding provided by ODA and DFID. There are 19 experimental villages. They (through Village Natural Resource Committees) have the power to make decisions about wildlife management in the villages. The main source of revenue comes from game hunting. 25% of the revenue was distributed to villages in 1988 and 1999 worth about 4 million Tanzanian shillings (TSh.). In 1998, 13.3 million TSh. and 15 million in 1999 was collected and shared among 18 villages. In the Year 2000, 20million TSh was collected in the 19 Villages. Half of this was dedicated to running costs and the other half went into the village coffers.

There are challenges such as negotiating with the people of Iringa to give up hunting, relationships with tourist investors who can compromise villagers plans. The newly gazetted Usangu Game Reserve has resulted in conflicts. As the Ruaha dries up, animals from the rich hunting area move away.

5.19 Hifadhi Ya Mazingira (HIMA) (Natural Resource Conservation and Land Use Project)

5.19.1 Introduction, Issues and Activities

HIMA-Programme operates in all five districts of Iringa region. The programme consists of 5 semi-autonomous projects namely HIMA-Iringa, HIMA-Njombe, HIMA-Makete, HIMA-Mufindi and HIMA-Ludewa. HIMA-Iringa project, once known as the Soil and Water Conservation Project was started in 1989, and the oldest of the five. HIMA-Njombe and HIMA-Makete were started in 1993. HIMA-Mufindi and HIMA-Ludewa were started in 1998. All projects are currently known as Natural Resource Conservation and Land Use Management Projects and are involved in similar activities taking into account socio-cultural, and agro-ecological differences. The respective district councils implement these projects, while agriculture, forestry and community development staff are directly involved with implementation of planned activities.

5.19.2 Programme Approach

This is a rural development programme with the objective of improving the livelihood of poor and disadvantaged women and men living in the rural areas. The lowest legally recognized government entity is the village, which also comprises of several sub-villages. Annual community plans are prepared at that level, hence known as village plans. The villagers make these village plans,

themselves in cooperation with their respective village governments. In addition to annual plans, the villagers prepare a vision of what they would like to see in their village in five years time. The ward is now the basis for planning.

5.19.3 Responses

There are a number of activities which are implemented in the various projects' areas and which have a strong bearing on the upstream-downstream linkage in the Rufiji River basin. These include:

- soil erosion control and water conservation measures: involving construction of contour bunds / grass hedgerows.
- farm fertility improvement
- training farmers on improved crop husbandry:
- protection of natural forests and grasslands in or adjacent to the respective villages
- protection of water sources.
- improvement of leadership skills for village, strengthening management capacity and providing credit
- training farmers on the use of plant based materials for pest control

Iringa and Mufindi Districts are almost completely in the Rufiji Basin watershed. A larger part of Njombe district is a watershed for the Rufiji River Basin. Makete District forms a very important part of the basin. Ludewa District is a watershed for rivers draining into Lake Nyasa.

It is clear to the programme that what is happening in the region has effects downstream. Run-off from agricultural fields and bare lands deposits heavy loads of soil into rivers and streams. The muddy little Ruaha river is testimony to this especially during the first three months of the rainy season. Cultivation near and damage to water sources has led to drying up of streams resulting in low flow volume of water reaching the downstream areas. There are a couple of rivers in Sadani division in Mufindi district, Mkikifuku and Utosi rivers have not dried up in living memory, but which dried up towards the end of 2000 mainly due to the destruction of water sources and river banks as a result of cropping. Sediments deposited in rivers and streams do contain washed agrochemicals and fertilizers from farms. Although the amount of agrochemicals and fertilizers used in the region is low when compared to levels in industrialized countries, even small amounts can contribute to a the disturbance of a stable ecosystem in the long run.

The Vision of the Programme

The programme would like to see the following in the area it operates:

- A change of attitude on the part of all stakeholders in the programme area on the need to conserve the environment.
- Soil erosion from agricultural and non-agricultural lands reduced to almost natural process levels.
- Vegetation cover improved, ground water recharge increased as a result of improved infiltration - and there was more water yield by rivers and streams at the end of the dry season.
- Water sources protected so that stream and river low flow volumes will be increased
- Village governments and communities continue to protect water sources, natural forests / woodlands and grasslands (catchment characteristics and function).
- Villagers have understood the direct impact of their actions on their immediate environment. They should also have understood externalities to their actions in downstream areas.
- Decreasing dependence on external resources such as fertilizers and pesticides.
- Sustained action; District councils will continue to see to it that natural resource use and protection continues long after projects and the programme have ended.
- Biodiversity in the programme area will be conserved and / or enriched.
- Wildfire incidences will have been tremendously reduced to controllable levels.

- Every village has well prepared and implemented land use plan which allows for future expansion.
- Forest reserves (village, district council and central) are jointly managed by villagers.

6 Experiences From River Basins In West Africa and In Other Countries (IUCN)

Experience of networking for sustainable floodplain management in the West and central African Sahel was presented by Dr Jean-Yves Pirot from the Wetlands and Water Resources Programme, IUCN Headquarters, Switzerland.

IUCN provided support to the Sahelian Wetlands Expert Group (SAWEG) which brings together *ca.* 100 specialists (engineers, ecologists, hydrologists, health specialists, decision makers, etc.) from universities, ministerial departments and basin agencies from nine West and central African countries (Burkina Faso, Cameroon, the Gambia, Mali, Mauritania, Niger, Nigeria, Chad, Senegal). SAWEG was established to bring about a change in the way Sahelian floodplains have been developed for irrigation and hydropower generation, with major negative impacts on floodplain functions and benefits.

The initial goal of SAWG was to support cross-sectoral and inter-disciplinary cooperation among stakeholders, agree on key issues and principles for integrated management, and develop a roster of regional experts interested in designing and implementing improved floodplain management plans. From 1993-1999, a number of regional meetings were held in Côte d'Ivoire, Mali, Niger, Senegal and Switzerland, during which members of the network discussed a large number of issues, ranging from water quality to community needs assessments, and cross-cutting themes such as training and legislation.

Based on these discussions, and in order to influence government institutions and the private sector towards sustainable, integrated management, SAWEG addressed the need to improve knowledge on ecosystem linkages, to identify sectoral developments which neglect the integrated nature of water resources, to improve data collection and dissemination, and to make independent EIAs a regular feature in infrastructure development. The work of SAWEG culminated with the publication of a common document, entitled "*Towards Sustainable Management of Sahelian Floodplains*" (IUCN, 2000, in French), based on contributions from *ca.* 45 different members of the network. These also produced a set of guidelines. Both documents will be used to practically influence management practices, and facilitate institutional strengthening and capacity building, at a number of restoration sites in the Sahel.

Another tangible result of SAWEG was to achieve a higher level of dialogue among proponents and opponents of large-scale infrastructure development. In doing so, SAWEG constitutes a platform where stakeholders can discuss policies and strategies (such as those embedded in the Vision for Water adopted at the 2nd World Water Forum or in the report produced by the World Commission on Dams) and hopefully agree on their implementation in the Western Sahel.

6.1.1 IUCN Basin Experiences

A short summary of some of the IUCN experiences with river basin management were presented by Dr. Ger Bergkamp, Freshwater Management Advisor, IUCN The World Conservation Union (Gland, Switzerland).

During the last 10 years IUCN has increasingly become involved in issues related to river basin management. Often these relate to the water requirements of coastal or delta and/or wetland areas. In Vietnam, for example, IUCN has worked in the Tam Chiang Lagoon that is connected to the Huong river basin (Hue province). Floods and high pressure on water related natural resources increasingly threaten the security of local livelihoods. Due to a lack of inter-sectoral planning and unclear mandates of various institutions, a gridlock situation exists that results in a rapid degradation of water related natural resources. Over the last years, IUCN has worked on assessment, planning and management of the lagoon and coastal zones forming part or connected to the Huong river basin. In partnership with Provincial People's Committee, government agencies,

local groups, NGOs in the entire river basin, IUCN will facilitate information sharing and provide technical assistance to stakeholder groups to work towards co-ordination in the river basin.

Another example forms the Okavango delta in Southern Africa. Here pressure on resource use from upstream - riparian countries is very high and combined with the increasing resource use pressures within delta form a threat to the livelihoods of the over 200,000 inhabitants of the delta. Currently, no estimates are available of the water needs to maintain delta ecosystem. Increasingly, however, political will is expressed to set-up integrated planning and management. Over the last years, IUCN assisted the Botswana government and local groups in the review of the EIA studies and the creation of the Ramsar site. During the last year, IUCN coordinated the inception phase of integrated planning project that forms the Botswana government input into the strategic planning work of the multilateral Okavango river basin commission (OKACOM).

Based on the experiences over the last decades a few lessons can be summarized. First, it is important to establish stakeholder recognition for the need to have basin wide co-ordination. Second, all key stakeholder groups should express a truthful willingness to collaborate on establishing a basin wide co-ordination. This would need to lead to the creation of political interest and commitment for integrated basin planning. Fourth it is important to start working in an early stage towards common data sets and improved baselines to substantiate arguments and provide the basis for transparent negotiations. Essential for this is the willingness and ability to share information between stakeholder groups. Finally it is important to start addressing critical issues as soon as possible at sub-basin or micro-basin level while overall planning and strategizing continues.

After a summary presented by Dr Geoffrey Howard for the IUCN and a short speech by a participant's representative Ms Miriam Zacharia, The Director of RUBADA officially closed the Workshop.

7 Closing Remarks

Closing remarks were made by Mr. B. J. Kabuzya, Director General of the Rufiji Basin Development Authority, (RUBADA). He thanked IUCN for convening the workshop and noted the number of interested participants and stakeholders apparent from the number of presentations made. He said that another opportunity to critically appraise and examine the importance of the need for an integrated basin wide approach in the utilization of the resources available in a river basin had been provided. He noted that the knowledge about resources and potentials available are vast, for example, eight major hydropower sites in the Rufiji Basin which included the Kihansi Hydropower Project were found in 1984. If more studies were carried out perhaps other hydropower sites which could produce 1 - 3 MW would be found. Indeed, such sites are ideal for rural electrification and easier to implement. The same is true for other sectors in agriculture, tourism, forestry and fisheries.

In view of the potential of the Basin he urged that the exploitation of these resources must be done rationally and in a sustainable manner.

He reiterated the need for Integrated River Basin Management by giving an example of the Pangani and the Wami River Basin where a river authority was to be set up so as to coordinate development in these Basins. Unfortunately these recommendations were not carried out. It has consequently resulted in competition for water between hydroelectric power production and agricultural needs in the Pangani Basin. As for the Wami River, development of its resources has been on a haphazard basis.

More recently, the Usangu Plains in the Upper Rufiji Basin have been subject of several studies to look into the apparent problem of less water flowing into the Mtera dam. Apparently, it was conceived and believed that livestock from pastoralist entering the Usangu plains was in excess of the carrying capacity of the land thus causing erosion and environmental degradation. In addition to this, deforestation in the catchment areas did contribute to reduction of water flows downstream to the Mtera dam. This notion prompted the Mbeya Regional and District Authorities to take remedial measures of declaring part of the Utengule swamp (Ihefu) a game reserve, and to start a campaign of tree planting in catchment areas. However, the SMUWC Project has found out that these factors in themselves do not significantly influence the shortage of water downstream to the Mtera dam. (SMUWC, 2001).

Out of all the 13 main hydrological zones in Tanzania, only the Rufiji River (the largest), has an Act of Parliament (1975) for the purpose of managing the resources of this river in an integrated manner.

This Act, while comprehensive puts emphasis on the construction of hydroelectricity and flood control works. Thus from its establishment RUBADA concentrated its work on undertaking all engineering, economic and social studies that would have enabled the construction of the Stiegler's Gorge multipurpose project.

However, when this project could not have been undertaken in 1980's RUBADA decided to carry out a Rufiji Basin hydropower Master Plan which identified 8 major hydropower sites. Unfortunately the non-implementation of the Stiegler's Gorge project has had serious results in Authority's capacity to do other functions of importance required by a River Basin Authority. The speaker underscored the point because many stakeholders have regarded RUBADA as the developer of Stiegler's Gorge and nothing else or as a developer of agricultural potential of the Rufiji basin and in particular those of the Lower Rufiji Valley. Thus the multipurpose functions of the Authority have received little emphasize and have not been understood by even very senior officials from the Government. Perhaps the fault is in RUBADA itself in not being able to sensitize stakeholders of the importance of integrated resource management of the Basin as a whole. Invariably, this has not been possible due to RUBADA's financial constraints.

Other problems have included the lack of participation of stakeholders and the “egocentrism” of some of our Government and parastatal institutions and donor and financing institutions biases resulting in the duplication of efforts.

He noted that there was a real need to

- share information of the Basin
- address some sub-basin concrete issues e.g. drying up of Great Ruaha River
- meet with all stakeholders in the basin and address all the pertinent issues at least once in the year.
- have a information center for all the reports on the Rufiji Basin

The lessons learnt include

1. Developments of resources of river basins in Tanzania, as in other basins, require collective action.
2. Correct data and information is necessary and important before making decision on those projects that utilize resource in a river basin (case of Pastoralists in Usangu.)
3. Continued collection of hydrological data, soil and others is important for reference and future development. I.e. the updating of bank data is important. He added that all data and information should find its way to a central body, in case of the Rufiji River Basin should be in RUBADA.
4. A Land Use Master Plan of all river basins must be undertaken. These should be integrated with those of various Regional and District Authorities and publicized.
5. Periodical exchange of information is necessary by calling an annual conference of all key stakeholders in the basin. (A conference like this is ideal) but with all stakeholders participating.
6. Formation of River Basin Authorities is recommended and these be sustained.

8 Conclusions

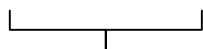
The Upstream Downstream workshop was a success in that it achieved its objectives to review and share information and examine options for the way forward for a more integrated river basin management approach. The participants gave the mandate to follow-up on the resolutions taken at the workshop.

Those who attended the workshop were cognizant and aware of the need to consult and participate in a concerted planning effort in the Rufiji Basin. Central government initiatives and efforts can only be effective with the support and good practices of all stakeholders. Within the context of the inevitability of change at the ecosystem level, people are an integral component of the system, without cooperation of all the stakeholders, any management effort will run the risk of failure. The workshop was a milestone in building a partnership and constituency of environmentally conscious practitioners in the Basin.

9 Appendices

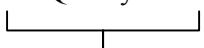
Appendix 1: Technical Documents

- Usangu Catchment - Baseline 2001
- Talking about Usangu (available in English and Kiswahili)
- Video about Usangu.



Available from SMUWC

- Catchment Degradation in the Rufiji Review of the Water Resources Management Policy
- River Basin Modeling
- Hydrological Phenomena: Floods and Droughts Available from RBMSIIP
- Ground Water Assessment Reports
- Water Quality and Effluent Treatment



Available from RBMSIIP

REMP's Technical Reports.

1. Strategy for the Assessment of Woody Vegetation of the Rufiji Environment Management Area. *May 1999*.
2. Selection of Pilot Villages – A report on rapid appraisal methodology used and the selections made, together with eleven individual village profiles. *May 1999*.
3. “ We are all poor here.” Some socio-economic observations on Rufiji Floodplain and Delta. (From the results of village and household studies carried out from late 1998 to early 2000 in four villages). *June 2000*
4. Fuelwood and Charcoal Uses with Possible Alternative Energy Sources in Ikwiriri Township and Mbunju-Mvuleni Village - Rufiji District. *July 2000*.
5. REMP Monitoring and Evaluation System. *2000*.
6. A Socio-Economic Profile of the Rufiji Floodplain and Delta - Selection of Four Additional Pilot Villages. (Three volumes) *March 2001*.
7. The Pattern of Logging in Rufiji District. *2000*.
8. Proceedings of the Seminar on “The Formulation, Implementation, and Review of Environmental Policies and Legislation and their Practice at District and Village levels: Their impacts on the Natural Resources Status in Rufiji District” Held in Utete, Rufiji District, 3-5 May 2000. (Swahili version).
9. A Preliminary Biodiversity (Fauna) Assessment of the Rufiji Floodplain and Delta. *July 2000*.

10. A Preliminary Biodiversity (Flora) Assessment of Selected Forests of the Rufiji Floodplain. *July 2000.*
11. A Preliminary Checklist of the Flora & Fauna of Rufiji District. Working document. October 2000
12. An Inventory Report of the Principal Timber Resources of the Miombo & Riverine Woodlands & Forests of Rufiji District. *Sep 2000*
13. Land use / cover maps for Rufiji district, 4 pilot villages & updated topographical sheets (within REMP's project area). *Dec 2000*
14. Development Of A Computerised Flood Warning Model, Identification And Quantification Of The Principal Hydrological Characteristics of the Lower Rufiji Floodplain and Delta. Interim Report.
15. Report of the Rufiji District Stakeholder's Environmental Management Planning Workshop, Held at Utete, Rufiji 29-30 June 2000. *Sept 2000. (English and Kiswahili Versions)*
16. An Environmental Awareness Programme Design for Rufiji Environment Management Project . *March 2001 (Technical Report No. 20)*
17. The Use And Value Of Natural Resources Of The Rufiji Floodplain And Delta, Tanzania. *November 2000*

Appendix 2: Workshop Agenda

DAY ONE – Monday 26th

08:30	Registration
09:30	Welcome, Introductions and Opening
10:30	Approval of the Agenda and process Official Opening by RAS Morogoro
11:00	Tea/Coffee
11:30	Presentations by participating organisations
13:00	LUNCH
14:00	Presentations by participating organisations
16:00	TEA/COFFEE
16:15	Presentations by participating organisations
17:30	Close for the day
18:30	WELCOME COCKTAIL

DAY TWO – Tuesday 27th

08:30	Progress towards the objectives of the workshop
09:00	Presentations by participating organisations
10:30	TEA/COFFEE
11:00	Experiences of IUCN and WWF in other river basins - with discussion
13:00	LUNCH
14:00	Group work on development of communication and interactions within the basin
16:00	TEA/COFFEE
16:15	Plenary discussion of the group work
17:00	Close

DAY THREE – Wednesday 28th

08:30	Planning for the last sessions
08:45	Group work on data and information needs for integrated river basin management
10:30	TEA/COFFEE
11:00	Plenary discussion of group findings
12:00	Development of recommendations
12:45	Closing
13:00	LUNCH and FAREWELL