

# Study on experiences / lessons for watershed management

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# 1 Introduction



In order to formulate promising strategies for the (lower) Kagera Basin Transboundary Agro-Ecosystem Management Program (Kagera TAMP), a study was conducted to identify the good and bad practices and lessons learned from other river basins and participatory catchment based approaches for improved land and water management in Tanzania. These practices and lessons focused on the sustainable use, restoration and management of the agro-pastoral system, intensive cropping system and integrated ecosystem in the watershed, with attention to income generating activities and sustainable livelihoods.

More specifically, the study includes:

- a) Observed changes on land use and agricultural systems and management practices, the driving forces and impacts (baseline scenario)
- b) Inter-linkages and conflicts between agricultural and pastoral systems and possibly their relationships with wetland and highland systems
- c) Strategies, experiences, good and bad practices and lessons learned
- d) Examples of valuation of ecosystem goods and services

The information was gathered mostly through literature and talks (in office) with persons involved. Also a fieldtrip was made to the Mkoji area, the uppermost sub-catchment of the Rufiji basin.



In Tanzania, the Rufiji and Pangani river basins have received relatively much attention from government and donors and therefore, good and bad experiences would be likely to be found and documented there. In terms of runoff, Rufiji river is the largest river in Tanzania and Pangani the smallest of Tanzania.

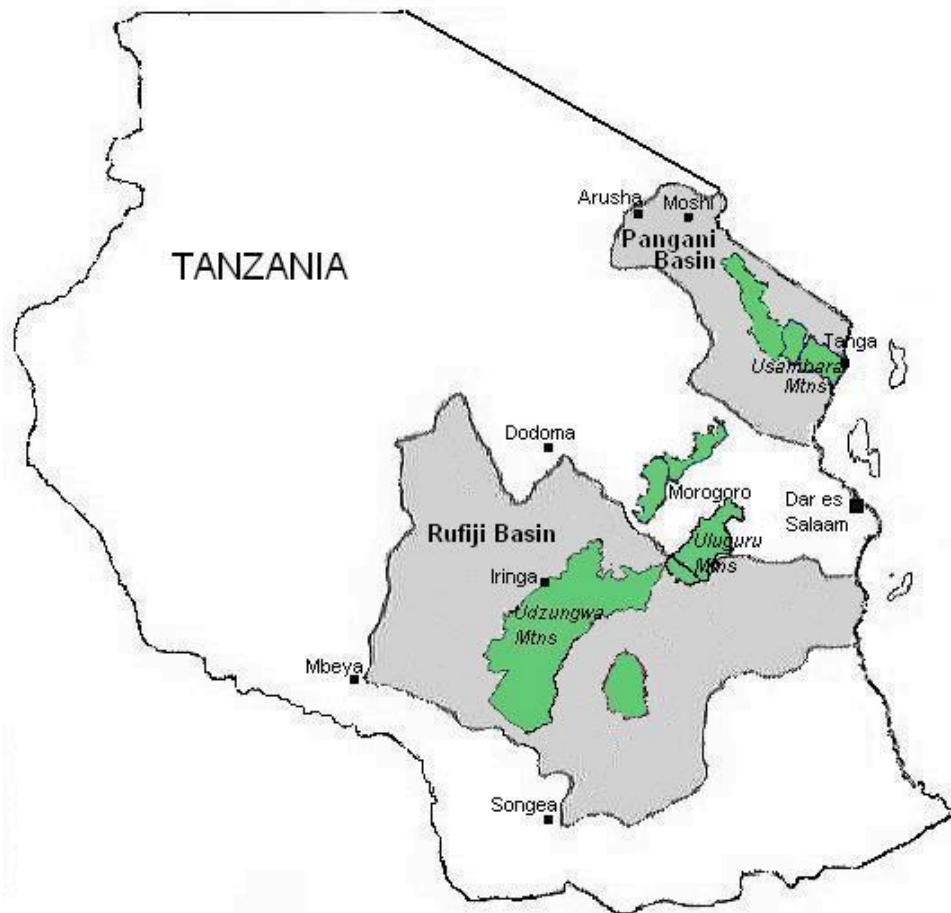
Rufiji basin is the largest river basin of Tanzania, including parts of 8 mid- and south-eastern regions. It comprises mangrove forest areas, parts of the Eastern arc reserves, parts of Selous and Ruaha national park, hydropower dams, private companies for sugar and teak, state owned large scale irrigation companies (NAFCO), wetlands and improved smallholder irrigation schemes. Various serious conflicts over resources are taking place, e.g. conflict over water resources between irrigated agriculture and hydropower generation, or over land, forest and wildlife resources between conservation and livelihood development.

Pangani Basin includes parts of 4 north-eastern regions in Tanzania and also a small part in Kenya. The basin is of national importance for hydropower, mining and agro-industries as well as irrigated farming – both traditional and large-scale farming (e.g. sugar cane, sisal and flowers). The expanding cities of Moshi and Arusha are in the basin, as well as national parks such as Mt. Kilimanjaro, Arusha national park and Tsavo park in Kenya. The competition over resources, especially water and land is high. Among the biggest environmental problems is deforestation with very serious consequences for biodiversity.

The Eastern Arc Mountains are for a great part in Rufiji and Pangani river basins: e.g. the North and South Pare Mountains and Usambara Mountains in Pangani Basin, and the Udzungwa and part of the Uluguru mountains in Rufiji Basin.

The Eastern Arc Mountains are renowned for their high biodiversity value; they are among the 25 biodiversity hotspots in the world. The forests are the major source of water for many important rivers. It is estimated that 10 to 25 % of the population gets their water from these rivers. Several major hydropower plants use water flowing from the Eastern Arc mountains: more than 50% of national grid (electricity) comes from Eastern Arc sources.

Rufiji and Pangani basins are also the few places in Tanzania where major ecological alterations have occurred to wetlands. Most of these wetlands in Tanzania are still in a fairly natural condition, with their integrity more or less intact, except a few: Kirua Swamp, the largest wetland in Pangani Basin, and the wetlands in the Usangu Plains in Rufiji River.



**Figure 1: Rufiji and Pangani basins and the Eastern Arc Mountains (in green)**

Government, donors and NGOs are greatly involved in the Rufiji basin in water resources management, biodiversity conservation, community forestry, wetland management and other programs. Some programs that could be interesting in relation to Kagera TAMP are:

- RBM/SIIP river basin and irrigation project (World Bank, 1998 – 2003)
- SMUWC research and awareness project in Usangu catchment (DFID, 1999 - 2002)
- RIPARWIN / FNPP research on IWRM and irrigation in Mkoji sub-catchment (DFID & FAO, 2003 – 2005)
- Ruaha river program (WWF, 2003 – 2008)
- HIMA natural resource and land use project in Iringa region (Danida 1989 - 2002)
- Sustainable Wetlands Management program in Iringa and Mbeya regions (Danida / MNRT, 2004 –2009)
- REMP project in Rufiji district on village environmental management (IUCN/DGIS, 1998 – 2003)
- UMADEP sustainable agriculture and soil and water conservation in Uluguru and Udzungwa Mountains (SUA)
- Eastern Arc Biodiversity Conservation in Uluguru Mountains (UNDP / GEF / WB, 2003-2008)
- Udzungwa Mountains National Park program (WWF, 1990 – 2010)
- Lower Kihansi Environmental Management Program (WB/VPO, 2002 – 2012) assists in long-term conservation of the Kihansi Gorge ecosystem and upstream catchment areas (in the Udzungwa mountains).

In Pangani basin the following projects are or have been active:

- RBM/SIIP river basin and irrigation project (World Bank, 1998 – 2003)
- IUCN Water and Nature Initiative (WANI) with studies e.g. situation analysis of Pangani basin and on payment for environmental services
- Pangani River Basin Management Project (Pangani Basin Office / Pamoja Trust / IUCN / GEF / GoT, 2002 – 2007) aims to improve water management and reduction of conflicts by research and measures.
- Greater Pangani Basin Cross-border Dialogue in Kenya and Tanzania (Pangani Basin Office / Kenya Coast Development Authority / Pamoja Trust / GTZ / InWent, 2005) aims to develop an integrated management plan and dialogue for Lake Jipe, Lake Chala and Uмба River.
- Soil Erosion Control and Agro-forestry Project (SECAP) in Lushoto District (GTZ, 1981 – 2000)
- East Usambara Conservation Area Management Programme (EUCAMP) on agro-forestry and IPM (MNRT/ Finland, 1997-2000)
- East Africa Cross-border Biodiversity Project (FAO/UNDP/GEF, 1998 – 2002) in Kenya, Uganda and Tanzania, worked in the North Pare Mountains (Eastern Arc) on joint forest management with local communities.



It has to be taken into account that drawing lessons from other parts in Tanzania in order to compare them to the Kagera basin is difficult.

First of all play irrigated agriculture and hydropower generation (and the conflicts between these) in both Pangani and Rufiji basins important roles, and not at all in the Tanzanian part of Kagera basin. The agricultural system is very different (e.g. irrigated rice compared to banana intercropping system in Kagera).

The high altitude and steep slopes in Rwanda are the source of sediment in the Kagera river. In the upper Rufiji basin this problem does hardly exist, although in the Uluguru mountains (further downstream in Rufiji basin) and in the Pangani basin similar situations could be found.

Although the Rufiji and Pangani basins receive a lot of attention from government, donors and NGOs, hardly any of these programs is working on a whole (sub)catchment scale. WWF developed with MWLD a project document for the Great Ruaha Catchment Management Project, but this was never actively used to attract donor funding for it. WWF also started working on the Songwe Transboundary Catchment Project, which seems to have similar objectives to the Kagera TAMP program.

A difficulty that will have to be phased in Kagera basin is the different institutional set-up between the countries. Only Pangani basin in Tanzania shares a part with Kenya and could in that sense be compared.

## 2 Observed changes on land use and agricultural practices, the driving forces and impacts



In 1993 the Ruaha river (Rufiji basin) began drying up every year in the Ruaha National Park, and 10 years later this increased to zero-flow for almost for 4 months a year. How did this happen?



**Figure 2: Dried up Ruaha river** (Source: WWF)

The Usangu plains where the Wasangu people lived used to have rich soils, pastures, and abundant wildlife and water resources. “In 1963 it took us one week to get to Iringa because the Usangu plains were too wet.” The Wasangu respected the wetlands are their ritual places.

In the 1950s many other tribes came to the Usangu plains and did not respect the resources so much. Due to this immigration in combination with

population growth, the pressure on the natural resources became higher. It is commonly believed that (immigrant) pastoralists with high numbers of livestock increased the pressure further: they were driven into the wetland area where they compacted the soils, which decreased vegetative growth, increased evaporation and reduced water retaining capacity. With population growth the encroachment in the upland forest increased and conversion of forest into agricultural areas. Finally, the state owned NAFCO rice farms created big irrigation schemes and attracted also others to settle near their irrigation schemes.

The SMUWC research project concluded that despite all believed stories, the total water volume in the Ruaha river has not changed. They stated that the one and only main reason for the zero-flow is water extraction for irrigated agriculture in the dry season, which has a significant impact on the low water volumes in that season.

The drying up Ruaha river has huge implications for the Ruaha National Park and so for tourism. Besides this, the wetlands in the area are also shrinking. If the wetlands would get the water they need, 80% of all water in the dry season would need to go to the wetlands. Conflicts between irrigators and pastoralists over water have gone to the point that last year people fought each other into hospital. Another implication is that the hydropower dams are not getting enough water to supply electricity for the country.

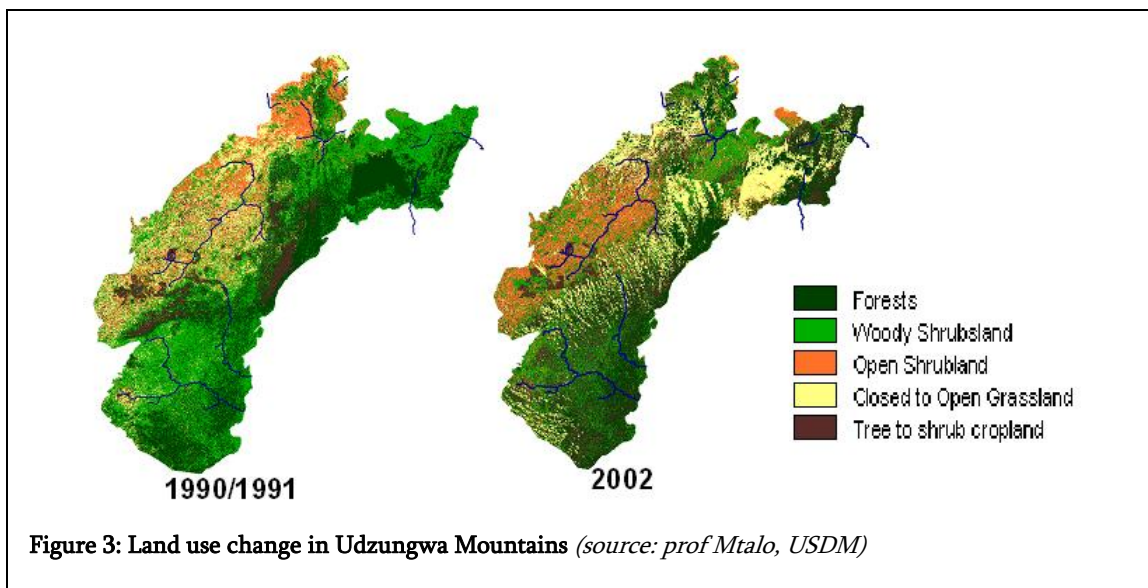
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The Eastern Arc Mountains are facing degradation, fragmentation of forests and loss of habitat. Contributing factors are said to be population growth, poverty leading to unsustainable use of forest resources, under-resourced government institutions and outdated or lack of effective environmental legislation.

A land use study on the Eastern Arc Mountain Forest (EAMF) by the Water Resources Engineering Dept, UDSM showed the following data:

- Forest cover decreased in the EAMF by 7 to 28%
- Tree or shrub cropland increased by 2.2 to 18.6 %

It was concluded that the Eastern Arc Mountains are losing their forests, woody and shrub land cover and it's being replaced by cropland and grassland. In all the mountains, the remaining forests occur as isolated patches unlike in the earlier times when they were occurring as complete blocks. There is evidence for opening and clearing of the forests as noted by replacement of forest by agricultural cropland and recent data shows even reserved area being encroached. The land cover changes together with land degradation might lead to serious environmental problems e.g. fire risks, change in surface and ground water resources, rainfall patterns and climate change.



### 3 Linkages and conflicts between agricultural and pastoral systems (with wetlands and highlands)

*This chapter describes the situation in Usangu catchment, the upper part of the Rufiji Basin.*

The Usangu, and the Mkoji sub-catchment in specific, is known for its conflicts between cultivators and pastoralists.

In Usangu is one permanent swamp; the situation used to be that every wet season the area outside the swamp flooded and dried out every dry season. The wetland and flooded areas are important for fisherman, is a home for different bird species (a potential Ramsar site), and helps to regulate the flow and clean the water.

The flooded areas also produce large amounts of grass which is grazed off completely by livestock and wildlife every year. During the wet season, when the wetlands are flooded, the livestock graze on the fans. As the flooding goes down, the cattle follow the retreat of the water, taking advantage of the new grass left behind and the available water. Provided the land floods, the grass will re-grow every year and because the wetland is so flat, run-off moves slowly and is unlikely to cause erosion.

Problems for livestock keepers:

- Water that used to flood the wetlands now used for irrigation, therefore there is less forage produced in the area and there is less water available.
- Over the past 40 years, many of the traditional wet season grazing areas on the fans have been taken for cultivation. This has risen to conflicts with cultivators who see the pastoralists as trespassing on 'their' land.
- Livestock has also been excluded from the Usangu Game Reserve

Besides illegal grazing and conflicts, many livestock keepers will settle permanently on the fans, this will increase the degradation of the sloping and intensively cultivated fans, affecting both cultivation and livestock.

The pastoralists are approached negatively as well by cultivators and institutions.

- As during the 1950s pastoralists from elsewhere in Tanzania started to move into Usangu with their livestock in search of good pastures and water, some of the dominant cattle keepers are considered immigrants who are taking advantage of someone else's resources
- Their lifestyle makes it difficult to provide services such as schooling to the pastoralists families
- It is difficult to establish themselves as members of village communities, which together limits their ability to participate in local government and to represent themselves to higher authorities.

All this reinforces the view onto pastoralists as being old fashioned, different and careless.





**Figure 4: Cattle watered by Sukuma agro-pastoralists in downstream Mkoji. This river is dry 4 months a year due to upstream irrigation in the dry season.**

Raised possible solutions to these conflicts between cultivators and pastoralists (based on talks and FNPP workshop report):

1. Overall land use plan with zonation and well-defined land tenure; all land users should keep within their boundaries and make sustainable land management plans for their areas. This should be dictated from the district supported by the national government. Only if this is in place, the villages can deal with their own land use plans and water management.
2. Water harvesting schemes for cattle such as charco dams
3. Strict enforcement of water rights

In the Oxfam organized land issues seminar the concern was strongly raised that the pastoralist way of life is not respected and that their livelihoods are not valued and will not be protected. The current land law does not provide for them. Land should be specifically be allocated for pastoralists.

*More information possibly to be found from IUCN in Rufiji district and in Pangani (Kirua Swamp).*

#### 4 Strategies, experiences, good and bad practices and lessons learned

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Previous projects focused mostly on the combination of introducing technical measures like tree nurseries, soil and water conservation and forest protection with environmental awareness raising. Examples of such projects are SECAP (The Soil Erosion Control and Agroforestry Project) in Lushoto district (1981 – 2000), Danida’s HIMA project in Iringa region and WCST’s Uluguru biodiversity conservation project.

SECAP managed that in 20 years about 10 million trees (!) have been planted on farmlands, which is about 20% of the required number of trees to meet the growing demand for fuel wood and reduce harvesting pressure on existing natural forests. The book *‘Ten Million Trees Later’* describes how a stranger observes “There are trees everywhere: thousands of agro-forestry trees and fruit trees on the farmland, forest trees in the forest, and even some new woodlots in between.”

SECAP’s Lessons learned: Macro contour strips consisting of upper-storey trees, shrubs and fodder grass were not popular with the farmers because the components were competitive to agricultural crops, harboured rodents pests to crops and believed to be potential carriers of plague. They were also not very effective in promoting water infiltration. Consequently they were modified to bench terraces with trees on the embankments.

Another problem was that most of the farmland on the upper slopes seems to be abandoned or fallow. They say it’s because wild bush pigs have returned after the forest was protected, and that they finish all the crops up there. The villagers suspect that some nature-loving foreigner is responsible for secretly releasing a male and a female pig in the forest, because they know for sure that they eradicated this pest in the 1980s.

The Uluguru Mountains Biodiversity Conservation Project (UMBCP) (since 1999) focuses on environmental awareness raising and helping communities with their needs in a sustainable way through sustainable agriculture and tree planting. UMBCP established Village Environmental Committees, wildlife clubs in schools, trained farmers on agro-forestry which improved incomes, established woodlots and (school) tree nurseries. This is successful: The awareness level has ‘doubled’ and the biodiversity level is gradually improving.

The ASPS-I review about the HIMA Sustainable Agriculture and Conservation project (1989 – 2002) was quite critical about the sustainability of such projects however. They noticed that households and villages will not spontaneously adopt and sustain the activities without a substantial subsidy, particularly in the forestry and land husbandry sub-components. Rural households rather choose immediate benefits for higher income and production than HIMA supported longer-term natural resource management and interventions. Another reason could have been that in the HIMA project no clear and consistent cost-sharing strategy with communities has been applied.

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Many organizations and projects have now realized that the protection of biodiversity areas in many cases leads to illegal activities by poor people, and that farmers will not spontaneously adopt environmental measures without own short-term benefits. The focus has shifted towards the combination with livelihood strategies.

UMADEP (Uluguru Mountains Agricultural Development Program) of Sokoine University of Agriculture learned that poor farmers near the forest area will encroach the forest to keep up production. By integration with livestock (goats and pigs) for manure, by improved access to loans and credit through formation of SACCOs, and other income generating activities, they don't need to use the forest unsustainably anymore.

Even WWF, who established the Udzungwa mountains national park, will in its next project phase focus on establishing local institutions and livelihood strategies.

In general, 'demand-driven' environmental management means providing economic incentives for communities. These may include:

- Tangible outputs of 'low biodiversity value' resources for communities / villages
- Villages managing their own natural resources (as through village land and forest acts)
- Awareness raising of villagers' rights to manage their own resources
- Improved communication and linkages between districts and villages (e.g. through NGOs).

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The land, forestry and wildlife laws recently have gone through a lot of changes. The resources from these sectors provide villagers with their means of making a living. Many villagers are not aware of the new laws and their rights to manage their own natural resources.

The Danida / MNRT Sustainable Wetlands Development program states in its project document that migration, population growth, the establishment of protected areas and increased production for outside markets have disrupted traditional community management structures of local natural resources including wetlands.

The current approach is to focus on community level management of natural (and also wetland) resources. "To revitalise, modernise and link local community structures to overall planning could reinforce the social responsibility in wetland resource management and remains a major opportunity."

*In 'Community-Based Forest Management' and 'Joint Forest Management', some beginnings in the Ulugurus. Lessons learnt on Joint Forest Management:*

- Very positive attitude of some local people who would like to have forest areas under their own management, to better protect the forests and especially their water supplies (and also for their ancestors to live in).
- Power struggles between village government who would like to allocate forest land for farming (converting forest to banana plantations), and newly created forest committees who would like to establish conservation management systems for those forests.

The Tanzania Natural Resources Forum in Arusha, an NGO platform, published the very useful Land and Natural Resources Management Law and Policy Syllabus - a plain language guide to

Tanzania's Land, Forest and Wildlife Laws and Policies (2004). This syllabus addresses the issue of lack of knowledge of the laws. It provides the main points about the policies and laws in such a way that it can be used by villages in rural communities.

REMP: Village scouts were trained, and fines were established to discourage unsustainable and illegal use. REMP helped villagers to design management of the local resources and registered these natural resources as their village resources. Villages were trained on environmental acts and developed WISE use activities. By-laws were also developed where necessary, village scouts were trained, and fines were established for unsustainable activities. The REMP program won the UNDP Equator price.

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The review of the HIMA project also concluded that the project lacked a clear strategy how the districts sustain the acquired capacity of equipment, recurrent cost financing and human resource development, and that there was little co-operation and synergies between HIMA and ongoing district processes.

The Rufiji Environmental Management Program (REMP) in Rufiji district found that capacity building of districts, improved communication between districts and communities, and empowerment of communities were the most important limiting factors for sustainable community-based environmental management. It was necessary to train villagers and districts on the existing environmental acts and to develop WISE use activities and by-laws. Communication between villagers and district authorities was highly improved.

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I have not found good experiences on the issues of pastoralists versus agriculturalists yet, other than demarcation of zones. Initiatives have been taken to establish multi-stakeholder dialogue (Pangani) or institutions around sub-catchments (Mkoji in Rufiji) but it may be too early to conclude on these.

SECAP found that "Cows don't roam around in the fields and the forest anymore. Instead, they are kept in stalls on a zero-grazing regime, or grazed in well-defined private pastures above the hamlets. The valley-bottom pastures and the forest grazing are gone (well, almost gone... some customs die hard)"

...

In Pangani basin are many experiences with conflict resolution and prevention (on water-related conflicts) through dialogue processes. Lessons learned are:

- People need to have a stake (ownership) in resources as an incentive to use the resource sustainably.

- Dialogues forums strengthen local users associations and stimulate formation of new ones, and foster relationships between the government and communities. They have a better chance of success if they are initiated prior to a crisis situation. They should include an analysis of the conflict, relationship and trust building, negotiating solutions and action plans and joint implementation of the action plans. They also require time and resources and increase the transaction costs of resource management.
- The more inclusive the process is, the more sustainable and equitable the outcome will likely be. Traditional governance systems of dealing with water conflicts should be recognized and accommodated as much as possible. The co-existence of legal and illegal resource users hinders the willingness to negotiate equitable solutions, therefore all should be involved. It is necessary to involve and clarify the roles and responsibilities of all different institutional arrangements (national, regional, district, local).
- It is necessary to use a site specific approach, taking into account history, current politics and market forces, population demographics, and effects of climate change

... *[Handwritten Swahili text]*

Development of environmental plans for certain areas seem common and useful outputs of community based natural resources management and multi-stakeholder cooperation. SECAP already developed village forest management plans in the last 20 years and REMP developed through participatory processes 4 Village Environment Management Plans and a District Environment Management Plan was developed (but is not yet incorporated in District development plan). REMP mentioned in the proposal for a possible phase 2 that the DEMP was not yet integrated with the District Development Plan. In Mkoji (upper Rufiji) the Mkoji sub-catchment Water User Association is strengthened with WWF and FNPP support. The sustainability and effectiveness of such new institutions depend greatly on its mandate and responsibilities in relation to existing institutions e.g. the District (Agricultural) Development Plans.

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In Pangani basin, which lies in Tanzania and Kenya, the facilities to manage the resources together are limited. The main initiative on transboundary management seems to have focused on Lake Jipe ecosystem on the border. Reduced water flows and nutrient inflows have caused rapid expansion of waterweeds, almost overgrowing the whole lake, posing serious threat to both the biodiversity as well as the livelihood opportunities for the fisher communities. With IUCN support the relevant authorities and other stakeholders have met and discussed ways of coordinated management. After some issues were taken onwards the momentum has slowed again. A need still exists to develop some mechanism by which to coordinate management between the two countries sustainably.

## 5 Examples of valuation of ecosystem goods and services

Valuation of ecosystem goods and services is gradually getting more attention in Tanzania.

Examples of valuation mentioned here are:

1. The contribution of natural resources to economic growth e.g. revenue derived from export of timber and fish.
2. Values derived from market prices of products that use ecosystem goods, e.g. the value of a volume of water based on the price for paddy rice and hydropower services
3. Planned and starting initiatives with Payment for Environmental Services e.g. greenhouse gas credits, and payment by water users for catchment protection.

*Figure 1: The contribution of natural resources to economic growth in Tanzania.*

The World Bank, through COWI, has made an analysis on the contribution of Tanzania's natural resources to growth and reduction of poverty for the Country Economic Memorandum. The value of Tanzania's natural resources can be derived here, although it has to be said that these represent the value solely for economic growth and the intrinsic value of ecosystems is not looked at.

The study mentions especially the contribution and untapped growth potentials of the forestry, wildlife, fisheries and mining sectors. It has to be taken into account that the researchers had many difficulties to get hold of reliable data, as no complete data could be found and many sources seem contradictory.

“Forestry contributes officially 2-3 percent to GDP and a 10-15 percent share of export earnings. Estimates taking unaccounted services and non-industrial forestry into account are accounting for a value of 10-15 percent of GDP. Forests provide around 75% of building materials and 100% of indigenous medicinal plants and supplementary food products. 95% of Tanzania's energy consumption is woodfuel based, which includes major inputs factors into rural industries such as for example tobacco curing and fish smoking. The value of carbon sequestration services provided by Tanzanian forests is estimated to be between US\$ 700 and 1,500 per ha.

Tanzania's **Fisheries** sector has grown at a rate of 6 to 7 percent annually since 2000. In 2004 revenue collection from Fisheries amounted to Tsh. 9.7 billion. This represents roughly a 50 percent increase from revenue collected in 2001/02. About 80 percent of revenue is coming from freshwater fisheries (2003). In terms of export earnings, Fisheries contributed 10% of total exports in 2003, which equalled US\$ 130 million, the export value of Nile Perch being US\$ 100 mill. Fisheries registered a revenue over-collection of roughly Tsh. 3 billion in 2003/04.

Although contribution to GDP is still not more than 1.9 percent,

*Figure 2: The contribution of fisheries to economic growth in Tanzania.*

Turpie et al. (2005) provide estimates of the value of water in different uses, and review various issues and economic tools pertaining to water resource allocation and financing mechanisms in Pangani River basin.

Table 1. Rough estimated value added per m<sup>3</sup> water in different uses

Type of use	Estimated water consumption	Estimated average value (Tsh per m <sup>3</sup> )
Sugar estates	12 – 17 000 m <sup>3</sup> /ha	32 – 101
Hydro-electric power production	2.4 -19 m <sup>3</sup> /kWh	73 – 300
Traditional furrow irrigation	3000 m <sup>3</sup> /ha	109 – 574
Improved Irrigation schemes	850 – 1195 m <sup>3</sup> /ha	574 – 1400
Domestic use	18 – 70 m <sup>3</sup> /head	1200 – 1500
Livestock	2.5 - 36 m <sup>3</sup> /head	479 – 2263
Coffee estates	1000 m <sup>3</sup> /ha	723 – 6205
Flower farms	18 250 m <sup>3</sup> /ha	3500 – 5300

Through similar water valuation, Mutabazi et al., 2005 demonstrated the economic benefits of rainwater management for crop production (maize enterprise under macro-catchment rainwater harvesting) in a semi-arid Makanya Watershed in the Pangani River basin, by comparing seasonal returns to land and labour.

This kind of research is interesting in terms of cost efficiency of natural resources based services. Again, the biodiversity and long-term values of natural resources are not included here.

Besides the value of water volumes, Turpie et al. (2005) looked at the money (Tsh per year) households derived from harvesting of aquatic resources (including value added in processing), averaged across user and non-user households.

	Highlands	Upper basin	Kirua Swamp	Pangani estuary
Food & medicinal plants	63	815	2 383	170
Reeds, sedges and grasses	2 120	2 433	2 852	0
Palms	0	4 269	4 434	86 721
Mangroves				7 890
Reptiles, mammals & birds		6	8	
Fisheries		392	33 883	693 012
Average total income per household	2 183	7 915	43 560	787 793



The TIST program on Planting Trees and Improving Agriculture for Better Lives ([www.tist.org](http://www.tist.org)) works with small groups on conservation farming and tree planting. In Tanzania they work in Dodoma, Kigoma, Morogoro and Tanga, have so far established 863 groups and planted 1,169,561 trees.

TIST expects to provide long-term revenue for the small group participants through the sale of greenhouse gas credits (GhG) by linking with the World Bank CDM bio-carbon fund. Tree growth and carbon storage are measured with palm computers and Global Position System (GPS) and transmitted through the internet. Present models show that the trees planted through the pilot program Phase III (in 4 countries) should achieve between 500,000 tons and 3,000,000 tons of CO<sub>2</sub> sequestration.

Small cash stipends for every living tree are then deposited regularly into bank accounts opened by Small Groups for this purpose. This stipend encourages groups to devote the time and care

necessary to ensure the trees' survival while providing a source of income for years to come for family necessities such as medication and school fees.

Sustainable forestry and conservation farming assure other durable economic benefits. "As the trees grow, the money flows" – not only from greenhouse gas credit sales but also from fruit, nuts, timber, firewood, and other forest products that the Small Groups sell. Benefits grow as the trees continually improve the local soil and farming conditions. More food is available as better agricultural techniques are used.



As catchment forests are decreasing, their conservation capacity for water is reduced<sup>1</sup> and water supply for towns with increasing population faces critical shortages. At the same time, many poor people are dependent on forest biodiversity for wood-fuel, food, honey, medicines, building poles, timber, animal fodder and farming. Forest biodiversity needs to be maintained to sustain essential environmental services such as water supply, carbon sequestration, soil conservation and wildlife habitat.

In Tanzania, more and more people start talking about Payment for Environmental Services (PES). In July 2005 a large stakeholder meeting was held in Dar es Salaam to talk about starting initiatives for PES in catchment management. It was agreed there that in Tanzania there is no mechanism in place for people to contribute to Catchment Management. The government capacity to manage catchments is limited and donor funding not sustainable and cannot be guaranteed. Funds currently allocated to forest conservation are inadequate given the state of the catchment and their importance to water availability. Incentives packages and water users contribution are crucial. Payment for water as an environmental service is a potential mechanism.

In a proposal "Making Payments for Environmental Services Work for Nature and People," WWF, CARE and IIED propose carefully constructed Payments for Environmental Services (PES) in the Uluguru Mountains. This PES, especially with regards to water, have the potential to shift the incentives-structure of local people and authorities from damaging to preserving forests in the Uluguru Mountains and at the same time will be part of efforts that aim at the promotion of environmental sustainability that become fully integrated into poverty reduction efforts.

The watershed services that would be sold are:

1. Soil/stream bank stabilization to ensure the *quality* of downstream water, and
2. Catchment forest conservation to improve the *reliability* of water flows.

It is planned that at a later stage the biodiversity conservation, carbon sequestration services and aesthetics will also be sold as part of a bundle of ecological services

Potential buyers of watershed services would be the cities of Dar es Salaam and Morogoro Urban Water Authorities / Company.

"Revenues raised from PES can be expected to generate a *substantial* and *sustainable* impact on local livelihoods especially through improved land use/ husbandry, agricultural and horticultural productivity and organizing communities into CBOs for obtaining other/additional sources of incomes."

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<sup>1</sup> Note discussion Water Issues Announcement List!



PES in the Uluguru Mountains are likely to have considerable conservation impact because they can readily focus on upland communities that are directly involved in the degradation of forest assets and are positioned to regulate the use of forest assets by themselves as well as others.

Also in Pangani Basin a study on PES was conducted by the Pangani River Basin Management Project / IUCN through the Economic Research Bureau of UDSM.

The shortfalls for catchment management in Pangani Basin for 2002 were found to be 32% for Arusha, 33% for Kilimanjaro and 23% for Tanga region.

According to this study, opportunity costs not only exist in urban water supply, but also in power generation and commercial irrigation. A formula was developed to determine the willingness to pay for environmental services. The results indicated that a significant amount of money can be mobilised in excess of the current allocations to Arusha, Kilimanjaro and Tanga regions for catchment conservation and collections by PBWO.

The study proposed an Environmental Services Management Fund to be managed by the Pangani Basin Water Office for the stakeholders of the Pangani Basin conservation.

In the East Usambaras and Sigi catchment (Pangani basin) a general willingness to pay was found. Tentative conclusions were that:

- The International community has been funding forest management based on the “global values of biodiversity”, and locally the benefits have been consistent flows of water and cheap water.
- Consideration must be given to rewarding upland communities around the forests to obtain sustainable management of the catchment
- Part of the revenues collected from water users should be used to establish various social services and boost economic status of the upland communities
- Most water users see the idea of watershed management as critical and have shown an interest to contribute to it.
- Modalities of payment have yet to be worked out



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