Integrated Watershed Management Research and Development Capacity Building

Integrated Watershed Management for Upper Mefou Sub-catchment Area – An Overview

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Preface

This document is the outcome of a Workshop on "Integrated Watershed Management Capacity Building" held at the University Yaoundé I, Cameroon, from 15th to 23rd November, 2013. The workshop, funded by DAAD, was a joint project of the University Yaoundé I in Cameroon, the Freie Universität Berlin in Germany, Kenyatta University in Kenya, the University of Cape Town in South Africa, the United Nations University in Bonn, Germany, and the consulting company IWM Expert GmbH, Germany.

The workshop was designed to train at different stakeholder lever the topic "Integrated Watershed Management and to examine the potential for developing a Water Resources Users Association (WRUA) in the upper Mefou sub-catchment near Yaoundé. It followed a participatory approach, inviting a number of the chiefs in the area, representatives of the Ministry of Water and Energy, other ministries, regulatory authorities, and university lecturers and students to attend all deliberations. An introductory presentation on Integrated Watershed Management was followed by a visit to the catchment. During the field visit participants were shown the newly-restored Mefou Dam, which will provide water for Yaoundé but which introduces challenges to both the local villagers and to CamWater, the water authority responsible for the dam. We also had a valuable discussion with a representative of the local chief. Later we visited upstream villages and were hosted by another of the chiefs. Back in Yaoundé a number of students gave presentations on results generated during their Master's thesis projects. In the workshop itself, participants addressed four major topics: governance and institutional arrangements with regard to water resource management in Cameroon; the biophysical setting of the upper Mefou sub-catchment; challenges faced by inhabitants of the upper Mefou sub-catchment; and the process of development of a WRUA.

This document is a record of the deliberations of the participants at the workshop. The majority of participants strongly supported the development of a Water Resources Users Association for the upper Mefou sub-catchment. We hope that this document will be a useful resource for local people as they work towards the initiation of the WRUA.

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1 Introduction to Integrated Watershed Management

Integrated Watershed Management is a **holistic** and **integrated** approach for sustainable management of a watershed area; a watershed area is understood as an ecological system which can only survive as a unit:

- the individual components of the watershed (e.g., water resources, water user)
- the relationships between the characteristic forms of the landscape (e.g., slope, bedrock, vegetation, water bodies)
- the process factors (e.g. precipitation intensity, human-environment dynamics)

Management of vital resources available in the watershed is to be carried out collectively and simultaneously to improve the living conditions of the local population. Watershed-based planning aims to balance environmental goals with socio-economic and political goals within the watershed considered.

Integrated Watershed Management is a process of *rational decision making* in successive steps. Systematically the available management options are compared, and a Watershed Management Plan is developed that is mainly a rural development concept.

The following management components need to be considered for following a holistic approach:

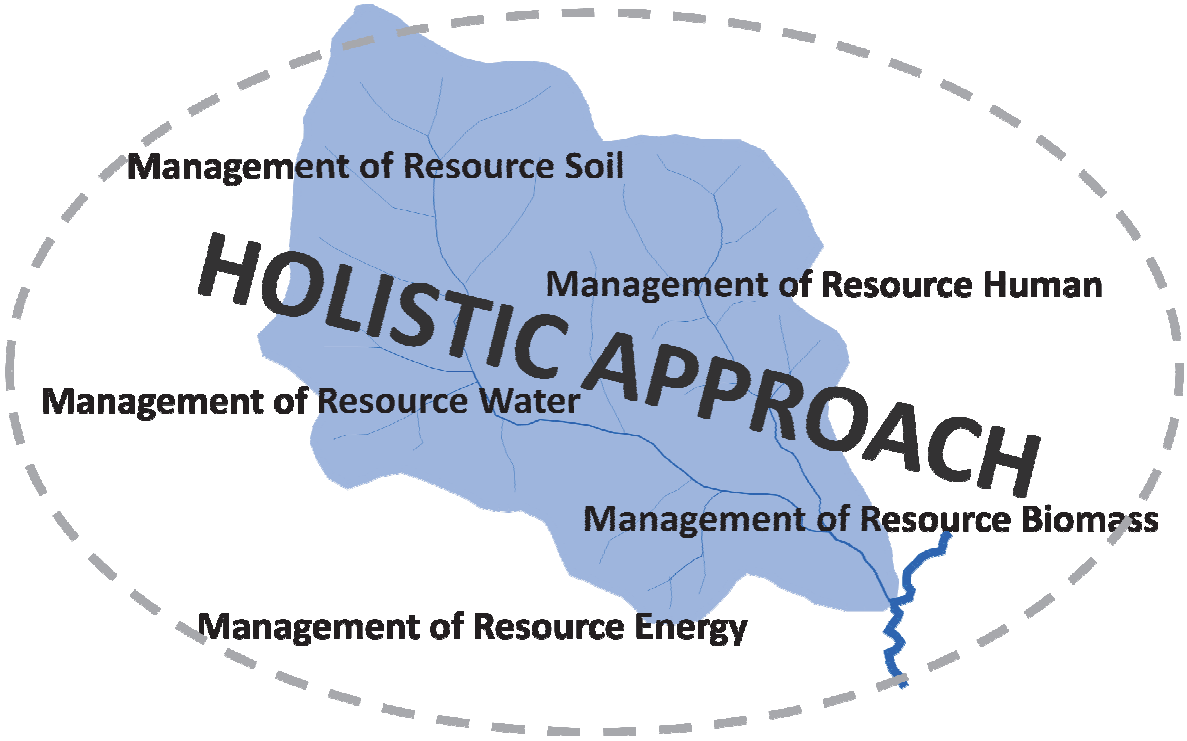

Figure 1: Integrated Approach of Integrated Watershed Management

1.1 Objectives of Integrated Watershed Management

- conserve soil, rainwater, and vegetation effectively and harvest the surplus water to create water sources in addition to groundwater recharge
- promote sustainable farming and stabilize crop yields by adopting suitable soil, water, nutrient, and crop management practices
- cover non-arable area effectively through afforestation, horticulture, and pasture land development based on land capability class
- enhance the income of individuals by adopting alternative enterprises
- restore ecological balance
- build capacity to appreciate economic value of ecologic functioning watersheds

1.2 Principals of Integrated Watershed Management

- utilise natural resources according to its sustainable capability
- secure adequate vegetation cover during the rainy season
- conserve as much rainwater as possible at the place where it falls
- effective utilisation of surface and groundwater resources
- avoid gully formation and control soil erosion
- increase groundwater recharge
- ensure sustainability of the ecosystem services
- improve infrastructural facilities with regard to storage, transportation, and marketing
- prevent water pollution and increasing WASH (water and sanitation hygiene) facilities
- solve water conflicts within the watershed
- secure access to water

1.3 Benefits from IWM

<u>for farmers</u>

- increased productivity and higher profits
- improved water availability
- improved soil quality and better drainage
- improved livelihoods

<u>for local community:</u>

- reduced flooding and water logging
- reduced soil erosion and land degradation
- increased agricultural productivity
- improved livelihoods options and land management
- less socio-economic conflict

for larger society:

- reduced risks from floods to downstream cities and farmlands
- reduced sedimentation in agricultural productive areas and dams
- better conservation of natural resources
- higher resilience of communities.

2 Geographical Introduction to Upper Mefou Sub-catchment

Figure 2: Relief map of Cameroon and location of Upper Mefou Sub-catchment

2.1 Location

The rivers of Cameroon are grouped in two major settings and five basins. The basins of the Sanaga and the Nyong (and the small coastal rivers) are national Cameroonian rivers that do not cross a border. The three other main basins are trans-boundary. These are the Congo Basin in the Southeast, the Niger Basin in the West and the Lake Chad Basin in the North.

The Mefou is a right tributary of the Nyong River, so is part of the *Basin des Fleuves Côtiers*. The outlet of the Upper Mefou Sub-Catchment, which is its lowest point, is located in Nkolbisson, an area in the northwest of the Cameroonian capital of Yaoundé at UTM 32, 772132, 428414 (701 m a.s.l.). The catchment area is of 97 km².

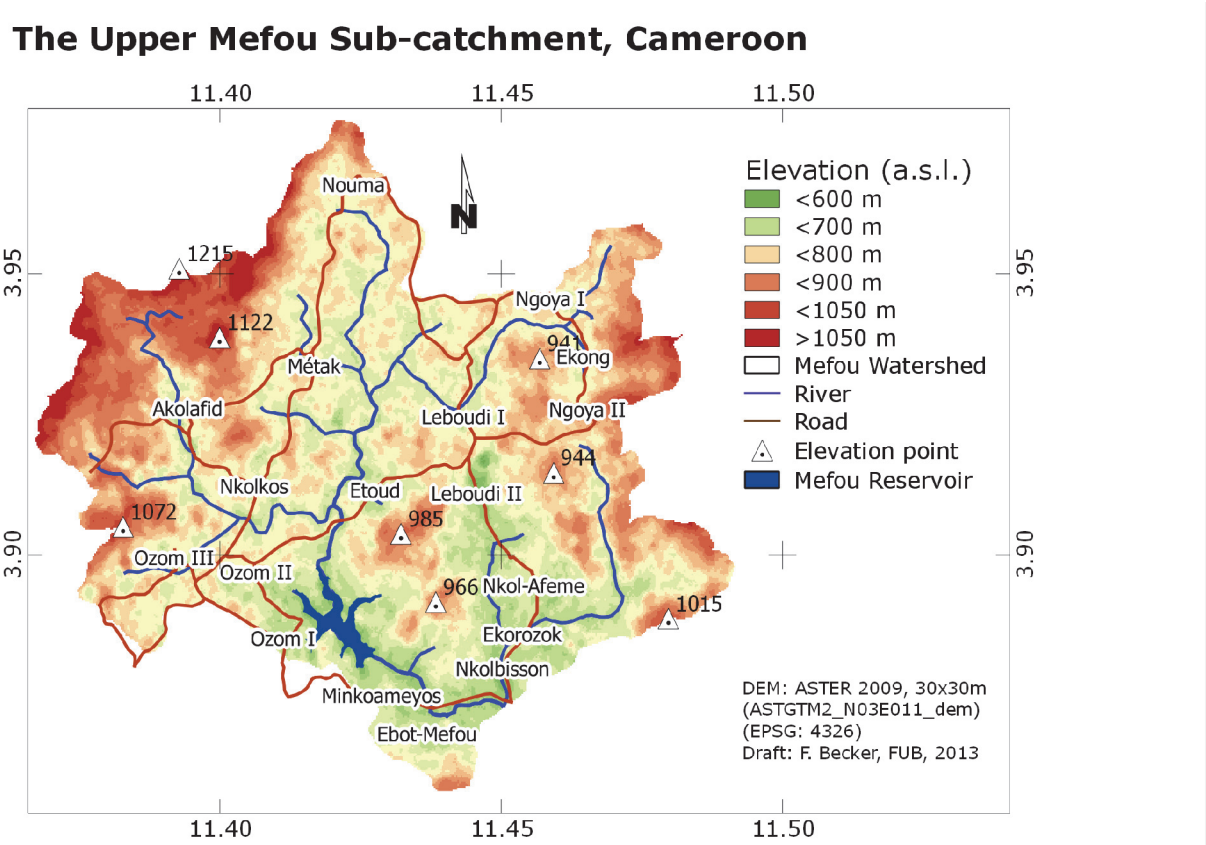

Figure 3: Upper Mefou Sub-catchment

2.2 Geology and relief

The geological setting of the Upper Mefou Catchment is similar to that of Yaoundé and the surrounding areas on the Southern Cameroon Plateau. The Yaoundé belt is a Meso- to Neo-proterozoic unit, aging from 700 to 1000 million years (aka *Panafricain*), on the southern edge of the Central African Fault Belt. The belt consists of granulites and migmatitic gneisses.

The relief of the Upper Mefou Sub-catchment can be divided into three major morphological units:

- The valley bottoms, which are covered by the rivers, floodplains, wetlands and the surrounding slopes. They are mainly located at altitude less than 725 m a.s.l. and are occupied by the Mefou Reservoir, and the densely settled areas of Nkolbission and the villages of Minkoamios, Ebot-Mefou, and Nkolafeme.
- The zone of the middle altitude (peneplains: 725 to 850 m a.s.l.) are rolling hills. Most of the small villages are located here.
- The peaks from more than 850m to the highest point of the Catchment at 1221 m a.s.l. are inselbergs, made up of resistant rock residuals. Except from some rocky outcrops, they are predominantly covered by dense rainforest and are not under human use. The sources of the Mefou River are located here.

2.3 Hydrology

The main rivers of the Catchment are the Mefou itself and its main tributaries, which are the Zamengoe, the Nkoi, the Afeumev and the Benyam. The source of the Mefou River is located in the Mt Mbam Minkom area. Having a total length of 121 km, the Mefou joins the Nyong at Odou. A major tributary of the Mefou is the Mfoundi, which is the main drainage of Yaoundé. An important feature of the Upper Mefou (aka *Mopfou*) is a dam, constructed in 1969 and currently under reconstruction.

The Mefou reservoir (Barrage du Mefou) has a surface of 105 ha, a maximum length of 13 km and a volume 7 million m³. It is located at an altitude approximately 721 m. a.s.l. Between 1976 and 2005 the reservoir was abandoned but the dam wall has been under reconstruction since August 2011. It has an average height of 17.5 m and an average length of 225 m. The water stored in the reservoir will contribute to the freshwater supply of Yaoundé.

2.4 Soils

The soils of the Mefou Catchment are the typical soils of the southern parts of Cameroon. According to the World Reference Database, the soils might be classified as Ferralosols. In the local classification system, there a three subtypes of ferralitic soils.

Red and yellow ferralitic soils cover most of the catchment, especially the mid-altitudes and the summits. They are deeply weathered (sometimes more than 15 m), have a high clay content and are acidic (pH > 5.5). The main clay minerals are kaolinite, haematite, goethite, quartz and gibbsite. At the foot of the hills the soils are more yellow, also rich in clay minerals (especially quartz) and iron, but less stable than the red soils.

Deep red soils are also known as lateritic soils, because of the presence of an accumulation horizon, containing oxides and hydroxides of iron and aluminium. Agriculture on red or yellow soils is possible after clearing the forest, but due to the low fertility of the soils – most of the nutrients are stored in the biomass – the cultivation system has to take into account the poor soil quality. Besides farming, red soils are used to produce bricks to build traditional houses. They are also a relatively good material for creating unpaved roads. Shallower soils are located in areas characterised by high relief and steep slopes. The soils

have low humus content and unweathered rocks are close to the surface. These soils are strongly influenced by tree coverage, in that the roots of the trees tend to hold the substratum in place. Due to their topographic position and the shallow depth of these soils they are normally not used for agriculture.

Hydromorphic ferralitic soils are located In the river valleys. They are of a blackish colour, have higher humus content than the soils higher in the catchment, are therefore more fertile. Yields of plants grown on these hydromorphic soils are much higher than those grown on red or yellow soils.

The concentration of sesquioxides (of aluminium and iron) gives the soils a good aggregate stability, which means their susceptibility to being destroyed by raindrops, or to being transported by overland flow, is low. In addition, the high clay content lessens the risk of soil erosion.

2.5 Climate

The Upper Mefou sub-catchment is located in the equatorial Guinean-type climate, which is characterized by high temperatures (21–23 °C) around the year and a high humidity with pronounced dry seasons. Maximum temperatures are seldom more than 35°C. It is a bimodal climate with two rainy seasons and two dry seasons:

- long dry season from mid-November to mid-February
- short rainy season from mid-February to June
- short dry season in July and August
- long rainy season from September to the first half of November.

The average annual rainfall is approximately 1600 mm, with extremes between 1000 and 2100 mm.

2.6 Land use and land cover

Concerning its natural vegetation, the upper Mefou sub-catchment is located in a transition zone between the dense humid forest of the bimodal precipitation regime and the zone of lesser forests. So there tend to be single huge trees with a more dense coverage of smaller trees and shrubs. The mountainous areas in the north-west and east of the catchment have relatively dense vegetation coverage, except of some rocky outcrops, while the south-east is peri-urban and only the wetlands are covered by natural vegetation.

In accordance to the two rainfall seasons, there are two growing seasons, one from mid-February to June and one from September to mid-November, where the first is most important for agriculture. Planting starts at the beginning of the rainy season. Sometimes maize is sown earlier and cassava is planted when other crops are already growing. Preparation of the fields starts one month before the planting, and includes cutting trees and bush when the field is used the first time, or clearing the fallow. After the field is burned, tillage is done by simple hand-held hoes. There are two types of tillage: with and without ridges. Maintenances of the fields – weed removing – takes place once or twice a

growing season. Some crops are harvested after the rainy season, while cassava will be harvested after a second rainy season.

The farming system might be classified as shifting cultivation. So, a short period of growing (one or two years) will be followed by a long period of fallowing (up to 15 years). In areas with a higher population density, the period of the fallow is shorter.

Figure 4: Land-use in the middle part of upper Mefou sub-catchment

One main feature of the farming system is intercropping, also known as mosaic or mixed cultivation. Up to four crops may be planted in one field. The major crop associations are: maize or cassava combined with groundnuts, beans or sweet potatoes. Makabo or yams are also associated, but may also occur as more or less single plants. Plantain is a major food tree found on fields. Sometimes single palms are used for the production of palm wine (*vin blanc*).

Besides this ways of subsistence farming, the surplus in the production is often sold on the market of Mokolo in Yaoundé. The main cash crops are cacao and palm oil. The plantains meanwhile cover only a small area of the catchment and are owned by local farmers.

2.7 Population

According to the National Census of 2005, the total population of the area is approx. 22 000 people, of which 50.3 % are women. The majority of the people live in the densely settled urban part of Yaoundé in the southeast of the upper Mefou sub-catchment and along the paved roads from Carrefour Nkolbisson in a northerly and westerly direction. The overall population density in the catchment is 227 people per km². The rural areas have an average population density of 76 people per km². An average household consists of 5.6 people.

The upper Mefou sub-catchment is located in the French-speaking part of Cameroon, traditionally settled by Eton-speaking people. In the urban areas, there is a mixture of people with various mother tongues.

2.8 Socio-economic activities

The main economic activity of the population in the rural parts of the catchment is subsistence farming but other income-generating activities are also carried out. In the primary sector these includes the production of cash crops, especially cacao, plantations of which are common all over the catchment. Palm-oil production for food preparation takes place on a relatively small scale. Animal husbandry (chicken, but also some goats and sheep) is mainly a subsistence activity, but a few wealthier farmers produce cattle for the local market in Yaoundé.

The main sources of non-agrarian income are fishing, aquaculture and selling of timber and related products, e.g. for electricity poles. There are a few small enterprises and shops, so working as a taxi driver ("*benskin*") is the major source of income in the tertiary sector.

2.9 Administrative division of the sub-catchment

The entire upper Mefou Sub-catchment is located in the Central Region of Cameroon (*region du centre*). The southeast is located in the Mfoundi division (*department*), which includes the sub-divisions (*arrondissement*) of Yaoundé VII and Yaoundé II. The other part of the catchment is in the Lekie division, which is divided in the sub-divisions Lobo and Okola. The majority of the villages in the catchment are in this division.

Besides this system of administrative organisation, there is also a traditional system of hereditary chiefdoms. Each village in the catchment has its own chief (*chef de 3em degree*) which is supervised by a *chef de groupement* and a *chef supérieure.* The role of a chief is to solve problems of the people living in his area and between the people in his area. This especially comprises questions of land ownership and water resources management.

3 Situation Analyses of upper Mefou Sub-catchment

The upper Mefou sub-catchment faces a wide range of ecological and socio-economic challenges. The following SWOT analysis was carried out by the local chiefs and other participants of the workshop so it reflects their perceptions of the local people.

3.1 SWOT Analysis

Strengths

- A Guinean equatorial climate with an bimodal rainfall pattern
- Water availability and a dense drainage network
- A moderate hilly terrain alternating with a few higher mountains
- Lateritic soils favourable for agriculture
- A valuable natural environment supporting dense vegetation cover, rare and endangered species, sensitive ecological habitats, protected natural sites of special interest, plant species of commercial importance and endangered animal species.
- The availability of land
- A diverse population, consisting of aboriginal (Eton, Ewondo) and immigrant peoples, including Bamileke and strangers from other African countries.
- Bedrock that attracts mining companies
- Mefou dam to supply water to Yaoundé
- A traditional socio-political system designed to stimulate local development.

Opportunities

- Creation of employment with the implementation of some projects:
  - Dam rehabilitation
  - Reconstruction of the Water treatment station of Nkolbisson
  - Construction of Yaoundé – Douala highway
  - construction of roads that will connect villages with the highway
- Aquaculture
- Agriculture
  - Breeding in rural areas of pigs, goats and poultry
- Artisanal hunting
- Exploitation of quarry materials
- Surface mine exploitation
- Forest exploitation of:
  - Timber
  - wood for charcoal
  - Non- timber forest products
- Tourism
  - Rich Biodiversity
  - Presence of endemic species
  - Idyllic view of the lake
  - Panorama of some hills
- Production of hydroelectric energy
- Production of clean drinking water
- Handicrafts

Weakness

- Insecurity which lead to fear and death
- Flooding

Threats

- Limited education of children in the watershed, especially in the rural part

– Diseases caused by insects like mosquitoes, snails and others – Naïvete of stakeholders – Lack of collaboration among different stakeholders, including people living in the catchment area – Insufficient information exchange – Invasive plants – Poor agricultural techniques – Poor cultivation of soil – Excessive removal of timber – Insufficient waste management – Lack of adequate infrastructure – Disparities in access to electricity – Wasting of biomass which can provide energy, gas, etc. – Little participation of population in development projects – Selfish interests – Absence of innovation – Poor use of fertilizers – Pollution of various types – Short coming down of administrators in the area	– Lack of establishment of general and technical primary and secondary education – Deforestation – Accelerated erosion and soil erosion – Increasing urbanization and the destruction of vegetation cover – Poor condition of roads – Ephemeral rivers – Floods in urban area – strong winds exposing plantations and housing – Insecurity and banditry resulting from urbanisation (proximity to Yaoundé) – Land disputes between local and immigrant populations – The rural exodus – Lack of agricultural extension assistance for education of farmers – Vector- water-borne diseases – Increased numbers of mosquitoes and black lies due to the reservoir – The problem of leadership: inclination towards implementation of own instead of community interests

3.2 Ecosystem Services

Intact ecosystems provide the fundamental requirements for life, including clean water, oxygen, and food. They also decompose dead biomass, contributing to the cycling of water and nutrients. The provision of these substances, and the processes involved, are known as *ecosystem services*. Locally, the most important and most easily damaged ecosystems are forests, rivers and wetlands.

Ecosystem services provided by forests

It is easy to see that forests provide important materials such as food, wood for fuel and building materials, and other useful materials such as fibres and medicines. What is less obvious, but globally more significant, is that forests are the most important natural controllers of climate on Earth. By the evapotranspiration of the trees, forests provide water to the atmosphere, contributing to the global hydrological cycle. Forests, by their photosynthesis, provide oxygen to the atmosphere. Furthermore, forest biomass also

contains a large proportion of the carbon found in living organisms on the planet (the sea is the other major source). About 12 million hectares of tropical forest are being destroyed per year, contributing at least a billion tons of carbon to the atmosphere. (Decomposition of agricultural waste adds another two billion). Loss of forest therefore reduces the amount of oxygen in the atmosphere and increases the amount of carbon dioxide, which is a major cause of global warming. Local climate is also affected when forests are destroyed. It is thought that the melting of the glaciers on Mount Kilimanjaro has largely been due to felling of the rainforest on its slopes.

We tend to think of forests as occurring on very nutrient-rich land, because of the huge biomass they support. In fact this is seldom the case: in most forests nearly all the nutrients are bound up in the trees and other plant biomass, and very little is available in the soils. Thus when a forest is felled, the timber removed and the remaining biomass burned, the soils are depleted of nutrients. After a couple of years of agriculture on such land, crops begin to fail unless fertilizers are added to the soil. For this reason, and because their complex plant communities take many generations to develop, forests take a very long time to recover from damage/destruction, if they ever do: forests are not "renewable" in human lifetimes.

How can we protect forests from further destruction? Clearly local people living in the forest need to make a living from agriculture and income from forest products, but it is possible to reduce the impact that they have on the ecosystem. For instance, it is possible to use renewable biomass (e.g. agricultural by-products and understorey plants) for compost or biogas production.

Maintaining undisturbed forests is the best way to maintain the globally important services provided by forests. But this is a great challenge to the local villagers, particularly if they are likely to be paid significant amounts of money by international timber companies wanting to fell the trees. The idea is being discussed of *payment for ecosystem services*: payment (how, by whom?) to countries or local communities to maintain and protect forests rather than destroy them. As yet, there are few examples of payment for ecosystem services world-wide.

<u>Ecosystem services provided by rivers and wetlands</u>

We all know that rivers provide water and seem to remove waste, and that many wetlands support large stands of wetland plants. These aquatic ecosystems also provide many other services, though.

Aquatic ecosystems provide clean water. *Rivers* do this firstly by washing solid and dissolved materials downstream (which may be problematic for people living downstream and using the water). Water running in rivers is also cleansed because rivers provide habitat (living space) for "good" bacteria under and between stones, or in the bed sediments. These bacteria break down (decompose) organic matter, releasing carbon dioxide, most of which escapes into the air, and nutrients, which are washed downstream. *Wetlands* are even more efficient than rivers at providing clean water. The large dense stands of wetland plants act as

filters, slowing down water movement and trapping particles (including sediments, organic matter and bacteria). These particles settle out on the bottom, so water flowing out of the wetland is clear and not muddy. Particles of organic material (including faeces) are decomposed by bacteria on the bottom and in the sediments, being converted to carbon dioxide or methane, and nutrients. Wetlands are Nature's waste-water treatment plants and water-purification works. Artificial wetlands are easy to construct and are very effective in cleansing polluted water.

Wetlands provide hydrological control. Because of the presence of dense stands of rooted plants, wetlands hold back flood waters. Also, the beds of wetlands often contain deep layers of peat, which is dead but undecayed plant material. Peat acts as a sponge, taking up water and releasing it slowly after a flood has passed. At the same time, water seeps slowly down into the ground and recharges underlying aquifers.

Rivers provide materials to the coastal zone. The nutrients transported to the sea by rivers are key to the productivity of the coastal zone. The sea itself is very poor in nutrients and so populations of coastal fishes depend very largely on river-borne nutrients to support the base of the food-chain. In a similar way, sediments transported by rivers sometimes supply sand to beaches. When rivers are dammed, and sediments can no longer reach the sea, coastal erosion can become problematic.

Rivers and wetlands also produce living biomass (e.g. rice, fish, timber, reeds, etc.), much of which can be used by humans, who also practise subsistence agriculture on wetland floodplains. Aquatic ecosystems in general are also valuable resources with regards to recreation and tourism, biodiversity and conservation, and represent important cultural & spiritual values.

3.3 Endangerment of ecosystem functioning of the watershed from opportunities derived by local population

Opportunities...	...potentially leading (or misleading) to ecologically and economically sustainable management of the catchment area...
– Creation of employment with the implementation of some projects: - Dam rehabilitation - Reconstruction of the Water treatment station of Nkolbisson - Construction of Yaoundé – Douala highway - construction of roads which will connected villages with the highway	

– Aquaculture	
– Agriculture	
– Breeding in rural areas - Pig - goats - Poultry	
– Artisanal hunting	
– Quarry exploitation	
– Surface mine exploitation	
– Forest exploitation for the production of: - Timber - Charcoal - Non-timber forest products	
– Tourism - Rich Biodiversity - Presence of endemic species - Idyllic view of the lake - Panorama of some hills	
– Production of hydroelectric energy	
– Production of clean drinking water	
– Handicrafts	

3.4 Description of challenges

Access to potable water

The lack of a drinking water supply system and the lack of boreholes: Nkolmefou village had a public tap in front of the water treatment plant located on its territory. But, with the creation of the dam of AkomNyada at Mbalmayo, this water plant was closed in 1995 and the single standpipe that was aiding local populations with drinking water also ceased to operate.

- the population of the Mefou watershed was thus forced to fetch water, sometimes dirty and unhealthy, from sources such as wells or rivers
- the already difficult situation worsened in the dry season with the drying up of water sources and some wells; silting and cluttering of the streams and rivers in rainy season caused by the erosion of the slopes and runoff (due to impermeability of the soil by the buildings and structures, particularly in the urban fringe of the watershed)
- the Mefou watershed populations are faced with drinking water problem which goes on to aggravate the already very poor living conditions of the local population.

Water quality

The absence or weakness of a water supply system in the Mefou watershed pushes people to look for unhealthy alternative sources of water, thus predisposing the population to a set of waterborne diseases such as malaria, typhoid, diarrhoea, amoebic dysentery, cholera, onchocerciasis or river blindness, and bilharzia or schistosomiasis.

Mismanagement of water resources and the associated risks

Floods and their consequences: material losses (destruction of houses, roads, bridges and structures, and other socio-economic infrastructures, crops, etc.) and deaths of human beings; pollution of groundwater; sedimentation and silting up of the bed of the watercourse; resurgence of water-borne diseases.

The development of mosquitos' breeding grounds due to invasion of the waters of the dam by invasive plants is increasing the prevalence of malaria around the dam. It is also causing cause sanitation problems due to the mismanagement of garbage and industrial discharges in streams, rivers and drains.

Biomass

- Plastic waste, mixed with biodegradable waste dumped in nature, pollutes the environment
- Deforestation for increased agricultural land
- Logging with the sale of firewood and charcoal production
- The disappearance of animal and plant species due to the construction of the dam has changed the ecosystem

- Improper use of chemical fertilizers and pesticides that can not only destroy the beneficial bacteria in the soil but can also pollute streams by runoff and erosion
- The appearance of invasive species that are not necessarily beneficial to the watershed and can later cause eutrophication of the dam or river in the watershed.

Soil

Land degradation caused by erosion due to degradation of vegetation cover, agriculture on steep slopes with poor farming practices that destroy the humus and cause soil infertility.

Demography

- Growing urbanisation (rural exodus, spatial extension of the town)
- Land and ethnic conflicts (insufficiency of spaces)
- Anarchic occupation of lands (non-respect of Urbanism Directive Programme, ineffective administration)
- Urban promiscuity (absence of laws and lack of enforcement of laws)
- Proliferation of violent crimes (high rate of unemployment)
- Hygiene and restoration problems (large populations of very poor people in towns)
- Insufficient basic socioeconomic infrastructure (poverty: source of income insufficient in the decentralized system)
- Lack of training (absence of appropriate infrastructures)
- Pollution (non-respect of Urban Directive Programme)
- Lack of electricity in some localities (source of income insufficiency)
- Lack of appropriate medical assistance, spare-time activities and monotonous lives an obstacle to education (absence of appropriate infrastructures)
- Risk of accidents (poorly maintained equipment used)

4 Institutional Set-up of the Water Sector in Cameroon

4.1 General Description

Cameroon's location on the Atlantic coast in central Africa between latitude 2° and 13° north, has a huge and diversified water resources potential. In terms of quantity, it is the second potential in Africa after the Democratic Republic of Congo. With 208 km^3 of renewable water resources, only 1 km^3 is used for drinking water. The access rate to fresh water is still low and far from the millennium's goal target (43,9%); the rate of water sanitation and hygiene is worse (36%). The gap between rural and urban areas is huge as well as among the ten regions. Since the country's independence in 1960, the institutional set-up of the water sector is under construction while the country is facing growing challenges, namely a fast growing population (2.6% per year) and unplanned rapid urbanization.

4.2 An overview of the main actors in the water sector

In Cameroon, the water sector is managed by the Ministry of Water Resources and Energy. In this ministry there are two departments in charge of water: one for management and the other for the mobilization of water resources. Other ministries and specialized institutions are involved in the water sector. The table below shows the main public actors of the sector.

Public actor in charge of the definition/ elaboration of the national policy.	Ministry of Water and Energy Ministry of Environment, protection of the nature and sustainable development
Public actors in charge of the mobilization/ utilization of water resources	MINEE, MINDUH, MINADER, MINEPIA, MINATD (local council)
Public actor in charge of finance for the water sector	MINEE, MINEFI, MINEPAT
Public actors in charge of facilitation of state activities and research	MINREX, MINATD, MINSANTE, MINRESI (CRH, IRAD, etc…), MINCOMMERCE, MINIMIDT
Actors to whom the government has delegated the competence to manage some aspect in the water sector	Camwater (in terms of maintaining and building infrastructures) CDE in terms of distribution of fresh water in the town

4.3 The legal framework of the water sector in Cameroon.

The rules and regulations governing fresh water and sanitation in Cameroon come from two main sources:

- The international norms or conventions that Cameroon has ratified. One of the most important is that the country is committed to achieve the Millennium Development Goals concerning the water sector; another one is that Cameroon has

adopted the 4 Dublin principles concerning Integrated Water Resources Management (IWRM).

- The national development policy. Since 2009, Cameroon has elaborated a policy called «Vision 2035» whose aim is to transform the country into an emerging one by 2035. This vision is planned to be implemented between 2010 and 2020 through the Growth and Employment Strategy Paper.

The legal framework comprises the following rules and regulations.

The laws:

- Law No. 96/12 of 5 August 1996: on the environmental management states that waste should be treated in an environmentally sound manner. This Act gives powers to the decentralized local authorities to take measures for their elimination.
- Law No. 98/ 005 of 14 April 1998 on water regime; which states (Article 2, "1") that water is the national heritage which the State ensures the protection and management and provides access to all. Nnother provision of the Act (Article 25) stipulates that the administration responsible for the management of water resources provides an inventory establishing the degree of pollution of inland waters, depending on the physical , biological and bacteriological criteria chemical . This inventory is reviewed periodically or whenever an exceptional pollution affects the status of these waters.
- Law No. 2004 /18 of 22 July 2004 laying down common rules which defined the powers transferred to municipalities including drinking water resource protection in groundwater and surface water among others.

Rules and regulations

The sector has a clear regulatory framework provided although some regulations arising directly above legal provisions are still expected. We include among others:

- Decree No. 2001/216 of 2 August 2001 on the establishment of a special account to finance sustainable development projects for drinking water and sanitation
- Decree No. 2005/493 of 31 December 2005 laying down the procedures for the delegation of public services of drinking water and sewerage in urban and suburban areas
- Decree No. 2001/161/PM 08 May 2001 fixing the responsibilities, organization and functioning of the National Water Committee
- Decree No. 2001/162/PM 08 May 2001 laying down the procedures for designating sworn agents for monitoring and control of water quality
- Decree No. 2001/163/PM of 8 May 2001 regulating the protection perimeters around points catchments, treatment and storage of water potabilisables
- Decree No. 2001/164/PM 08 May 2001 specifying the terms and conditions of samples of surface water or groundwater for industrial or commercial purposes.

- Decree No. 2001/165/PM 08 May 2001 specifying the terms of protection of surface water and groundwater against pollution
- Decree No. 2010/0239/PM of 26 February 2010 laying down the procedures for the exercise of certain powers transferred by the State House of Commons in drinking water in areas not covered by the public distribution network water granted by the State " Project management and management of wells and boreholes (studies, construction, conservation, protection and sustainable use of water, care and maintenance , hygiene measures, etc)"

4.4 The State of fresh water supply in Cameroon

Rate (%)	Rural	Urban	National
Access to fresh water	27,7	75,1	43,9
Sanitation	14,2	66,4	36,6

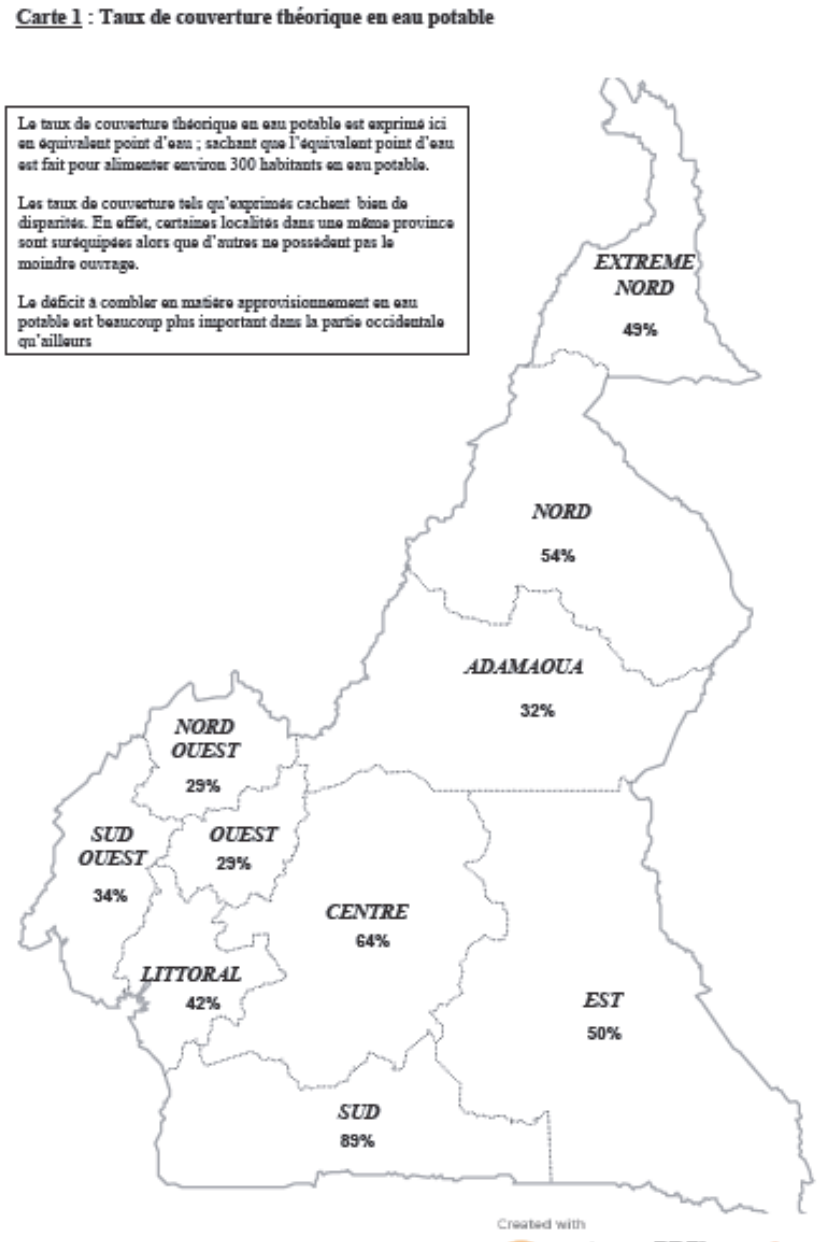

Figure 5: National coverage of drinking water

Water supply infrastructures coverage

Many types of water infrastructures exist in Cameroon: water pumps, wells, water pipes, dams, etc. The theoretical rate of drinking water coverage is expressed by equivalent water points. An equivalent water point is the hydraulic unit designed to supply a population of about 300 people with drinking water.

The map below shows major disparities. Indeed, some areas within a region are over-equipped while others do not have any infrastructure. The need for water infrastructure is greatest in the northern part of the country.

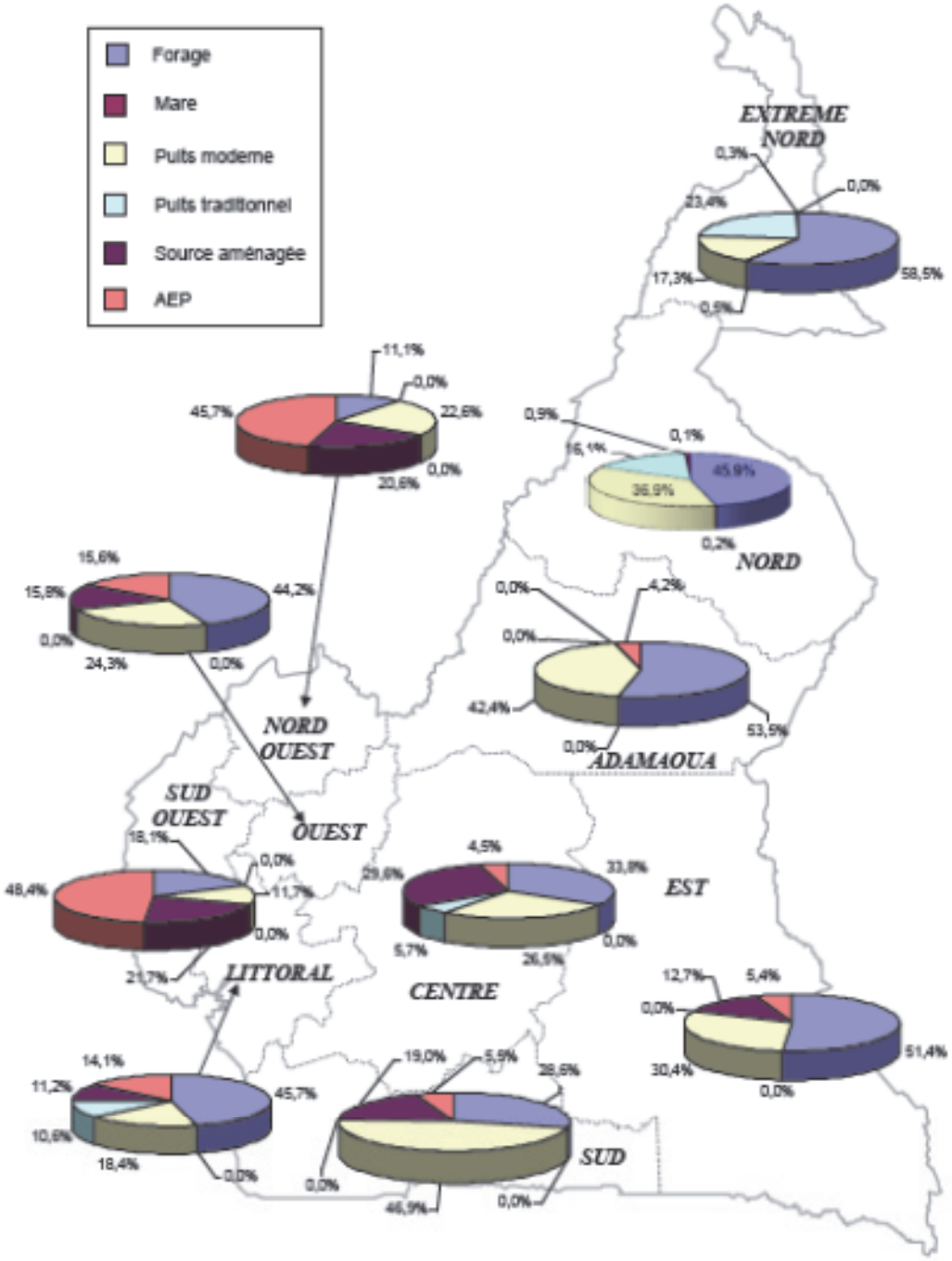

Figure 6: Hydraulic infrastructures rates in Cameroon

4.5 Opportunities in the water resources sector

Opportunities in the field of drinking water and sanitation can be summarized as follows:

- The elaboration and adoption of a master policy document to guide all water interventions in the sector
- The implementation of IWRM principles in the management drinking water's sector
- The definition of status for both watersheds and water points
- The reactivation of the National Water Committee and the operationalisation of the Special Assignment account
- Capacity building of regional and local authorities in the conduct of programmes and management structures
- The adaptation of training and employment in institutions at national level
- Taking into account the commitments made in different forums
- Technological improvement
- The finalization of the National Action Plan for Integrated Water Resources Management (PANGIRE)

4.6 SWOT Analysis

Strength	Opportunities
– Sustainable management of natural resources is one of the key issues of the national development policy, stated mainly in "Vision 2035" and "Document of Strategy for Increase and Employment" – Huge potential for hydropower (the second in Africa) – Many hydraulic infrastructures – Democracy is the political system in Cameroon and it stipulates that people are free to create or to participate in association, political parties, enterprises – Cameroon has adopted many international texts/conventions on water and is implementing some of them	– Ongoing process of establishment of the Integrated Water Resources Management in Cameroon – Local committees of water management created where infrastructure to provide fresh water has been built – The existence of a legal text which authorizes the creation of association (law N° 20/053 of the 19th December 1990). – Many projects, financial and technical opportunities linked to the participation of Cameroon in many regional/ International organizations concerning water
Weakness	**Threats**
– Absence of a juridical framework recognizing and organizing the management of watersheds	– Rich juridical framework (many legislative and regulating texts) – Conflicts among administration (example:

– The law of 1998 on the water sector is old; it is no more adapted to the context and the current challenges. – Competences or mandates concerning the water resources sector are scattered in many governmental structures, so coordination is difficult or impossible. – Little communication between governmental and non-governmental bodies operating in the water sector – The ministry in charge of water is at the time coordinating the energy sector; difficult to concentrate on the water sector – Incomplete inventory of hydraulic infrastructures built by governmental and non-governmental organization. – Attributions between governmental administrations working in the water are not precise and it lead to confusion – Insufficiency of provision in terms of availability of resources, policies – Insufficient human resources – Insufficient finance	between the ministry in charge of water and the one in charge of mining about auhorization to exploit water) – Embezzlement – Misinformation – Incividism and vandalism mostly on of water infrastructure – Extreme weather effects – Rapid deterioration of infrastructures

5 Establishment of a Water Resources Users Association

5.1 Introduction

A Water Resources User's Association is a medium for beneficiaries to discuss and agree on the best way of utilizing water resources in a catchment sustainably. It is created to enhance the participation of the local communities in the management of water resources. The medium provides a platform for stakeholders with varying interests, by sharing a common water resource, to negotiate how the resource will be protected, managed and shared with equity for the benefit of all stakeholders. The idea revolves around the principle of local users taking responsibility for the guardianship of their own resource. It can be developed or formed as a direct response to crisis or a realization that it is better to be prepared to face shortages than to wait to react when they occur.

WRUAs implement governmental water resources policies at the community level and act as environmental policing agents. The WRUA is not a part or a representative of the government at the local level but rather an active partner in water resources related issues and management. The association is owned by its members, who are united in conserving a natural resource thereby making management free from official interference and control from external sources. The WRUA is a typical example of a bottom-up approach in managing natural resources.

5.2 Vision

Management of catchment water resources for sustainable development

or

A lead catchment intervention agency influencing efficient and sustainable water resources management as well as preserving and improving on biodiversity in Cameroon.

5.3 Objectives or mandates

- Sensitization of the population to good environmental practices such as
  - Sanitation
  - Soil and water conservation
  - Integration of scientific and indigenous knowledge on sustainable resources management
- Serve as a platform for conflict management among resource users
- Training and capacity building in sustainable environmental management (Trainer of trainees, education on environmental issues even at primary schools)
- Serve as intermediary between the local population (voice of the people) and other stakeholders in the catchment
- Be the whistle blower on illegal activities within the catchment
- Implement government policies related to environmental issues in the catchment.
- Discuss potential projects and developments that may affect water usage with a view to obtain the consent of other WRUA members and the public

- Lobby for resources to improve availability, reliability, quality or other aspects of the water resources

5.4 Activities of WRUA

- Promote legal abstraction of water from the rivers in the catchment
- Promote efficient and proper use of the available and potential water resources
- Promote sustainable water use, management and development
- Promote soil and water conservation practices within catchment areas
- Promote conservation of water quality in the river
- Provide a forum to discuss, prevent and resolve water use conflicts
- Promote afforestation of indigenous trees in the catchment

5.5 Formation and status of a WRUA

Initial sensitization should be done by chiefs and participants from the workshop on integrated management and capacity building.

A small interim committee from the workshop should be setup to facilitate the formation of the WRUA in the upper Mefou sub-catchment. This should be made up of the local project coordinator, the chiefs or a representative of the chiefs, a representative of CAMWATER and a representative from the ministry. This committee should immediately be dissolved as soon as the executive committee of the association is elected.

Foreign students carrying out research in the catchment should be encouraged to sensitize and educate the populace on the benefits of IWM and the importance of WRUA

Young people trained by CAMWATER to plant trees in the catchment should be encouraged to educate the populace on the importance of tree planting in IWM and the roles and importance of WRUA in catchment management.

The whole process shall refer to the law on association development of 1990

5.6 Proposed structure of WRUA in the Mefou catchment

Membership should be opened to all stakeholders within the catchment such as private households, institutions such as schools, hospitals, churches, commercial and industrial (Identification of all stakeholders with interest in the catchment) but subject to registration.

All registered members form the General Assembly (GA) who elects their representative into the Management Committee (MC) of WRUA who then elect Executive Committee members (EC).

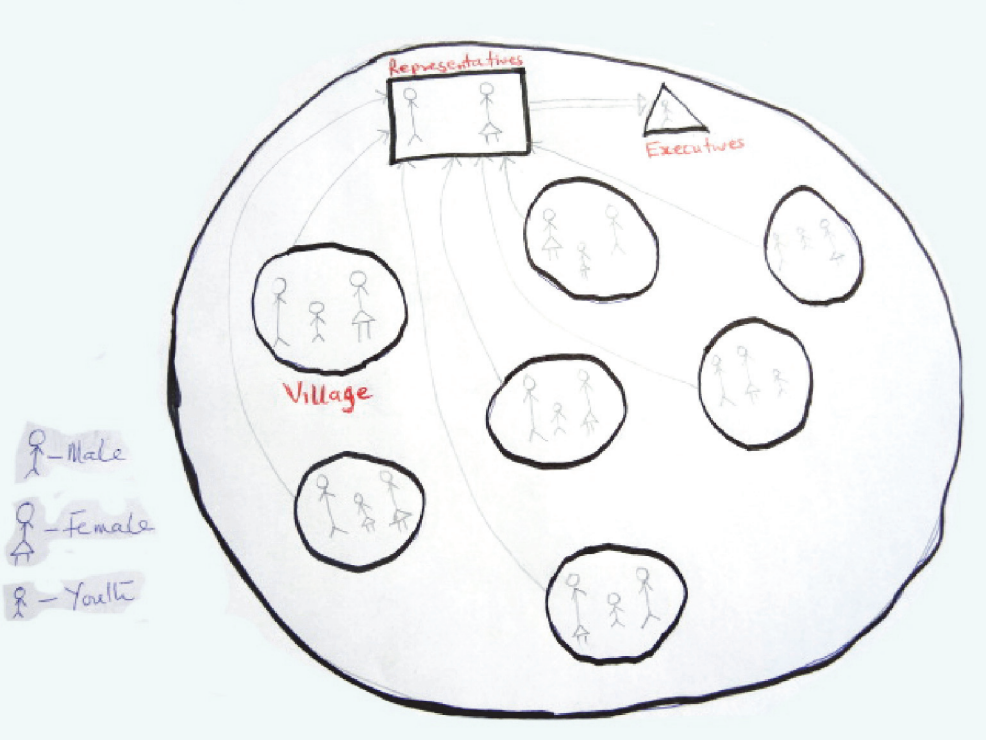

Figure 7: Schematic representation of WRUA structure

The figure above shows a schematic representation of WRUA structure. At the village level, all registered WRUA members elect eight (8) representatives into a management committee (gender equity emphasized e.g. three out of the eight representatives can be women and a youth). The management committee acts as board of directors of the WRUA. The management committee then elects members of the executive committee and the latter ensures the daily management of WRUA

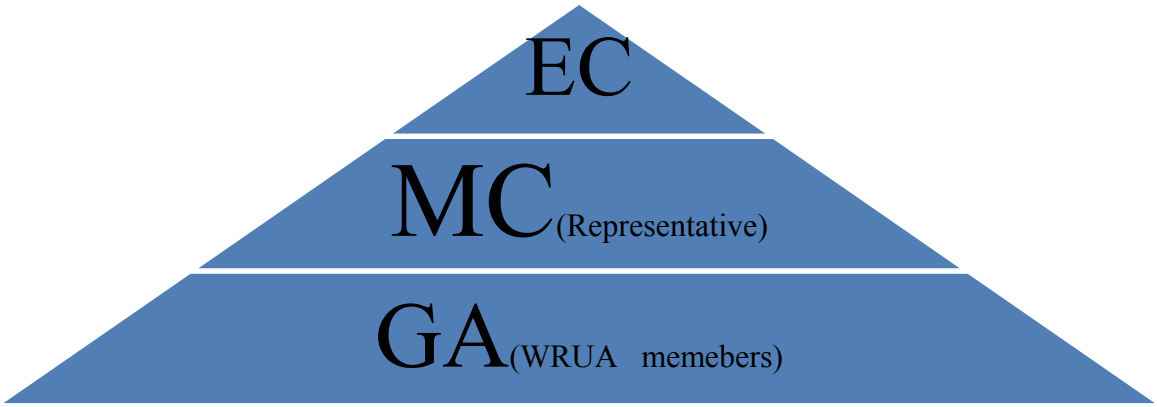

Figure 8: Proposed hierarchy for WRUAs

- General Assembly (GA) – should be made up of all registered members from the various villages
- Management Committee – should be a representative of all the villages composed of male, female and a youth
- Executive committee – should be elected by the Management committee (representative) and should reflect gender equity

5.7 Proposed Composition of a WRUA

General assembly

- Management committee
- Executive committee should be made up of:
    - The president
    - Vice president
    - Secretary
    - Deputy secretary
    - Treasurer
    - Financial secretary
    - Two technical advisors
    - Tenure of office of Executive Committee

The mandate may be for two years with the possibility of re-election only once.

The General Assembly meets at least four times a year (but an extraordinary GA can be convened by the president) to:

- Elect representative into MC
- Vote budget
- Discuss and review report from the EC
- Resolve issues not able to be resolved by EC
- Quorum of more than 50% of active members (define later)
- Development of internal rules and regulations
- By the members when the association is formed taking into consideration the rules and regulations as stipulated within the framework of the existing laws in Cameroon
- Location of the headquarters (fixed or rotatory)
- To be determined by the WRUA members

5.8 The strength of a democratic WRUA

- Enjoys legitimacy because it is elected by the people and represents the people
- Builds a sense of ownership-involvement
- Promote participation of all stakeholders
- Promote the bottom up approach and address grass root problems
- Enjoy a united and strong bargaining power
- Can easily lobby and appeal for funds for projects and the daily management of the WRUA

5.9 Proposed communication plan

STAKEHOLDERS	INTEREST	METHODS	IMPORTANCE
Ministries of water/ energy, Environment, Mines, Agric.	Development projects Fund raising Reporting illegal activities New policies and implementations Capacity building Close collaborations	Letters Memos Seminars Workshops Proposal writing Event organization SMS Social media	Make the WRUA powerful in tackling illegal activities in the catchment Influence decision affecting the catchment Keep them up to date with new policies and legislature Awareness of what is happening in the catchment
CAMWATER			Building partnership Enabling WRUA to grow To avoid duplication and conflict with the catchment Facilitate the development of IWM
University Research Institution	Training and capacity building Sharing of newly discovered scientific and indigenous Knowledge in IWM		Technical assistant in the development and management of the catchment

Other Institutions eg. NGOs UNEP GIZ UNHabitat Other WRUAs	Capacity building Fundraising Sharing of experience		Learn new techniques in Environmental management Sharing of new experiences
Communication among members (WRUA)	Announcement of meetings Feedback from members Event organizations	Notice board Letters Posters Flyers SMS Minutes from previous meetings Word of mouth	Enable every member of the happenings in both the WRUA and the catchment Sensitization and awareness-creation among members Implementation of the concept of IWM Foster understanding and social cohesion Sustain the existence of WRUA

6 Impressions from Mefou Catchment Area

Figure 9: Urbanisation in the lower part of upper Mefou sub-catchment

Figure 10: simple gauging station downstream the outlet

Figure 11: Waste dumping and water pollution

Figure 12: Mefou reservoir

Figure 13: Stakeholder discussion at Mefou dam

Figure 14: Road infrastructure in the middle part of the catchment

Figure 15: Deforestation in the catchment area

Figure 16: Agricultural activities in the middle part of the catchment

Figure 17: Tree nursery in the middle part of the sub-catchment

Figure 18: Upper part of upper Mefou sub-catchment

7 Description of Implementing Project "Integrated Watershed Research & Development Capacity Building"

The international university project "Integrated Watershed Management Research & Development Capacity Building" is designed as an interdisciplinary research, development, and capacity building project of Freie Universität Berlin, United Nations University, Kenyatta University, University of Cape Town, University Yaoundé I, and the consultancy IWM Expert GmbH.

These days Integrated Watershed Management (IWM) is a widely accepted concept for the sustainable management of human and natural resources of a watershed in order to keep and increase livelihoods of the local population. Management and development competences in the sector of IWM are lacking, not only due to missing capacity building opportunities, but due to a severe communication gap among the different IWM stakeholder: researchers, regulatory authorities, water resources users associations and other community based organisation.

The overall objective of this project aims at strengthening information and knowledge transfer among the different stakeholder groups with regard to IWM. Thus, the project contributes to reach the MDGs 7 (ensure environmental sustainability) and MDG 1 (eradicate extreme poverty and hunger) and supports international exchange in research and education.

Freie Universität Berlin

Project Applicant and Management

Kenyatta University

Project Partner

University of Cape Town

Project Partner

University Yaoundé I

Project Partner

United Nations University

Project Partner

IWM Expert GmbH

Project Management

Within the general framework of the IWM R&D CB-project, activities also took place in Cameroon. The project is situated at the Higher Teachers' Training College and the Faculty of Sciences of Yaoundé I University.

The activities of the project in Cameroun comprise the following:

- Initialisation of the project at ENS and the Faculty of Sciences of UYI
- Project implementation in November 2012 with Partners from Freie Universität Berlin and Dr. Stefan Thiemann
- Project administration
- Various project meetings
- Design of a project poster
- Initial meeting with chiefs in the Upper Mefou Sub-catchment
- Regular field trips by local students including data collection for their M.Sc.-theses
- Joint field research of two German M.Sc.-students and students from ENS and UYI
- Meetings with national and international organizations and officials and participation in the international water day
- Participation in the evaluation of the National Water Resource Management Plan (PANGIRE)
- Organization of the present training course (14.11.2013–24.11.2013)

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