

Mission Report Kenya

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Summary

This mission has been formulated within the framework of the ADAPTS program. This program aims at *'Increasing developing countries' adaptive capacities by achieving the inclusion of climate change and adaptation considerations in water policies at the local scale'*. Under the ADAPTS program, a set of pilot areas will be selected that relate to ongoing local water management activities. These pilot areas will be used to assess the robustness of these ongoing activities against long-term climate change impacts. Each of the pilot studies will be coordinated by an NGO.

One of the potential pilot studies is located in Kenya within the Kitui district about 150 km's east of Nairobi. During the last 10 years, a local NGO called 'SASOL' has implemented a methodology to mitigate droughts by developing so called 'sand dams'. An average dam costs about U\$ 5,000 and is built through community inputs. The dams allow for storing water within an artificial sand aquifer that is created behind the dam. In this way, water loss due to evaporation is reduced to the minimum. Within 10 years, SASOL has developed 435 dams that currently offer water in the dry seasons to 150 people per dam on average. Hence, about 60,000 - 65,000 people have already been provided access to water during the dry season with an investment of U\$ 34.80 per capita. The average walking distance to water per capita (one of the prime targets of the government) has been reduced dramatically. The availability of water also made the region suitable for growing cash crops. As a result, economic growth has been increased in the region.

The main objective of the mission to Kenya was to establish contacts with stakeholders dealing both directly and in-directly with the 'Kitui Sand Dam project' in central Kenya and conduct a field visit. From these interviews, local and national needs for supporting the sand dam activities from the ADAPTS project could be identified.

There are three main issues that require ADAPTS support:

(1) Setup and support of a dialogue among stakeholders at different levels. Stakeholders include representatives from the government, research and NGOs. The dialogue should aim at safeguarding the success of local water management initiatives such as developed by SASOL by strengthening local and national water management policies. Important is to address long-term developments such as climate change.

(2) Development of a database --quantifiable data and information on the SASOL project activities is still largely missing. Although studies are currently being executed, no database on socio economic or hydrological indicators is available

(3) To assess long term effects on the sand dam construction. Climate change effects are currently not considered in the planning and development of the sand dams by SASOL. Similarly, the regional and national government has development a new water act, but climate impacts are still poorly addressed.

The mission interviews were conducted involving officials in Nairobi, and in Kitui district. Field visits to dam sites were held in the Kitui district.

1. The Kitui Sand Dam project ¹

The SASOL Foundation, a local NGO in Kenya, supports communities in the district of Kitui with developing so called Sand Dams. Thus far, 435 dams were developed – the highest concentration of sand dams in the world. This dense construction allowed an increase in water storage within (seasonal) rivers. Sand dam technology is simple, and uses predominately materials that are found locally. The construction itself is guided by SASOL but actually conducted through participatory development by farmers living near the dam. This makes it economically and socially effective. Only 45 percent of Kenyans have access to clean water for domestic use, and even fewer have access to water that is fit to drink. The acute water scarcity forced girls and women to walk up to 10 miles to water sources such as springs and scoop holes. SASOL's strategy was to reduce the distances to water sources to less than two kilometers and make water available for irrigation for the first time in this region. This goal has been achieved. Over the past 10 years the Kitui district has changed from a food importing district to a food exporting district.

The sand dams differ from traditional dams by not only storing water in upstream reservoirs, but also storing water within the sand and gravel particles accumulating against the dam. Coarse gravel and sand can store and retain up to 35 percent of its total volume as water. This water is captured for use through an ordinary well or tube well that is dug into this storage material. In this way, the stored water is protected against high evaporation losses. At certain locations where a soil of black volcanic ashes is present, replenishment of groundwater uphill is recorded. This type of soil has a high potential for holding water.



¹ *this introduction was largely copied from SASOL information published in 2004*

Figure 1: Example of a Sand Dam. The word 'sand' refers to storing water within the sand that accumulated behind the dam. A 'mature' dam is a dam where sand is accumulated to the highest level of the dam, hence generating the highest potential for water storage.

The construction of a dam starts with organizing the farmers and inhabitants of the community living along a stretch of river in a user group. Usually the group consists of around 26 families. Through the years SASOL became experienced with stimulating self organization. The user group decides which person(s) will take lead and function as focal point for the group. Usually the focal point is one of the elderly, but sometimes it is one of the young people. Through a series of meetings with the focal group the principle of the sand dams and the optimal conditions for its location is explained. Then the group and a technician of SASOL, which will assist the group throughout the construction of the dams, walk through the river bed to point out the best locations for the dam. The user group will put forward the best location on the base of user friendliness, like distance to the houses and the vicinity of roads. The technician will emphasize on the technical aspects, the dam must be constructed between hard rock and the base of the dam also needs to be on the hardrock (bedrock) to minimize the seepage of the dam. The river bed shouldn't be too broad and the banks need to be steep, this to minimize the construction costs. The goal is to find an optimal location, but the technical conditions are of most importance (see Figure 1).

After choosing the location the construction starts with digging a ditch in the river bed to reach the bedrock. The work is done by a group of circa 15 persons, which is changing over time. Who is delegated is decided by the user group. After the stretch of the dam is dug, it is filled with a mixture of building blocks (mined locally) and cement (supplied by SASOL), the dam is also reinforced with metal to improve the coherence of the dam. The construction normally takes 2 months and the material costs lay around U\$ 5000.- . The number of dams constructed by a user group depends on the length of the river, the number of suitable locations and the availability of funding. The user groups are responsible for the maintenance of the dam, because they invested a lot in the construction and thus own the dam they are eager to do this well.

Before the construction of the dam the river runoff had the form of flash floods in the rainy seasons, April-May and September-October and the rest of the year the river stood dry. After the dam is finished the first runoff is captured and the people can use the water instantly. The dam however is not "mature" yet. This will take 2 to 5 years; the fine sediment in the vicinity of the dam must be replaced by coarser sediments like sand and gravel, this is visible on the left side in Figure 1. These have a better water holding capacity and it is easier to extract water from. This replacement of sediment happens automatically through processes in the river. Meanwhile the farmers will cultivate the lands, this means the shrubs are cut and terraces are constructed to minimize erosion. SASOL actively promotes conservation agriculture in combination with dam construction. The information is transferred through the user groups.



Figure 2: Well with hand pump.

The user group also builds a hand pump well besides the dam (see Figure 2), for extracting drinking water. These wells are constructed by the FAO guidelines. The use of the wells vary between the user groups, when drinking water is available during most part of the year near their homes they only use the well during the dry period. When there is no easy access to water, the well is used throughout the year, saving the woman time. This time they utilize for starting up new activities like braiding baskets and through this broadening their economic basis and making them less dependent on agriculture. The water is also used for irrigation, both through simple scoping holes and the placing of water pumps. The availability of water during the whole year leads to cultivation of tomatoes, unions, mango, citrus, sugar cane, banana's and so on. During the dry period the water is also used for the production of bricks, an activity that is widespread in the district. Individual farmers start experimenting and develop innovations, like water harvesting from roads. This new knowledge spreads easily through the user groups. This fits in the philosophy of SASOL, making water available to the local people and let them decide what they do with it. These decisions are supported by the water user groups.

2. The ADAPTS programme.

Introduction

Currently 800 million people suffer from hunger, among them 200 million children under five years of age. It is estimated that by 2025 cereal production has to be increased by 38% to meet world food demands (FAO, 2003). The IPCC (2001) states that climate change and climate variability will reduce the potential for increasing both food- and environmental security and that the urgency to take action is more apparent than ever. The poor are particularly vulnerable to climate variability.

Climate change is expected to increase the severity, duration and frequency of these extreme events, threatening water availability and food security for millions of poor people. Hence, it is clear that adaptation strategies have to be implemented from the level of farmers to communities to national governments (Aerts and Droogers, 2004; Dialogue on Water, Food and Environment, 2003).

Adaptation and water management

Meanwhile, the adaptation agenda is a relatively new one. In fact, most development agencies and national governments have only recently started to consider and discuss adaptation to climate change. As a consequence, discussions have remained on a conceptual level. Given the growing interest in the subject of adaptation, there is a need to start identifying and implementing potential adaptation measures and to integrate adaptation into ongoing policy discussions. Water managers and policy makers have a key role in the development of adequate adaptation strategies –at all levels. A huge challenge for water managers lies in finding adaptation strategies that alleviate impacts from climate change, assures food production, sustains people’s livelihoods and ultimately contributes to rural and urban poverty alleviation.



Figure 3. Potential case study areas in the ADAPTS project

Methodology

Key challenges addressed by the ADAPTS program are the effective inclusion of local actions and knowledge. ADAPTS makes an effort to mainstream climate change and adaptation concerns by linking ADAPTS to ongoing local activities (Figure 3).

For this, the project will be divided in an inception phase 0 and three main project phases 1, 2, and 3 (Figure 4). The Inception Phase (phase 0) will identify ongoing local activities and local counterparts, existing information and information gaps on local and national/ basin levels, relevant policy processes, and local and national/ basin coordinators. An assessment of 9 pilot areas will be undertaken. After the selection of project basins, the activities in each basin will be divided in three phases. The first phase will be devoted to set the conditions for a dialogue process with stakeholders. Phase two will be devoted to the dialogue process per se, resolving conflicts and developing plans for executing a set of pilot adaptation projects. The final phase will focus on the implementation of adaptation projects.

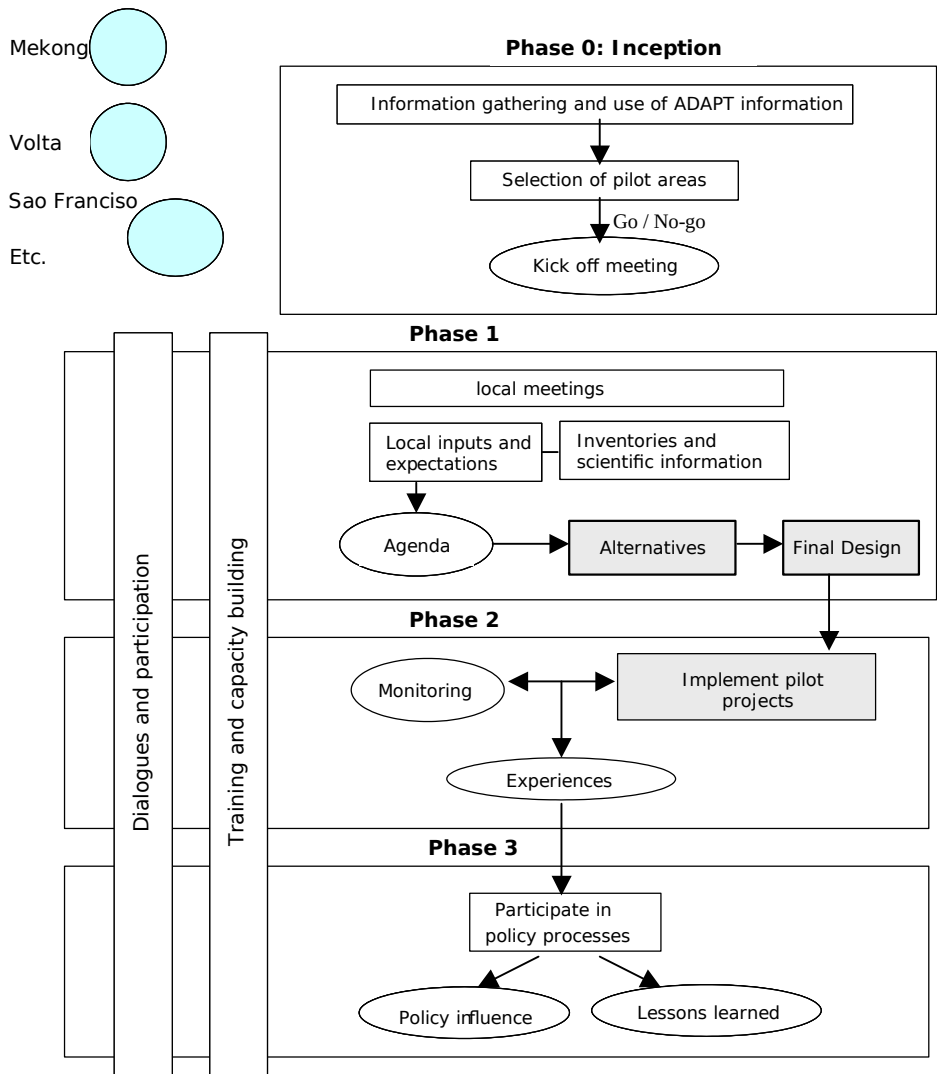


Figure 4. ADAPTS Project approach.

3. Interviews

This chapter describes the interviews that were held with stakeholders during the mission to Kenya.

Person: Mr. Augustus Musiki Ndingo
Institute: Ministry of Water Resources, district Kitui
Date: July 26th

Goal of the ministry is to provide water to communities. To achieve these objectives, there are policies. NGOs help to achieve targets, e.g. the SASOL sand dam project. Within the context of this project, the ministry is helping and training the communities to control the dams. The basic idea is that after training, communities deliver information to a central office on a regular basis.

Results: In terms of achieving targets: SASOL has begun to work during the early 1990s. Before 1990, only 10% of the rivers have been developed as potential reservoir for groundwater. After the 1990s this has risen to 25%

The results are very good: (1) the yield has increased through improved micro irrigation. More fruits and cash crops are being cropped. (2) Before the 1990s, many people had to walk more than 10km to have access to water

Communities: The Ministry is developing a attachment approach: this means that communities within a catchment are being organized. These communities have to report about the water conditions to the ministry.

Challenges: recharge to deeper aquifer could be improved> water could be pumped to wider areas.

Climate change: There are two seasons: the long and the short rainy seasons. Before the 1980s, the long season was reliable, and one knew how much rain would fall. During the last 25 years, the absolute quantity of rainfall is the same, but rain falls more in extremes.

Person: Mr. Manandu
Institute: Ministry of planning and national development, district Kitui
Date: July 26th

Goal: Ministry coordinates all NGOs, Civil society, public sector and private sector activities to achieve development goals and at the same time prevent duplications. Important are the economic targets that are mentioned in the National / district development plans. SASOL is part of the hydrological sector.

For example: there are targets for a maximum walking distance for farmers to water. This needs to be reduced; from 5 km in 2002 to a maximum of 2 km in 2008.

Indicators: Water resources management is top priority in the Ministry. Out of a survey under the inhabitants of Kitui on the PRSP, water was identified as the most important problem for them. Out of the PRSP regional poverty indices have been formulated: Website www.cbs.go.ke

Climate change: CC is a very big issue. There are early warning systems for food security, and Kitui was a pilot area for an FAO project on drought management. Every 10 years a period of a few dry years occurs. The district needs to learn to plan ahead to cope with these dry periods. The ministry has developed long term planning strategies for 2015-2020. For these years, poverty has to be reduced with 50%.

Communities: SASOL is doing a very good job; the communities are committed. They are spreading knowledge on cost efficient methods for water harvesting. The ministry would like to see that this information is spread beyond the district boundaries.

Person: Ms. Victoria Mbengi, farm management officer
Institute: Ministry of Agriculture, district Kitui
Date: July 26th

The ministry informs the farmers on which crop types are most fit for their farm conditions. These are coupled to ecological zones. The information is transferred to the farmers through meetings and field days. The meetings are organised round woman groups, farmer groups and basin community groups. These groups also report back to the ministry.

The ministry gathers information on rainfall (airports) and food security. This information is used for an early warning system for the region. All the agriculture in the Kitui district is rain fed, only in the vicinity of sand dams irrigated agriculture is possible. Irrigated farms grow cash crops like vegetables, fruit and horticulture. They do this because irrigation is expensive and they need to make money to compensate for this.

Person: Mr. Micheal ***
Institute: Data analyst, land resource management programme of World Bank
Date: July 26th

He works on development of drought early warning system. They receive each month data from 10 sample areas on land assets, water conditions, nutrition's, human health, livestock, etc. If these indicators show an upcoming crisis through e.g. drought, the Kenya food security meet together with donors is warned. They can provide relief, after having done an independent assessment. Relief can be provided in 10-14 days.

There is also a preparedness program by the development of boreholes.

There is a big difference in farmers near a dam compared to other farmers: They are more resilient. Farmers to dam can e.g. grow Napia grass which can be feed to animals

Person: Ms. Charity Myaga
Institute: researcher
Date: July 26th

Ms Myaga performs a socio economic impact study of sand dams, this study is guided by Dr. Verel (?). It will take another 2 months before the results are ready. Households are being interviewed on the benefits of the dams in terms of socio economic indicators

Already it seems that one important result of the dams is that they support farmer practices innovation.

Person: Prof. Dr. Eric O Odada
Institute: University of Nairobi, Department of geology
Date: July 28th

Goal:

This meeting was set up to establish cooperation between SASOL, the Free University Amsterdam and the University of Nairobi. It is suggested that the SASOL project needs quantitative data on their results. This could be facilitated by the University of Nairobi. Information is especially needed in the area of hydrology, climate and meteorological data and socio economic parameters.

This was a very productive meeting. Prof Odado is very interested in the subject of climate change and water management. He proposes to involve student or post Docs in the project and even can provide on funding for field work. The professor has a large network and he can introduce us to the right persons for this project. The planning is as follows; at the start of the project a 2 day workshop is organised in Nairobi to specify the work plan and to agree on which partner will carry out which part of the work.

Indicators

For Africa a quick assessment has been done on basin scale and the indicators / parameters used in this study (p. 3 of Vulnerability of water resources to environmental change in Africa) can be used as a starting point for the detailed local research. It is the goal that throughout Africa the quick assessment is detailed by local research.

Climate change

There is a drop in the total amount of precipitation and a shift in intensity. The precipitation falls in less days and in more intense events. Prof. Odada thinks this is mainly caused by changes in vegetation.

Person: Mr. Calistus Wachana
Institute: Kenyan Meteorological Service
Date: July 28th

A short visit has been paid to the meteo office in Nairobi. In order to estimate impacts from climate change, it is necessary to first examine historical meteo data from the Kitui region, such as: precipitation, evaporation and temperature. There is data from 1906 to the present.

It is agreed that a detailed request will be made to the Met office.

Person: Prof. Dr. L. O. Gallo, David Adegü
Institute: IGAD - WMO

Date: July 28th

Goal

The IGAD is specialized in drought management and drought early warning. They use meteosat information for supplying information on rainfall for whole Africa. (www.dmcn.org). The ADAPTS project sounds very interested for IGAD. For their analysis the following information is used: precipitation, min. / max. temperature, evaporation, some modelling. The information is gathered at metrological stations in Kenya. We can list what information we need for the project and the IGAD will tell what information they can supply. Dr. Gallo proposes that Mr David Adegu will be the contact person.

IGAD participate in NEMA (National Committee on Climate Change). This is a meeting where all ministries and other institutes participate. They also contribute to the UNFCCC, the first communication is finished, now they are working on the second communication.

Climate change

For Kenya it seems the minimum temperature is rising, the intensity of precipitation is rising but the total amounts per year stay the same.

Person: Mr. Patrick Oloo
Institute: Ministry of Water Resources, Nairobi
E-mail: wrma@wrma.or.ke
Date: July 29th

Goal: The goal of the ministry is to regulate water. There is reorganization under way and the issues are more decentralized. They are evolving from one ministry that is responsible for all the aspects of water to a structure with more administrative bodies for the different aspects of water (hydrology, permitting, water quality, supply, sanitation, structures). For the first three aspects the country is divided in 6 regions, for the last it is divided in 7 regions. In these regions a decentralised section will operate.

The national poverty eradication strategy is guiding principal for the water management together with the millennium development goals.

Sand Dams: The issue of the dams should be handled by the National Water Cooperation. For water extraction, permits are required. The question is whether the sand dams fall under water extraction?

Climate change: Overall on the ground there are more important issues in the field that need to be solved than climate change. CC is important for scientists and for the higher management. For the longer term the implications are important, but there are not enough resources to take this into account now. The most important issues at the moment are the Mount Kenya problem ('water towers'), and the ministry worries about the situation. Low flows are a huge problem and the sand dam project is a nice example of adaptation related to this problem. Also the increase in evapotranspiration in the country worries the ministry.

The ministry will check through watershed regulation. This means that a minimum discharge and maximum water quality levels should be maintained. The farmers in the watershed should organize such that these requirements are met. These

associations are organised round lakes, stretches of rivers / basins and constitute of local people. Current issues are over extracting of water, pollution and sedimentation.

4. Conclusions and recommendations

The mission has clearly identified the Kitui Sand dam project as a successful adaptation project to mitigate effects from droughts. After 10 years having developed 435 dams, water is available in the dry season to over 60,000 farmers and inhabitants. Moreover, the project shows that not only droughts are mitigated, but that carefully planned adaptations together with local stakeholders can gear up innovations, technological development and economic prosperity. From interviews it appeared that the sand dams provide an economic basis to the region that provides all kinds of incentives to economic activities other than agriculture.

There are, however, still a few challenges to be tackled, especially within the area of linking local scale sand dam development to the national water management scale and to include long term effects such as climate change within the present sand dam project. For this, the mission has identified three main issues for further cooperation between the ADAPTS project and the Kitui sand dam project. The main goal of linking the Kitui sand dam project to the ADAPTS project is to try to develop the Kitui Sand dam project into an activity that is able to cope with long term climate change impacts -to make it 'climate proof'.

The main issues to be addressed are:

- (1) To set up a stakeholder dialogue to strengthen current water management policies
- (2) To set up a database with current information and long term perspectives
- (3) To assess long-term developments that affect the sand dam project and to develop adaptation strategies for the Kitui sand dam project.

More specifically, the following activities can be identified:

(1) Stakeholder dialogue and institutional aspects:

- To set up a regional and national dialogue with stakeholders through workshops and meetings
- Evaluate current national and regional water management policies on their potential for adaptation: How should policies change to sustain success of sand dam project under climate change?
- To determine how Kenyan water reforms influence the Kitui project
- To assess whether the sand dam project experience can be up-scaled to other regions?
- To study how the Sand dam user groups function after the dam building is finished (what other activities are deployed)
- To assess potential for cooperation between different institutes in the context of climate change: SASOL, University of Nairobi, Regional Ministry of planning, Meteorological Service and IGAD-WMO. Develop a work plan defining roles.

(2) Database development

- Strengthening the information capacity of both SASOL and the government by developing a central database accessible to all stakeholders
- Derive socio economic data (1985-2005) such as changes in income, changes in distance to drinking water, changes in types of crops, changes in production of non agricultural products

- Set up a GIS & database system including information on: location of dams, socio economic data, changes in vegetation, changes in habitation
- Derive historical and current measurements of meteorological and hydrological parameters: daily precipitation, daily minimum and maximum temperatures, daily evaporation, daily runoff

(3) Assess long term effects and develop adaptation strategies

- Evaluate water availability under long term developments (national and in Kitui)
- Evaluate Kitui socio economic issues and indicators under long term developments, including climate change
- Develop alternative or complementary adaptation measures or policies at different levels (national, regional, local)
- Test adaptation strategies in practice and / or implement adaptation policies within policy documents
- Evaluate the performance of the sand dams under climate change and their effectiveness for providing water to farmers.