

## **CLIMATE CHANGE IMPACTS, VULNERABILITY AND ADAPTATION ASSESSMENT IN EAST AFRICA**

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### **INTRODUCTORY BACKGROUND**

Impacts, vulnerability and adaptation studies in Kenya were undertaken through two projects namely:

Kenya Country Study Project that was funded by United States -1994-1995  
GEF funded UNDP Project entitled "Capacity Building in Sub-Saharan Africa to Respond to the UNFCCC -1996-1998 (4 countries: **Ghana, Kenya, Mali and Zimbabwe**)

Other smaller scale studies have been undertaken addressing location specific areas of socio-economic sectors.

The vulnerability and adaptation process was undertaken by developing internally consistent scenarios using IPCC methodologies. The future time frame was 2030. These scenarios were then applied to make assessments of vulnerability and adaptation in the major socio-economic sectors of the country.

#### **Current Climate**

The current climate in East Africa is characterized by large variability in rainfall with occurrence of extreme events in terms of droughts and floods. The following are the major droughts that have occurred since 1980:

**1983/84, 1991/92, 1995/96, 1999/2001, 2004/05.**

The La-Nina related drought of 1999/2001 was thought to be the "worst in the living memory". It was preceded by El-Nino related floods of 1997/98 which were some of the worst in recent times. Another drought occurred in 2004/05 and led to famine in the marginal rainfall areas in Kenya.

## **VULNERABILITY AND ADAPTATION ASSESSMENT**

The following were some of the sectors that were addressed during the assessment

### **Agricultural Sector**

Rain-fed agriculture is the mainstay of economic development in East Africa. climate variability therefore has the highest impact on agricultural production. This variability is expected to increase including more frequent occurrence of extreme events. This variability will be more in the marginal rainfall areas.

Vulnerability will be associated with the following factors:

- Poverty among the small -scale subsistence farmers.
- Farming in the marginal rainfall areas.
- Over-cultivation and land degradation.
- Lack of technologies to improve production.
- Lack of economic diversification.
- Lack of knowledge on the use of climate information to maximize agricultural production.

### **Adaptation Assessment**

The following adaptation options were found to be most appropriate for Kenya.

- Adoption of drought resistant/escaping crops.
- Soil conservation measures.
- Adoption of appropriate water conservation technologies.
- Crop diversification in subsistence farming.
- Alternative means of income generation for subsistence farmers.
- Public education and awareness raising on effective use of climate information. This will enable farmers to prepare for adverse climate conditions and to take advantage of favourable conditions to maximize production.

## **WATER RESOURCES**

The climate impacts of water resources is largest in the marginal rainfall areas of the country. The climate scenarios show that rainfall variability and increased evaporation due to higher temperatures will lead to decrease in the available water.

### **Vulnerability Assessment**

Vulnerability of water resources in Kenya will be influenced by the following factors:

- Population increase in the marginal areas leading to increased demand for water.
- Over-cultivation in sloping areas leading to flash floods and siltation of rivers and reservoirs.
- Deforestation in the water catchment areas.
- Inefficient utilization of available water, e.g. irrigation methods.

- Water pollution, especially by industries.

### **Adaptation Options Assessment**

The assessment resulted in the following adaptation options.

- Increased afforestation especially in the water catchment areas.
- Exploitation of underground water especially in the marginal rainfall areas.
- Adoption of irrigation technologies that lead to water conservation.
- Policies and measures that enhance water quality.
- Good soil conservation practices in agriculture.
- Public education and awareness raising.

### **ENERGY RESOURCES**

East Africa as a whole is highly dependent on hydropower for electrical energy.

Most households in rural areas depend on biomass for energy.

Climate variability especially drought occurrences exert severe impacts on these energy resources .

### **Vulnerability assessment.**

Vulnerability of hydropower will be influenced by the following factors:

- Deforestation especially in the hydropower dams catchment areas.
- Over cultivation resulting in siltation of rivers and dams.
- Inefficient utilization of biomass for energy.
- Poverty leading to over exploitation of biomass.

### **Adaptation Assessment**

Adaptation assessment resulted in the following options:

- Increased afforestation and reforestation.
- Good agricultural practices and soil conservation.
- Adoption of biomass energy -efficient stoves.
- Increasing exploitation of renewable energy resources such as wind, solar and geothermal energy.
- Enhanced energy efficiency in industrial and commercial operations.
- Public education and awareness raising.

### **HEALTH AND PUBLIC SAFETY**

Global warming and rainfall variability will have serious impacts on human health and public safety.

Increase in mean temperatures will lead to infestation of disease vectors especially mosquitoes in areas that have been too cold for them.

Incidences of water borne diseases are expected to increase on account of flooding during heavy rain episodes.

severe drought episodes will lead to increased famine especially in the marginal rainfall areas.

Community conflicts driven by competition for scarce water and pasture resources will increase.

Human wild life conflicts will also increase thereby endangering human safety.

Flooding will endanger human safety for those living in flood prone areas.

### **Vulnerability Assessment**

The following factors will increase vulnerability in health and public safety.

- Inadequate health services especially in rural areas.
- Inadequate relief food and infrastructure.
- Poverty especially among rural communities.
- Lack of alternative means of income especially in marginal rainfall areas.
- Traditional ways of life that are not changing with time.
- Inadequate public awareness of disease risks.
- Encroachment of wildlife parks and reserves by farmers and pastoralists.

### **Adaptation Assessment**

The following adaptation options have been identified.

- Adequate response strategies to the outbreak of climate related diseases.
- Availability and utilization of climate information towards preparedness.
- sustainable disease vector control strategies.
- Provision of clean and adequate water.
- Sustainable community conflicts resolution strategies.
- Alternative sources of income for communities in marginal rainfall areas.
- Public education and awareness raising.

The above sectors are only some of the sectors that were addressed during vulnerability and adaptation assessment. Others were: human settlements, terrestrial ecosystems, forestry, industry, aquatic and coastal resources.

### **LESSONS LEARNED**

The vulnerability and adaptation assessment process led to the following conclusions as lessons learned.

- The most effective adaptation options are those that also address climate change mitigation.

**For example:**

1. Soil conservation measures lead to carbon sequestration and enhanced vegetation growth.
  2. Afforestation and reforestation lead to enhancement of carbon sinks.
  3. Exploitation of renewable energy resources leads to reduction in the use of fossil fuels for electric power generation.
  4. Energy efficiency also leads to reduction in fossil fuel energy use.
- Adaptation options must be consistent with national development plans and priorities. This enables them to be easily incorporated into the national development activities.
  - Technical and institutional capacity to respond to climate change must be an ongoing process because of complexity of the problem and emerging issues which need to be addressed.
  - Regional cooperation is crucial because some of the resources that are vulnerable to climate change are shared among neighbouring countries.
  - Involvement of the vulnerable communities is crucial for adaptation strategies.
  - Public education and awareness raising is a central component of adaptation strategies.
  - Research and technology has an important role to play in development of adaptation strategies.

**For example:**

1. Development of drought resistant crop varieties.
2. Energy efficient stoves.
3. Alternative sources of energy – solar, wind energy; that can be utilized by rural communities.
4. Development of water efficient irrigation systems,
5. And many other contributions.

**REMAINING GAPS and NEEDS**

Gaps still remain in the vulnerability and adaptation assessment process. Among these are:

- Uncertainty in characterization of current climate because of inadequate observations.
- Uncertainty in the characterization of climate change in the medium and longer terms in order to characterize future impacts.
- Uncertainty in characterization of vulnerability indicators and how they might change in future.
- Uncertainty in characterization of current socio-economic drivers of decision making and how they might change under future climate.

## NEEDS

Vulnerability and adaptation assessment showed that:

- There is need to enhance systematic observations network in Africa in order to enhance our knowledge of climate characteristics.
- There is need to mainstream/integrate adaptation strategies into the national development plans and priorities. Some of these are already addressed directly or indirectly but not in a robust or sustainable way.
- There is need to employ research and technology in our adaptation strategies.
- There is need to Incorporate indigenous knowledge and technologies into adaptation options.
- There is need to enhance technical capacity to undertake vulnerability and adaptation assessment.
- There is need to enhance institutional capacity to integrate adaptation into national development plans.
- There is need to enhance institutional capacity for regional cooperation in climate change issues.
- There is need to increase public education and awareness raising in climate change issues especially those that affect the communities.
- Climate information is a crucial component of climate change adaptation strategies in different socio-economic sectors. Climate scientists should therefore enhance seasonal climate prediction skills. The capacity of the users to effectively utilize the information must be equally enhanced.

## ROLE OF LOCAL, NATIONAL AND REGIONAL ACTORS

- Communities that are directly or indirectly affected by climate change must be fully involved in development of adaptation strategies.
- National policy makers and planners have a crucial role to play in:
  - (1) Formulating policies that increase national and community adaptive capacity to climate change.
  - (2) Formulating Policies and measures that reduce poverty among the vulnerable communities.
  - (3) Integrating climate change issues into national development plans.
- Regional actors have a crucial role of developing regional cooperation to address climate change issues related to regionally shared resources, for example: **East African Community, IGAD, SADC etc.**

## **ROLE OF INTERNATIONAL ACTORS**

International cooperation is crucial in the following areas:

### **Systematic observation**

One of the main barriers to effective vulnerability and adaptation assessment in Africa is the inadequacy of systematic observations network, which is necessary for climate characterization.

International cooperation can therefore greatly enhance systematic observations in Africa.

### **Technology transfer:**

The other main barrier is inadequate technological capacity to implement adaptation projects. This is the other area where international cooperation can enhance adaptation in Africa.

### **Capacity building**

Technical capacity building in Africa must be enhanced for effective vulnerability and adaptation assessment and implementation of adaptation projects.

International cooperation can enhance this capacity in Africa.

### **How can the UNFCCC process facilitate impacts vulnerability and adaptation assessment?**

- Adaptation to climate change is the main priority in Africa because of the continents vulnerability.

### **UNFCCC process should:**

- promote international cooperation in adaptation.
- Promote technical capacity building process. This capacity building should combine training workshops and hands- on activities. For example: **pilot adaptation projects for demonstration.**
- Promote availability of adequate and predictable funding towards adaptation in Africa.