NATIONAL CLIMATE CHANGE ACTION PLAN

REPUBLIC OF KENYA

# Long-term National Low-carbon Climate Resilient Development Pathway

## Climate Risk Assessment of Kenya's Flagship Projects

## Arid and Semi-Arid Lands (ASAL) Development Projects

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# Climate Risk Assessment: "ASAL Development Projects"

To achieve its long-term vision of a globally competitive and increasingly prosperous Kenya, the Government of Kenya has developed Vision 2030 (V2030) and identified over 100 flagship projects to be implemented during its First Medium Term Plan (2008 to 2012). A detailed review of the vulnerability of five of these flagship projects to climate change was undertaken in 2012 to inform development of Kenya's National Climate Change Action Plan and support integration of risk reduction strategies in Kenya's Second Medium Term Plan (2013 to 2017). The review was completed as part of Subcomponent 1, "Long-term National Low Carbon Climate Resilient Development Pathway," of the action plan process.

This brief presents outcomes of the review of one of these flagship projects, the "ASAL Development Projects," and the key climate risks and possible risk reduction strategies identified. It contains:

- Overview of the methodology used to identify potential climate risks and risk reduction options
- Summary of the outcomes of the risk assessment
- Detailed presentation of the risk assessment outcomes

## Overview of Methodology

To conduct this assessment, a tailored Climate Risk Assessment methodology[1] was developed through an iterative process. This methodology was composed of two modules:

**Module 1: Deconstructed climate risk assessment**
To gain a better understanding of the climate change vulnerability of the selected project, the potential implications of specific climatic changes on their planned activities were assessed. Potential climate risks (e.g. higher temperatures, more frequent heavy rainfall events) to the project were deconstructed in relation to its different sub-components. The potential direct impacts of these changes were listed and quantitatively assessed with regard to (1) their likelihood of occurrence out to 2050 and (2) their potential severity or consequence. Combining the likelihood and consequence scores allowed for identification of the climatic changes likely to pose the greatest risk to the project's successful implementation and for its beneficiaries.

**Module 2: Identification and assessment of illustrative resilience building and risk reduction options**
Illustrative options for reducing the vulnerability of the flagship project to the listed high risk climatic changes were identified. Structural (or hardware) options, non-structural (or software) options and policy options were identified for each risk. To provide guidance regarding how to prioritize amongst the myriad of potential vulnerability reduction actions identified, these illustrative options in turn are assessed with respect to their:

- Feasibility of implementation and
- Potential to contribute to Kenya's sustainable development.

The outcome of this process was a shortlist of examples of potential strategies that could be used to reduce the vulnerability of the "ASAL Development Project" to the impacts of climate change. More information on the methodology used is provided in the annex of this brief. The full report from the assessment of vulnerability of Kenya's flagship projects to the impacts of climate change may be found at: http://www.info.kccap.info.

[1] A full description of this methodology is provided in "Kenya's Climate Change Action Plan - Subcomponent 1: Long-term National Low-carbon Climate Resilient Development Pathway. Climate Risk Assessment of Kenya's Flagship Project." October 2012. The report is available at: http://www.info.kccap.info.

## Summary of Results: "ASAL Development Projects"

| About the project | |
|---|---|
| Goals and objectives | Led by the Ministry of Agriculture, the project's objective is to increase the area of ASALs under irrigation by 100,000 hectares per year. In the MTP1 period, the ministry aims to increase the amount of irrigated land by 600,000 hectares, mainly in the Tana and Athi River Basins. This is to be achieved through:<br>• Improving farmers' access to small-scale irrigation schemes by constructing 22 medium-sized multi-purpose dams; constructing the Rahole inter-basin water transfer channel; and rehabilitating and expanding existing major irrigation schemes in the ASALs.<br>• The Lower Tana (Bura) project, which involves expanding the existing irrigation scheme by about 100,000 hectares.<br>• The Tana Integrated Sugar project, covering about 33,000 hectares of land. |
| Progress to date | Establishment of small- and medium scale irrigation systems in Turkana (10,000 hectares) and Lower Tana (4,400 hectares); initiation of a feasibility study for the Lower Tana (Bura) project; completion of a feasibility study for the Tana Delta Integrated Sugar project, as well as obtaining an Environmental Impact Assessment licence from NEMA. Remaining activities are to be rolled over into MTP2. |

**Climate risks of greatest concern due to their potential likelihood and severity/consequence**

| Climate Risk | Potential Impacts |
|---|---|
| Increase in average annual temperatures | • Increase in the rate of evapotranspiration, affecting large- and small-scale irrigation systems<br>• Increase in water demand from small-scale systems |
| Decrease in mean annual precipitation | • Reduction in the availability of water for large-scale irrigation systems |
| Unpredictable precipitation during both the short and long rains | • Greater water management (supply and demand) challenges for large and small-scale irrigation systems |
| More frequent drought | • Reduction in the availability of water for large- and small-scale irrigation systems |
| Increased potential for flood events | • Loss of crops supported by the planned small-scale irrigation systems |
| Changes in the timing of the short and long rains | • Greater difficulty to undertake crop management and planning activities in small-scale irrigation systems |
| More frequent heavy rainfall events | • Greater likelihood of flash floods damaging small-scale irrigation infrastructure |

**Illustrative vulnerability reduction options assessed to be most feasibility and have the greatest potential to contribute to Kenya's sustainable development**

| Vulnerable Project Components | Vulnerability Reduction Options |
|---|---|
| Large-scale irrigation systems | • Enforce requirements for the use of water efficient irrigation technology and techniques, such as drip irrigation or evening/night irrigation, where relevant.<br>• Restore key watersheds that feed irrigation systems in the ASALs by expanding programs that promote agroforestry practices by small-scale farmers.<br>• Provide large scale farmers with training on the techniques, costs etc. of establishing protected areas and water catchments within watersheds to ensure sustainable supplies of water for their irrigation systems. |
| Small-scale irrigation systems | • Provide small scale farmers with training in the appropriate design and use of irrigation systems in order to promote efficient use at all times and conservation of water supplies during periods of low water availability.<br>• Build community/farm based water catchments and boreholes/abstraction for use during dry periods.<br>• Provision of down-scaled information to small-scale farmers, such as forecasts of heavy rain to match planting and cropping cycles, through mechanisms like radio and Internet. |

## Detailed Project Description and Risk Assessment Results:

### 1. Project Description

Under MTP1, the Ministry of Agriculture focused on increasing the amount of irrigated land by an additional 600,000 to 1.2 million hectares (ha). The focus of this project is mainly in the Tana and Athi River Basins, but spread to in other areas across the country such as the Perkerra, Kerio Valley and small scale projects in Turkana. The project aligns with Kenya's Vision 2030 goals of increasing the amount of arable land by 30 percent, and to increasing the area of Arid and Semi-Arid Lands (ASALs) under irrigation by 100,000 ha per year. This target is to be achieved through small-scale irrigation for farmers and the Tana Delta projects: the Tana Integrated Sugar Project (TISP) and the Lower Tana (Bura) Project.

A fuller description of the project is presented in the table below.

<table>
<tr><td rowspan="4">Overview of project goals and components</td><td colspan="3">Vision 2030: To increase the area of ASALs under irrigation by 100,000 ha per year, thereby increasing the total area of land under irrigation in Kenya by 600,000 to 1.2 million hectares and the amount of arable land by 30 percent. [2]<br>MTP1: To increase the amount of irrigated land by an additional 600,000 to 1.2 million ha, mainly in the Tana and Athi River Basins. This target is to be achieved through small-scale irrigation for farmers and the Tana Delta projects: the Tana Integrated Sugar Project (TISP) and the Lower Tana (Bura) Project.</td></tr>
<tr><td rowspan="3">Project Components</td><td>Small and Medium Scale Irrigation Projects</td><td>• Construct 22 medium-sized multi-purpose dams with a total capacity of 2 billion cubic meters supply water for domestic use, livestock and irrigation use in arid and semi-arid areas.<br>• Construct the 54 km Rahole inter-basin water transfer channel from the Tana River that will terminate in a swamp/wetland in Garissa to serve as water source for domestic use, livestock, wildlife and small-scale irrigation.<br>• Rehabilitate and expand the existing major irrigation schemes in ASALs (i.e. Hola [Tana], Perkerra, Kerio Valley, TaitaTaveta, Ewaso Nyiro North and Ngurumani [Kajiado]).</td></tr>
<tr><td>Lower Tana (Bura) project</td><td>• Originally 11,700 ha in size, the Lower Tana project functioned until the early 1990s.<br>• The current project envisages expanding the old project into the larger lower Tana area to cover about 100,000 ha. The project is expected to be complete by 2014.</td></tr>
<tr><td>Tana Delta Integrated Sugar Project</td><td>• The Tana Delta is located within the coastal forests of eastern Africa, a recognized biodiversity hotspot. It has been appointed as an important bird area and is home to two endangered primates—the Tana Red Colobus and the Crested Mangabey monkey (Mireri, Onjala & Oguge, 2008; Temper, n.d.).<br>• The location of the sugar project in the Tana Delta has traditionally been used for dry season grazing by local pastoral communities (Mireri, Onjala & Oguge, 2008).<br>• TISP is private joint venture involving the Tana and Athi River Development Authority and Mumias Sugar Company (HVA International & M.A. Consulting, 2007).<br>• It is being developed 30 km away from the Tana Delta in Garsen Division, located in the southern part of Tana River County and partly in the western part of Lamu County. The project covers about 33,000 ha of land (HVA International & M.A. Consulting, 2007).<br>• The main features of the proposed project are as follows: irrigated sugarcane production through estate (16,000 ha) and out grower (4,000 ha) systems, water supply to the project, a sugar factory, co-generation facility of up to 34 MW power capacity, an ethanol production plant, and livestock supporting activities, including fisheries (HVA International & M.A. Consulting, 2007).</td></tr>
<tr><td>Location(s)</td><td colspan="3">Vision: All ASAL areas<br>MTP1: Mostly in Tana and Athi River basins, but spread to other areas such as the Perkerra, Kerio Valley and the very small scale projects in Turkana that are found within the Rift Valley drainage basin</td></tr>
</table>

[2] Irrigation projects listed in *Kenya Vision 2030* are spread across the country, but the focus of this analysis is on the projects found in the ASALs. For this reason, major irrigation projects, such as the Kano Plains, Mwea, Nzoia andWest Kano irrigation schemes, are excluded.

| | |
|---|---|
| **Status** | • These projects were initiated many years ago, with all phase of project planning completed except actual implementation. A typical case is the Bura Irrigation Scheme, which operated up to or around early 1990s.<br>• Most of the flagship project's components were to be completed during the MTP1, but delays in their implementation mean that they will likely be rolled over into the next MTP (2013-2018).<br>• *Medium scale irrigation projects:* By June 2012, irrigation schemes covering 10,000 ha in Turkana and 4,400 ha in Lower Tana had been established to support small-scale farmers.<br>• *Lower Tana (Bura):* Request for Proposals for a feasibility study for the proposed 100,000 ha project has been issued, and detailed design for 10,000 ha is ready. The project is expected to be complete by 2014.<br>• *Tana Delta Integrated Sugar Project:* Feasibility study has been undertaken. Expression of Interest for the project's construction is complete, and an Environmental Impact Assessment license has been obtained from the National Environment Management Authority. |
| **Expected Benefits** | • Agricultural land intensification, with higher crop yields.<br>• Potential for increased food security.[3]<br>• Potential increase in farmers' income. |
| **Budget estimate** | • TISP: Ksh 26.6 billion (HVA International & M.A. Consulting, 2007)[4]<br>• Taita Taveta: Ksh. 1,800 million (National Irrigation Board, n.d.)<br>• Turkwel: Ksh. 390 million (National Irrigation Board, n.d.)<br>• Arror Irrigation Scheme: Ksh. 402 million (National Irrigation Board, n.d.) |

## 2. General Description of Project Context and Rationale

Irrigated agriculture is still limited in Kenya. The area under irrigation is about 105,000 ha against an estimated potential of 539,000 ha (ROK, 2010, p.27). Most existing irrigation schemes in Kenya are large in scale and support the growth of export crops such as coffee, rice and horticulture. Private farmers cultivate 40 percent of irrigated land for horticulture and export crops, while small-scale farmers along with government managed schemes cultivate 42 percent and 18 percent of the irrigated land respectively, for food crops and vegetables (WWAP, 2006).

Expansion of irrigated agriculture is particularly urgent in the arid and semi-arid regions of Kenya, which constitute more than 80 percent of the country and are home to approximately 10 million people (GOK, 2007). Some irrigation schemes have been developed along the large rivers flow through the ASALs, such as the Tana and Athi Rivers, but there is significant potential for expansion. Harnessing water from such rivers could also benefit the livestock sub-sector, which is the main economic activity of the ASALs; over 50 percent of Kenya's livestock population and all of its camels are found in the ASALs (ROK, 2010). Intensified irrigation can increase agricultural productivity fourfold and, depending on the crops, incomes can be multiplied many times over. There is also evidence that the production of livestock fodder in irrigation schemes can be more profitable than crop production (Watson & Van Binsbergen, 2008).

A number of irrigation projects previously implemented in the ASAL and other regions, such as the Turkwel, Ewaso Nyiro and Tana projects, failed or have been performing below their optimal capacity for a number of reasons, but mainly due to mismanagement. These are the same projects that have been earmarked for rehabilitation and expansion in the Vision 2030. Small-scale irrigation has also been applied in the region, with some success. For example, even though the Katilu Irrigation Scheme in Turkana collapsed in 1997, some 6,000 farmers in the area have created their own canals from the Turkwel River and have continued farming (Watson & Van Binsbergen, 2008). In general, the use of diesel or petrol water pumps to carry water from boreholes, rivers or surface pools for irrigation is common.

[3] An increase in food security will depend on a combination of factors. For example, media reports (e.g. the Daily Nation of March 9. 2010) reported that while farmers experienced bumper harvests in early 2010 following completion of the Tana (Hola) and Bura Irrigation Schemes, some were forced to let their crops rot in the fields because of a lack of ready market access.

[4] Mireri et al. (2008) dispute this estimate, noting the assumption in the EIA and feasibility studies that irrigation water would be abstracted at zero cost is contrary to the provision of the Water Act of 2002, which states that water extracted from the environment for such use should be chargeable at Kenya cents 75 per cubic meter per second, among other errors and assumptions.

## 3. Climate Context

*A. Historic/current*

The defining feature of the ASALs is their aridity. Annual rainfall in the arid regions ranges between 150mm and 550mm per year, and in the semi-arid regions between 550mm and 850mm per year. Temperatures and evapotranspiration rates in the ASALs are high throughout the year. Data from the Kenya Meteorological Department indicates increasing temperatures over vast areas, with trends in inland areas showing a *general warming* with time for both minimum (night-time/early morning) and maximum (daytime) temperatures. Northern Kenya, which constitutes the largest portion of the ASAL region, is warming faster than the rest of the country.

Arid lands are historically vulnerable to drought, seasonal flooding and flash flooding. Floods that seasonally affect parts of the western part of the country also affect the lower parts of the Tana River drainage basin (AEA Group, 2008). The frequency and severity of drought periods is increasing. Northern Kenya recorded 28 major droughts in the last century, four of which occurred from 1999 onwards (Mude et al., 2010).

Extreme weather events significantly affect Kenya's economy. The 1997-1998 El-Niño floods followed by the 1999-2000 La Niña drought cost the Kenyan economy US$4.8 billion, equivalent to 14 percent of GDP. The 1999-2000 drought caused economic losses of approximately US$2million per day, as well as widespread human suffering (Barrow & Mogaka, 2007). In the aftermath of this drought, the Government of Kenya needed to provide US$10.5 million in emergency assistance to affected livestock communities to recover lost production (Wong, Roy & Duraiappah, 2005). The AEA Group study estimates that floods and droughts cause about 5.5 percent and 8 percent GDP loss every 7 years and 5 years, respectively, which translates to a long-term fiscal liability of about 2.4 percent of GDP per annum (AEA Group, 2008). This loss falls disproportionately on ASAL regions.

According the National Climate Change Response Strategy (2010), "major rivers including the Tana, Athi, Sondu Miriu, Ewaso Ngiro and Mara have experienced severe reduced volumes during droughts and many seasonal ones have completely dried up. The parts of the country most affected are the Eastern, North Eastern and parts of the Rift Valley provinces" (GOK, 2010). A 40 percent reduction in irrigated rice production occurred as a result of the 1999-2000 droughts (WWAP, 2006).

*B. Projected climatic changes*

While temperatures are projected to rise across the entire country, regional differences are expected. By 2025, western Kenya is projected to experience temperature increases ranging from 0.9°C to 1.1°C, while temperatures in the southern coastal area could increase by an average of 0.5°C. In the northern tip of eastern Kenya, temperatures could rise by 1.1°C.[5] In comparison, analysis based on a Regional Climate Model suggests that temperatures in northwestern Kenya will rise by 1°C greater than the rest of Kenya by 2100 while temperatures in north-eastern Kenya (e.g. around Wajir) will see 1° to 2°C less warming compared to the surrounding region (AEA Group, 2008).

Model results that focus specifically on Kenya's future rainfall patterns all indicate that precipitation regimes will change. Current research suggests that changes in rainfall patterns will vary between different parts of Kenya; lower rainfall areas (such as the ASALs) might become even drier. There appears to be greater certainty regarding an increase in rainfall during the short rains season. Greater uncertainty exists regarding whether

[5] Projected temperature increase to 2025 based on extension of observed changes in temperature between 1960 and 2009 (Funk et al., 2010).

rainfall amounts will increase or decrease during the long rains, with changes likely to vary between different parts of the country.

## 4. Climate Risk Assessment

To gain an understanding of the potential vulnerability of the "ASAL Development Project" to projected climate change, a general climate risk assessment was completed. Drawing upon existing literature, potential changes in climatic conditions in location where the flagship project is being implemented were identified. The potential *direct* impact of these changes was then identified. Each of these potential impacts was then quantitatively assessed on a scale of 1 to 5 with respect to their likelihood of occurrence per year in the 2050s and their potential severity to generate an overall climate risk assessment score. Climate risks with high scores were flagged for further analysis.

| Sub sector | Key Climate Risks | Potential Direct Impacts | Future Likelihood (1-5)[6] | Potential Future Severity / Consequence (1-5)[7] | Overall Risk Assessment (Low/Moderate/High) | Flagged for Deeper Assessment |
|---|---|---|---|---|---|---|
| **Large scale irrigation schemes** | Increase in average annual temperature | Increased rate of evapotranspiration | 5 | 3 | High | |
| | | Increased water demand. | 5 | 2 | Moderate | |
| | | Crop losses due to temperature | 3 | 4 | Moderate | |
| | Decrease in mean annual precipitation | Less water available for irrigation | 4 | 4 | High | ✓ |
| | Unpredictable precipitation during both the short and long rains | Water management challenged for demand and supply of irrigation water | 4 | 4 | High | ✓ |
| | More frequent drought | Reduced water resources available for irrigation | 4 | 4 | High | ✓ |
| | Changes in the timing of the short and long rains | Water management and planning challenges | 3 | 3 | Moderate | |
| | Flooding due to El Nino events | Crop losses | 3 | 3 | Moderate | |
| | | Damage to irrigation systems | 3 | 3 | Moderate | |
| | More frequent heavy rainfall events | Flash floods damage irrigation infrastructure | 4 | 2 | Moderate | |
| | | Water resource degradation | 3 | 3 | Moderate | |
| **Small scale irrigation schemes** | Increase in mean annual temperature | Increased rate of evapotranspiration | 5 | 4 | High | ✓ |
| | | Increased water demand. | 5 | 3 | High | |
| | Decrease in mean annual precipitation | Less water available for irrigation | 3 | 4 | Moderate | |
| | Unpredictable rainfall during both the short and long rains | Water management challenged for demand and supply of irrigation water | 4 | 5 | High | ✓ |
| | More frequent drought | Reduced water resources available for irrigation | 4 | 5 | High | |
| | Changes in the timing of the short and long rains | Crop management and planning challenges | 4 | 5 | High | |
| | Flooding events | Crop losses | 4 | 5 | High | ✓ |
| | | Damage to irrigation systems | 4 | 3 | Moderate | |
| | More frequent heavy rainfall events | Flash floods damage irrigation infrastructure | 4 | 4 | High | |
| | | Water resource degradation | 3 | 4 | Moderate | |

[6] Likelihood: 1 = Rare – Event not expected to occur, but possible (<5 percent probability of occurrence per year in 2050s); 2 = Unlikely – Event unlikely to occur, but not negligible (5-33 percent probability of occurrence per year in 2050s); 3 = Possible – Event less likely than not, but still appreciable change of occurring (33 – 66 percent probability of occurrence per year in 2050s); 4 = Likely – Event more likely to occur than not (66 – 95 percent probability of occurrence per year in 2050s); 5 = Almost certain –Event highly likely to occur (>95 percent probability of occurrence per year in 2050s)

[7] Consequence: 1 = insignificant; 2 = minor; 3 = reasonable/moderate; 4 = major; 5 = severe

## 5. Options for Reducing Selected Risks

In the next phase of the climate risk assessment process, possible measures for reducing the vulnerability of the "ASAL Development Project" to the high ranking climate risks were identified. For each risk, illustrative options were identified that fit within the following categories:

- Structural options – defined as physical or landscape level interventions that serve to modify or prevent the threat, or that involve a change in use or change in location;
- Non-structural options – defined as interventions that build human capacity through actions such as research, education, institutional strengthening and social change; or
- Policy options – defined as the introduction or modification of existing government policies, strategies and/or measures.

The possible benefits of these intervention options were noted. The resulting list presented in the table below is not exhaustive; a range of other vulnerability reduction options could be considered.

| Sub component | Key Climate Risk | Potential Direct Impacts | Intervention Description | Expected Key Impacts of Intervention Option |
|---|---|---|---|---|
| **Large scale irrigation systems** | Decrease in mean annual precipitation | Water supply, scarcity and demand challenges | **Structural:** | |
| | | | Install further resilient infrastructure for major rain water catchment and storage for dry season for all major agriculture/irrigation projects. | More water resources available and more resilience to prolonged drought |
| | | | **Non-structural:** | |
| | | | Develop water scarcity management plans and metering for all irrigation schemes that can adapt quickly to changing water availability conditions. | Enhance ability to plan for and manage periods of water stress and water abundance for irrigation needs |
| | | | **Policy:** | |
| | | | Public Investment: Provide risk reduction mechanisms for irrigation equipment and installation (e.g., government backed loan, risk sharing or guarantees) for private sector actors and appropriate incentives (e.g. tax breaks). | Reduce running/energy costs of equipment |
| | | | Regulatory: Enforcement of water efficient irrigation technology and techniques, such as drip irrigation or evening/night irrigation where relevant. | Efficient use of water |
| | Unpredictable precipitation during both the short and long rains | Water management challenged for demand and supply of irrigation water | **Structural:** | |
| | | | Restore key watersheds that feed irrigation systems in the ASALs by expanding programs that promote agroforestry practices by small-scale farmers. | More water resources available and greater resilience to prolonged drought |
| | | | **Non-structural:** | |
| | | | Provide large scale farmers with training on the techniques, costs etc. of establishing protected areas and water catchments within watersheds to ensure sustainable supplies of water for their irrigation systems. | Reduce vulnerability to drought events |
| | | | **Policy:** | |
| | | | Regulatory: Legal and enforced protection of key watershed areas identified as important for irrigation purposes. | Protect watershed and increase water capture and availability |
| | More frequent drought | Reduced water resources available for irrigation | **Structural:** | |
| | | | Systematic de-silting and maintenance of key irrigation channels before critical periods | Reduce risk of water supply problems during critical periods |
| | | | Employ water conservation and technical irrigation techniques, such as evening/night irrigation and targeted/drip irrigation | Reduced water consumption per farmed areas/yield |
| | | | **Non-structural:** | |
| | | | Develop water scarcity management plans and metering for all irrigation schemes that can adapt quickly to changing water availability conditions | Reduce vulnerability to flood events, enabling farmers to recover quickly and reducing direct short term human/community impacts |
| | | | **Policy** | |
| | | | Regulatory: limit and regulate "non-essential" water use during extended drought and provide guidance and planning framework for stakeholder led planning for drought events which is flexible and fed into by short term and long terms climate change predictions | Reduce impacts of drought events |

| Sub component | Key Climate Risk | Potential Direct Impacts | Intervention Description | Expected Key Impacts of Intervention Option |
|---|---|---|---|---|
| **Small scale farmer irrigation** | Increase in mean annual temperature | Increased rate of evapotranspiration | **Structural:** | |
| | | | Build community/farm based water catchments and boreholes/abstraction for use during dry periods | More resilient farming systems that are more productive and provide more value to small scale farmers |
| | | | **Non-structural:** | |
| | | | Promote stakeholder led planning and adaptation strategies at the community level which is flexible and continuously fed into by short term and long terms climate change predictions | Reduce impacts of temperature increase and enable long term community participation |
| | | | **Policy:** | |
| | | | Information based: Provide incentives for research, investment and distribution of heat and improved water efficiency and tolerance of crops and livestock | Reduce risk of temperature induced crop losses |
| | Unpredictable rainfall during both the short and long rains | Water management challenged for demand and supply of irrigation water | **Structural:** | |
| | | | Provide small scale farmers with training in the appropriate design and use of irrigation systems in order to promote efficient use at all times and conservation of water supplies during periods of low water availability. | Ensure continuous water supply, particularly in critical periods of water shortage |
| | | | **Non-structural:** | |
| | | | Provision of down-scaled information to small-scale farmers, such as forecasts of heavy rain to match planting and cropping cycles, through mechanisms like radio and Internet. | Reduce risk of crop failures and poor harvest |
| | | | **Policy:** | |
| | | | Information Based: provide down scaled climatic information with free and easy access, and link forecasts with practical information for small scale farmers | Reduce human impacts of changing weather patterns |
| | Flooding events | Crop losses | **Structural:** | |
| | | | Establish flood management plans at the county level, and allow for local community and paid participation in disaster relief actions | Reduce crop losses from flooding events |
| | | | Build flood control dams and water diversion/storage systems around flood prone plain areas | Reduce flood risk |
| | | | **Non-structural:** | |
| | | | Provide advance warning of flooding potential to small scale farmers | Reduce human impacts and enable short term mitigation of losses |
| | | | **Policy:** | |
| | | | Regulatory: Settlement planning for flood prone areas possibly re-gazetted as non-residential and non-agricultural, and critically assess irrigation development in high flood risk areas | Reduce human impacts of changing weather patterns |

## 6. Outcomes of the Analysis

Using expert judgement, each of the illustrative vulnerability reduction options identified are then assessed on a quantitative basis in terms of their:

- Potential feasibility, taking into consideration factors such as consistency with existing risk management activities, potential negative spin-offs, and attractiveness to donors and partners
- Potential contribution to Kenya's sustainable development, looking at factors such as employment generation potential, establishment of (grey and green) infrastructure, possible number of direct beneficiaries, and advancement of equity.

By combining the scores from this assessment, an overall assessment of an option's potential value as a risk reduction strategy was identified. Options receiving the highest scores (as indicated by check marks in the table below) were judged to be worth considering as possible ways in which to reduce the vulnerability of the "ASAL Development Project" to the impacts of climate change.

| Sub component | Key Climate Risk | Potential Direct Impacts | Intervention Description | Feasibility Subtotal | Sustainable Development Subtotal | Outcome score | Priority Options |
|---|---|---|---|---|---|---|---|
| **Large scale irrigation systems** | Decrease in mean annual precipitation | Water supply, scarcity and demand challenges | **Structural:** | | | | |
| | | | Install further resilient infrastructure for major rain water catchment and storage for dry season for all major agriculture/irrigation projects. | 10 | 14 | 83% | |
| | | | **Non-structural:** | | | | |
| | | | Develop water scarcity management plans and metering for all irrigation schemes that can adapt quickly to changing water availability conditions. | 9 | 15 | 81% | |
| | | | **Policy:** | | | | |
| | | | Public Investment: Provide risk reduction mechanisms for irrigation equipment and installation (e.g., government backed loan, risk sharing or guarantees) for private sector actors and appropriate incentives (e.g. tax breaks). | 10 | 14 | 83% | |
| | | | Regulatory: Enforcement of water efficient irrigation technology and techniques, such as drip irrigation or evening/night irrigation where relevant. | 10 | 16 | 88% | ✓ |
| | Unpredictable precipitation during both the short and long rains | Water manageme nt challenged for demand and supply of irrigation water | **Structural:** | | | | |
| | | | Restore key watersheds that feed irrigation systems in the ASALs by expanding programs that promote agroforestry practices by small-scale farmers. | 9 | 17 | 85% | ✓ |
| | | | **Non-structural:** | | | | |
| | | | Provide large scale farmers with training on the techniques, costs etc. of establishing protected areas and water catchments within watersheds to ensure sustainable supplies of water for their irrigation systems. | 10 | 15 | 86% | ✓ |
| | | | **Policy:** | | | | |
| | | | Regulatory: Legal and enforced protection of key watershed areas identified as important for irrigation purposes. | 8 | 18 | 83% | |
| | More frequent drought | Reduced water resources available for irrigation | **Structural:** | | | | |
| | | | Systematic de-silting and maintenance of key irrigation channels before critical periods | 10 | 11 | 76% | |
| | | | Employ water conservation and technical irrigation techniques, such as evening/night irrigation and targeted/drip irrigation | 10 | 12 | 79% | |
| | | | **Non-structural:** | | | | |
| | | | Develop water scarcity management plans and metering for all irrigation schemes that can adapt quickly to changing water availability conditions | 9 | 13 | 76% | |
| | | | **Policy** | | | | |
| | | | Regulatory: limit and regulate "non-essential" water use during extended drought and provide guidance and planning framework for stakeholder led planning for drought events which is flexible and fed into by short term and long terms climate change predictions | 9 | 8 | 64% | |
| Small scale farmer irrigation | Increase in mean annual temperature | Increased rate of evapotrans piration | **Structural:** | | | | |
| | | | Build community/farm based water catchments and boreholes/abstraction for use during dry periods | 9 | 15 | 81% | ✓ |
| | | | **Non-structural:** | | | | |
| | | | Promote stakeholder led planning and adaptation strategies at the community level which is flexible and continuously fed into by short term and long terms climate change predictions | 9 | 13 | 76% | |
| | | | **Policy:** | | | | |
| | | | Information based: Provide incentives for research, investment and distribution of heat | 7 | 9 | 56% | |

| Sub component | Key Climate Risk | Potential Direct Impacts | Intervention Description | Feasibility Subtotal | Sustainable Development Subtotal | Outcome score | Priority Options |
|---|---|---|---|---|---|---|---|
| | | | and improved water efficiency and tolerance of crops and livestock | | | | |
| | Unpredictable rainfall during both the short and long rains | Water management challenged for demand and supply of irrigation water | **Structural:** | | | | |
| | | | Provide small scale farmers with training in the appropriate design and use of irrigation systems in order to promote efficient use at all times and conservation of water supplies during periods of low water availability. | 10 | 16 | 88% | ✓ |
| | | | **Non-structural:** | | | | |
| | | | Provision of down-scaled information to small-scale farmers, such as forecasts of heavy rain to match planting and cropping cycles, through mechanisms like radio and Internet. | 9 | 15 | 81% | ✓ |
| | | | **Policy:** | | | | |
| | | | Information Based: provide down scaled climatic information with free and easy access, and link forecasts with practical information for small scale farmers | 9 | 13 | 76% | |
| | Flooding events | Crop losses | **Structural:** | | | | |
| | | | Establish flood management plans at the county level, and allow for local community and paid participation in disaster relief actions | 8 | 14 | 73% | |
| | | | Build flood control dams and water diversion/storage systems around flood prone plain areas | 9 | 12 | 74% | |
| | | | **Non-structural:** | | | | |
| | | | Provide advance warning of flooding potential to small scale farmers | 9 | 13 | 76% | |
| | | | **Policy:** | | | | |
| | | | Regulatory: Settlement planning for flood prone areas possibly re-gazetted as non-residential and non-agricultural, and critically assess irrigation development in high flood risk areas | 8 | 12 | 69% | |

## References


AEA Group. 2008. *Kenya: Climate Screening and Information Exchange*. Retrieved from http://www.dewpoint.org.uk/Asset percent20Library/DFID/Climate percent20Risk percent20Assessment percent20Appendices percent20- percent20Kenya.pdf

Barrow, E. and Mogaka, H. 2007. *Kenya's Drylands: Wastelands or an undervalued economic resources*. International Union for Conservation of Nature.

Funk, C., Eilerts, G., Davenport, F., and Michaelsen, J. 2010. *A climate trend analysis of Kenya – August 2010* [Fact Sheet 2010-3074]. United States Geological Survey. Retrieved from http://www.fews.net/docs/Publications/FEWS percent20Kenya percent20Climate percent20Trend percent20Analysis.pdf

Government of Kenya. 2007. *National policy for sustainable development of arid and semi arid lands of Kenya*. Retrieved from http://www.aridland.go.ke/inside.php?articleid=403

Government of Kenya. 2010. *National climate change response strategy: Executive brief*. Retrieved from http://www.environment.go.ke/wp-content/documents/complete percent20nccrs percent20executive percent20brief.pdf

HVA International & M.A. Consulting. 2007. *Environmental Impact Assessment Study Report for the Proposed Tana Integrated Sugar Project in Tana River and Lamu Districts, Coast Province, Kenya* (Land Allocation Reference No. 106796 of 17.1.1995). Retrieved from http://www.tanariverdelta.org/tana/967-DSY/version/default/part/AttachmentData/data/MUMIAS_Tana_EIA_part1.pdf

Mireri, C., Onjala, J. and Oguge, N. 2008. The Economic Valuation of the Proposed Tana Integrated Sugar Project (TISP). *Nature Kenya*. Retrieved from http://www.rspb.org.uk/Images/tana_tcm9-188706.pdf

Mogaka, H., Gichere, S., Davis, R., and Hirji, R. 2006. *Climate variability and water resources degradation in Kenya: Improving water resources development and management* (World Bank Working Paper No. 69). Washington, DC: World Bank. Retrieved from http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2006/01/10/000090341_20060110161654/Rendered/PDF/348540KE0Clima101OFFICIAL0USE0ONLY1.pdf

Mude A. *et al*. 2010. *Index Based Livestock Insurance for Northern Kenya's Arid and Semi-arid Lands: The Marsabit Pilot* (Project Summary Report). International Livestock Research Institute. Retrieved from http://mahider.ilri.org/bitstream/handle/10568/494/IBLI_PROJECT_SUMMARY_0110.pdf?sequence=1

National Irrigation Board. n.d. *National Irrigation Board* [web site]. Retrieved from http://www.nib.or.ke/.

Republic of Kenya. 2010. *Agricultural sector development strategy 2010–2020*. Retrieved from http://www.ascu.go.ke/DOCS/ASDS%20Final.pdf

Temper, L. no date. *Let Them Eat Sugar: Life and livelihood in Kenya's Tana Delta*. Autonomous University of Barcelona, Department of Economics and Economic History. Retrieved from http://www.ceecec.net/wp-content/uploads/2010/02/TANA_DELTA__FINAL.pdf

Watson, D.J. and Van Binsbergen, J. 2008. *Livelihood Diversification Opportunities for Pastoralists in Turkana, Kenya*. International Livestock Research Institute. Retrieved from http://mahider.ilri.org/bitstream/handle/10568/233/RR5_LivelihoodDiversification.pdf?sequence=1

Wong, C., Roy, M., and Duraiappah, A. K. 2005. *Connecting poverty and ecosystem services: A series of seven country scoping studies – Focus on Kenya*. Nairobi: United Nations Environment Programme and Winnipeg, Canada: International Institute for Sustainable Development. Retrieved from http://www.iisd.org/pdf/2005/economics_poverty_kenya.pdf

World Water Assessment Programme (WWAP). 2006. Kenya national water development report (Report No. UN-WATER/WWAP/2006/12). Report prepared for the 2nd UN World Water Development Report *Water: A Shared Responsibility*. Retrieved from http://unesdoc.unesco.org/images/0014/001488/148866e.pdf

## Annex: Detailed Methodology

The climate risk assessment of Kenya's flagship projects was undertaken by completing the following steps:

**1. Identification of Vulnerable Flagship Projects**

The first step in the risk assessment process was to determine which, if any, of Kenya's flagship projects are particularly vulnerable to the impacts of climate change. A list of 71 flagship projects identified for execution within Kenya's first Medium Term Plan was therefore complied, drawing upon information provided by the Ministry of State for Planning, National Development and Vision 2030. Basic information about each the objectives and accomplishments to date of these flagship projects were obtained by reviewing the Kenya Vision 2030 web page (http://www.vision2030.go.ke/index.php).

An initial screening of each of these flagship projects was then completing using a draft climate risk screening tool developed by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The draft GIZ screening tool assesses a project's vulnerability to climate change against the following four questions:

1. Is the project active in one of the following sectors: agriculture and rural development; forests/forestry; natural resources management and biodiversity; water; disaster management; urban, municipal or regional development; health; or energy? (Yes or No)
2. Is the project situation in one of following geographic regions: coastal zones; floodplains; areas affected by hurricanes or typhoons; arid areas; or mountain regions? (Yes or No)
3. Does the impact of the project depend on important climate parameters such as temperature, precipitation or wind? (Yes or No)
4. Does the project provide opportunities to significantly increase the adaptive capacity of the target group(s) or ecosystem(s)? (Yes or No)

If the response to any one of the above questions was "yes," the flagship project was tagged for further assessment. A total of 41 projects were thereby tagged for further examination. To further refine this list, a secondary screening was applied. Specifically, projects were prioritized for deeper screening if, in the expert opinion of the evaluators:

- The activities to be undertaken as part of the flagship project are likely to be significantly affected by either current climate variability and/or long-term climate change; and
- Implementation of the project could be expected to increase Kenyans adaptive capacity.

Based on completion of this deeper screening process, 13 projects were identified as being particularly vulnerable to the impacts of climate change and having potential capacity to contribute to building adaptive capacity in Kenya.

**2. Selection of Priority Projects for Detailed Analysis**

Each of the 13 projects identified through the initial screening process could have been assessed for their vulnerability to the impacts of climate change and options for reducing this vulnerability. However, in light of the scope and mandate of SC1, a further screen was applied in an effort to narrow down the list of particularly vulnerable projects to a maximum of five. To accomplish this goal, the identified projects were assessed with respect to their potential to provide benefits to a significant number of Kenyans. Each project was therefore screened against the following questions:

1. What is the expected number of direct beneficiaries of the flagship project? Responses to this question were ranked as follows:
    - Low if less than 500,000 Kenyans are expected to directly benefit from the project. (Allocated 1 point)

   - Moderate if 500,000 to 1 million Kenyans are expected to directly benefit from the project. (Allocated 2 points)
   - High if more than 1 million Kenyans are expected to directly benefit from the project. (Allocated 3 points)
2. Are the expected beneficiaries of the project members of vulnerable groups (e.g. women and children, indigenous peoples, pastoralists, individuals living in arid and semi-arid lands)? Responses to this question were ranked as follows:
   - If "no," then assigned zero points.
   - If "some," then assigned 1 point.
   - If the expected primary beneficiaries of the flagship project, then it was assigned 2 points.
3. Is the flagship project likely to be carried over into Kenya's second MTP? Responses to this question were ranked as follow:
   - If "no," then assigned zero points.
   - If "yes," then assigned 1 point.

Based on use of these assessment questions, projects that received a total number of points equal to or greater than 4 were identified as priority projects for deeper assessment. Seven priority projects were identified following application of this secondary screening process. From this list, the reviewers identified five priority projects for in-depth assessment, taking into consideration a desire to achieve a balance between "Economic," "Social" and "Enablers and Macro Projects," and to examine projects from different sectors and/or to be implemented in different regions of the country. Based on these considerations, the following five projects were selected:

- "ASAL Development Projects"
- "Setting up of Five Livestock Disease-free Zones in the ASAL Regions"
- "Installation of Physical and Social Infrastructure in Slums in 20 Urban Areas"
- "Rehabilitation and Protection of Indigenous Forests in Five Water Towers"
- "Energy Scale up Programme and Rural Electrification: Generation of 23,000 MW and Distributed at Competitive Prices."

**3. Climate Risk Assessment**

A general climate risk assessment was completed for each of the flagship projects by completing the following steps:

1. <u>Identification of potential changes in climatic conditions.</u> Drawing upon existing literature sources as well as draft reports produced as part of Sub-component 3 (SC3) of the Kenya Climate Change Action Plan process (development of a National Adaptation Plan), potential changes in climatic conditions (or climate risk factors) were identified. These climate risks included: an increase mean annual temperatures; an increase in the frequency of drought conditions; more frequent heavy rainfall events; a decline in mean annual precipitation; and changes in the timing of the short and long rains.

2. <u>Identification of how the anticipated change in climatic conditions might directly impact the flagship project</u>. For example, the reviewers asked the question "how might a decline in mean annual precipitation directly impact the activities planned as part of the ASAL Development Projects?" Potential impacts were then listed in the appropriate table. In order to limit the scope of the analysis, care was taken during this process to explicitly focus on the direct impact of the anticipated climate risk on the flagship project. For example, a decline in mean annual precipitation was identified as having the potential to make less water available for irrigation. The potential secondary impacts of this anticipated direct impact, such as a decline in crop production, were not considered in the analysis.

3. Assessment of the likelihood of the anticipated direct impact occurring. Based on the background information gathered and expert judgement, the likelihood (or probability of occurrence) of an anticipated event taking place was assessed. For consistency, the likelihood scale used within the analysis was the same as applied in the draft documents prepared as part of SC3, namely:

   *1 = Rare* – Event not expected to occur, but possible (<5 percent probability of occurrence per year in 2050s);

   *2 = Unlikely* – Event unlikely to occur, but not negligible (5-33 percent probability of occurrence per year in 2050s);

   *3 = Possible* – Event less likely than not, but still appreciable chance of occurring (33 – 66 percent probability of occurrence per year in 2050s);

   *4 = Likely* – Event more likely to occur than not (66 – 95 percent probability of occurrence per year in 2050s); or

   *5 = Almost certain* –Event highly likely to occur (>95 percent probability of occurrence per year in 2050s).

4. Assessment of the consequence of the anticipated direct impact. For each of the anticipated direct impacts on the assessed flagship project, the potential outcome was assessed using expert judgement as to being either:

   *1 = insignificant;*

   *2 = minor;*

   *3 = reasonable/moderate;*

   *4 = major; or*

   *5 = severe.*

5. Overall climate risk assessment. The degree of vulnerability of the flagship project to the climate risk factors identified was determined by adding together the likelihood and consequence scores, for a potential scoring range of 2 to 10. Based on this analysis, the risk posed by the projected change in climate for the examined flagship project was deemed to be:
   - *Low,* if the total score was between 2 and 4;
   - *Moderate,* if the total score was between 5 and 7; and
   - *High,* if the total score was between 8 and 10.

Climate risk factors ranked as "high" were flagged for more detailed consideration with respect to how the flagship project's vulnerability to their projected occurrence might be reduced. Using the above steps, a number of high risk climate events are identified for each projects (and/or sub-component). When necessary, the number of priority climate risks flagged is limited to two risks per project sub-component and a total of six risks per flagship project.

**4. Identification of Illustrative Options for Reducing Climate Risks**

The next phase of the climate risk assessment process involved the identification of possible measures that could be taken to reduce the vulnerability of the individual flagship projects to the highest ranking climate risks. Illustrative examples of possible vulnerability reduction options were identified and assessed. In all cases, a wide range of additional risk reduction strategies could have been considered. The options identified therefore are not necessarily the best strategies available, or ones that might be considered for implementation by Kenya.

In seeking measures to reduce vulnerability to climate change, a wide variety of possible actions may be considered. Some of these actions may involve changes to natural or human-generated physical structures. Others might focus on building the human, social, financial and/or political capacity of individuals, communities and businesses to prepare for and respond to the impacts of climate change. Additional options may focus on government-led policy initiatives that serve to strengthen adaptive capacity. Based upon this understanding, options for reducing vulnerability to priority climate risks were identified that fit within each of the following categories:

- *Structural options* – defined as physical or landscape level interventions that serve to modify or prevent the threat, or that involve a change in use or change in location;
- *Non-structural options* – defined as interventions that build human capacity through actions such as research, education, institutional strengthening and social change; or
- *Policy options* – defined as the introduction or modification of existing government policies, strategies and/or measures. To further convey the types of policy instruments that could be used to reduce vulnerability to identified climate risks, drawing on UNEP (2011), potential options were identified as being either market-based, regulatory, public investment, information based, international cooperation, or institution based instruments.

To further define the identified climate risk management options, the expected key impact of the proposed intervention was named. In essence, this description outlines how the proposed risk management option is anticipated to reduce the flagship project's vulnerability to one of the key climate risks to which it is projected to be exposed.

The proposed options' characteristics with respect to two time bound measures were also described:

- When the identified option likely would need to be implemented given projected changes in Kenya's climate, with the parameters for consideration being either:
    - Immediately, defined as being during the next Medium Term Plan (2013 to 2016); or
    - Longer term, defined as needing to occur after 2016.
- The estimated length of time to implement the illustrative option, with the parameters for consideration being either:
    - A short amount of time, defined as the option potentially be implemented in less than 3 years;
    - A middle length of time, defined as the option potentially be implemented in 3 to 5 years; or
    - A long length of time, defined as the option potentially requiring more than 5 years to implement, and including those action that may be viewed as needing to take place indefinitely.

**5. Assessment of Climate Risk Options**

The selected, illustrative options were then assessed with respect to their suitability and viability from two different perspectives: the feasibility of their implementation and their potential contribution to Kenya's sustainable development. To assess the feasibility of the proposed option, a slightly modified version of the assessment criteria and indicators used within the climate risk screening tool ORCHID (Opportunities and Risks of Climate Change and Disasters) was applied (Tanner et al., 2007, p.118). Using this approach, each proposed option was assessed against the following five questions:

1. Does the proposed risk management option support win-win or no regrets actions by:
    - Increasing capacity to address current or future climate risks? If so, then 1 point scored.
    - Increasing capacity to address current and future climate risk? If so, then 2 points scored.
2. Is the proposed risk management option consistent with existing risk management activities?
    - If no, then 1 point scored.

    - If yes, then 2 points scored.
3. Can the cost effectiveness of the proposed risk management option be easily determined?
    - If no, then 1 point scored.
    - If yes, then 2 points scored.
4. Are their potential negative spin-off impacts associated with the proposed risk management option?
    - If a high likelihood for negative spin-off impacts exists, then 1 point scored.
    - If a low likelihood of negative spin-off impacts exists, then 2 points scored.
5. Is the proposed risk management option practical and feasible for a donor, partners and project implementer?
    - If no, which was defined as the option being impractical and not attractive to donors, then zero points scored.
    - If difficult, defined as being practical (i.e. there is experience with its implementation and the cost is not exorbitant) but not attractive to donors, or not practical but potentially attractive to donors, then 1 point scored.
    - If yes, defined as being practical and likely to be attractive to donors, then 2 points scored.

The points assigned in response to these questions were then totaled to determine the assessed feasibility of the examined climate risk management option. The total points earned ranged from four to 10.

In the second stage of this analysis, the potential contribution of the proposed climate risk management option to sustainable development was assessed using expert judgement. The following questions were used within this assessment:

1. Does the option promote employment opportunities?
2. Does the option promote access to appropriate information, skills/capacity, technology or practices?
3. Does the option build, or help to build, relevant (physical) infrastructure (green or grey) that facilitates the movement of goods, people and/or (ecosystem) services?
4. Does the option build, or remove barriers to, relevant policy/information infrastructure?
5. Does the option have the potential to promote equity (e.g., gender, age or socio-economic)?
6. What is the expected number of direct beneficiaries of the project?:
    - Low, defined as being less than 500,000 people? If yes, scored as 1 point.
    - Moderate, defined as being between 500,000 and 1 million people? If yes, scored as 2 points.
    - High, defined as more than 1 million people? If, yes, scored as 3 points.
7. Does the option have benefits for water quality, air quality and/or biodiversity?

With the exception of question 6, each of these questions was ranked against the following scale:

- If expected to have a negative impact, scored as -1 point.
- If expected to have a neutral impact, scored as zero points.
- If expected to have a low positive impact, scored as 1 point.
- If expected to have medium positive impact, scored as 2 points.
- If expected to have a high positive impact, scored as 3 points.

The scores for each question were then totaled to estimate to proposed risk management option's contribution to sustainable development (a range of -6 to 21 points).

The overall assessed feasibility and appropriateness of the proposed options was determined by averaging of the percentage scores received for the assessed feasibility of the option (that is, X out of a total possible score of 10, expressed as a percentage) and its potential contribution to Kenya's sustainable development (X out of a total possible score of 21, expressed as a percentage). The options which received the highest scores were judged as being worth being considered for implementation by the Government of Kenya as it strives to integrate climate change considerations into its next MTP.