



**ECOFINDER KENYA**  
**P.O. Box 179-40123,**  
**Kisumu, Kenya**  
**[www.ecofinderkenya.org](http://www.ecofinderkenya.org)**

**PROMOTING CLIMATE AND ECOSYSTEM SMART LIVELIHOODS FOR  
CLIMATE CHANGE ADAPTATION AMONG YALA WETLAND  
COMMUNITIES, LAKE VICTORIA-KENYA**

**FINAL PROJECT REPORT**

PREPARED AND EDITED BY:  
**MAURICE O. OGOMA**  
**LEONARD O. AKWANY**

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## **ACRONYMS AND ABBREVIATIONS**

ASDSP – Agricultural Sector Development Support Programme

BMU – Beach Management Unit

BSA – Biodiversity Significant Area

CBO – Community Based Organization

C3A2 – Community Climate Change Adaptation Assessment

FGD – Focus Group Discussion

HH - Household

IBA – Important Bird Area

ICE – Information Communication and Education

ICRAF – World Agroforestry Center

KALRO – Kenya Agricultural and Livestock Research Organization

KES – Kenya Shillings

KFS – Kenya Forest Service

KWS – Kenya Wildlife Service

NEMA – National Environment Management Authority

NGO – Non Governmental Organization

PRA – Participatory Rural Appraisal

ACK – Anglican Church of Kenya

CBO – Community Based Organization

NGO – Non-Governmental Organization

PREPARED – Planning for Resilience in East Africa through Policy, Adaptation, Research & Economic Development.

RCMRD – Regional Centre for Mapping of Resources for Development

USAID – United States Agency for International Development

YASCCO – Yala Swamp Community Conservancy Organization

## EXECUTIVE SUMMARY

The project entitled “Promoting Climate and Ecosystem Smart Livelihoods for Climate Change Adaptation among Yala Wetlands Communities, Kenya” was conducted in Yala wetlands, an area identified by many studies as a climate and biodiversity hotspot including a study commissioned by the Lake Victoria Basin Commission (LVBC). The wetlands have also been designated by Birdlife International as an Important Bird Area (IBA) and also as a Biodiversity Significant Area (BSA) according to the Ecosystem Profile Assessment (EPA) conducted by the PREPARED. The project conducted participative research on climate change and its impact on local livelihoods; promote participatory community climate and ecosystem smart livelihoods and contribute data towards development of climate change adaptation strategy for the Lake Victoria region. These were implemented by first sharing the project objectives and activities with the local community members in three villages in Yala wetlands: Barolengo, Nyadorera B and Kaugagi/Hawinga, followed by stakeholder and community trainings on climate change and climate smart livelihoods, and climate change awareness creation in local schools, local markets and in local radio through climate change drama. Community climate change adaptation assessment (C3A2) toolkit was used to collect and analyse climate information locally following training of trainers on the protocols and application of C3A2. The results of C3A2 analysis were validated by the community and at the meso (County) levels. Climate smart livelihoods identified by the community were initiated at the community level for local adoption.

The project objectives and activities were unanimously verified by the community with representation from local institutions including local NGOs and CBOs. Three training manuals on agroforestry, water harvesting and sustainable farming in relation to climate change were developed and used for training of 17 (12 men, 5 women) individuals as climate smart livelihoods trainers and 64 individuals from the community representing 35 men and 27 women 12 youths from Barolengo, Nyadorera B and Kaugagi/Hawinga. This developed the capacity of the community and local institutions to adopt climate smart livelihoods as a strategy for climate change adaptation. Seven primary and four high schools participated in schools essay writing and arts competition that tested the understanding and perceptions of young people on climate change. 121 entries were received representing 65 and 56 females and males respectively. Awareness on climate change was created through two schools outreaches and community outreaches in two local markets through drama and puppetry with climate change messages disseminated to approx. 1000 people. This was augmented with interactive radio drama aired in Radio Lake Victoria with four drama episodes each lasting one hour on different dates. Local knowledge on climate change, impacts, coping mechanisms and adaptation options were assessed through implementation C3A2. Key climatic hazards in the community are floods, drought, human-wildlife conflict, soil erosion and invasive weeds. The communities has a weak capacity to respond to climate change owing to failure of local coping mechanisms to effectively address climatic impacts and lack of technical and financial capacity and awareness on adaptation measures. Following a rapid feasibility study and an exchange visit to the Tanga Kona commercial village in Busia County, selected climate smart livelihoods were piloted for adoption by the community. These included sinking and rehabilitation of community wells; water harvesting tank to promote agroforestry initiatives; 500m<sup>2</sup> agroforestry woodlot and demo plot; and cassava and sweet potato farming. The scope of this project was small compared to the area covered by Yala wetlands. However, the project has provided recommendations that would ensure adaptation of the local community to climate change.

## I INTRODUCTION

Ecofinder Kenya through the technical support of The PREPARED Project with financial support from the USAID addressed some of these climate change and related challenges by implementing the project entitled “Promoting Climate and Ecosystem Smart Livelihoods for Climate Change Adaptation among Yala Wetlands Communities, Kenya”. The project was implemented from 9<sup>th</sup> February 2015 to 30<sup>th</sup> April 2016 in Yala wetlands, Siaya County in the Lake Victoria region, Kenya. The project area, Yala Wetlands, is a designated Biodiversity Significant Area (BSA) and an Important Bird Area (IBA), which provides crucial ecosystem goods and services to biodiversity and at least 250,000 local inhabitants of the generally poor riparian communities.

The overall goal of this project was to develop climate change adaptation plan by promoting climate smart livelihoods through participative research and sustainable community actions among Yala wetland communities in Siaya County. The objectives of the project were to (1) conduct participative research on climate change and its impact on local livelihoods: establish the patterns and trends of temperature and rainfall and assess their impacts on local livelihoods; document the perceptions of local people concerning the effects of climate change on their livelihoods; and conduct climate change vulnerability assessment and identify climate risks among wetland communities; and (2) develop climate change adaptation plan through participatory community climate and ecosystem smart livelihoods: create climate change awareness among local communities and institutions; initiate climate change education and trainings to build local capacities; and promote climate-smart and ecosystem-friendly livelihoods among rural communities through community actions.

The project was implemented in eight milestones as follows:

1. Milestone A: Work plan and inception report
2. Milestone B: Training of Trainers on Climate Smart Livelihoods
3. Milestone C: Climate Smart Livelihood trainings
4. Milestone D: Strategy for communication and outreach approaches
5. Milestone E: Community Climate Change Adaptation Assessment (C3A2)
6. Milestone F: Community Actions on climate-smart livelihoods
7. Milestone G: C3A2 Validation & Development of Community Adaptation Plans
8. Milestone H: Final Technical and Financial Report

The project worked with various stakeholders to implement the above milestones: The local Yala wetlands communities, County Government of Siaya, local schools, Beach Management Units (BMU), Common Interest Groups (CIG), Opinion formers, Government bodies e.g. Kenya Forest Service (KFS), National Environment Management Authority (NEMA), Kenya Wildlife Service (KWS), Community Based Organizations (CBO), and Non-Governmental Organizations (NGO). The project has contributed information to feed on the indicators of the PREPARED Project on climate change adaptation e.g. Number of climate adaptation tools, technologies and methodologies developed, tested and/or adopted; Number of institutions with improved capacity to address climate change issues; Number of laws, policies, strategies, plans, agreements, or regulations addressing climate change adaptation officially proposed, adopted, or implemented; and Person hours of training completed in climate change.

## **2 OBJECTIVES & METHODOLOGY**

### **2.1 Project objectives**

The goal of this project was to develop climate change adaptation strategy by promoting climate smart livelihoods through participative research and sustainable community actions among Yala wetland communities in Siaya County, Kenya. The objectives of this project were implemented in two phases i.e. participatory research and community actions:

- a) Conduct participative research on climate change and its impact on local livelihoods;
  - Establish the patterns and trends of temperature and rainfall and assess their impacts on local livelihoods
  - Document the perceptions of local people concerning the effects of climate change on their livelihoods
  - Conduct climate change vulnerability assessment and identify climate risks among wetland communities
  
- b) Develop climate change adaptation strategy through participatory community climate and ecosystem smart livelihoods;
  - Create climate change awareness among local communities and institutions
  - Initiate climate change education and trainings to build local capacities
  - Promote climate-smart and ecosystem-friendly livelihoods among rural communities through community actions

### **2.2 Project Inception and Work plan**

A draft work plan was produced through internal consultations within Ecofinder Kenya and other key relevant stakeholders and submitted to PREPARED Project for approval. This followed project objectives, available resources and activities time frame. A fact finding pilot survey with local community and opinion leaders was conducted in Yala wetlands. A local stakeholders meeting was then held in Siaya County to verify the planned activities. The meeting was used to sensitize the local stakeholders about the impending project activities and acted as the platform for launch of the project activities. Publicity materials including banners, flyers and information leaflets were designed and produced with input from the PREPARED project technical support team.

Selected community opinion formers, local leaders, local administration, religious leaders and members of the civil society acting locally were targeted during this initial phase of the project. Assorted stationeries, branded ICE materials, meeting venue, meals and refreshments, transportation and communication services were all required to implement this milestone. Other services included language translation and use of public address system. With additional input from members of the community the project activities were successfully verified and workplan approved for implementation of project activities.

### **2.3 Trainings on Climate Smart Livelihoods**

#### **a) Training of Trainers**

Three training manuals on three livelihoods were produced through the services of a consultant: Agroforestry and Climate Change, Water harvesting and Climate Change and Sustainable farming and Climate Change. The manuals were then be used by facilitators to

train carefully selected stakeholders from local institutions and community groups on climate change adaptation. The training was conducted as a training of trainers (ToT) in Siaya town. The broad objective of the workshop was to impart theoretical and practical skills in three climate-smart livelihoods: sustainable farming, agro forestry and water harvesting to the trainees from the Yala Wetland Communities.

17 participants were trained on three climate smart livelihoods: Agroforestry, water harvesting techniques, and sustainable farming. These areas came out strongly to be of concern among the local residents during the training needs assessment conducted prior to this workshop. The trainees would act as agents of change for climate change adaptation and spearhead adaptation initiatives in their communities. The knowledge acquired by the trainees would be delivered back to other community members for implementation in helping them to adapt to climate change. The trainees were expected to: understand climate change, the causes and how to adapt to it; and understand the climate smart livelihoods, how to implement them and their contribution towards climate change adaptation. The methodologies used to facilitate the training workshop were: Power point presentations, hand out notes, group discussions, video clips, case studies discussions and practical demonstrations.

Requirements during the ToT workshop included meals and refreshments, accommodation services, assorted stationeries, communication and transportation services and certificates of participation. The key outcome of this milestone were production of three training manuals (Agroforestry, water harvesting techniques and sustainable farming), knowledge and skills on climate change adaptation successfully shared with participants, 17 trained participants became change agents in their various institutions, and close institutional linkages involving The PREPARED Project, Ecofinder Kenya, County Government of Siaya, Kenya Forest Service (KFS), National Environment Management Authority (NEMA), Kenya Wildlife Service (KWS).

### **b) Community Trainings**

A total of 62 participants selected from each of the 3 villages were trained on 3 climate smart livelihoods (Agroforestry, Sustainable agriculture and Water harvesting). These included 35 male and 27 female participants respectively, while a total of 12 youths comprising 9 males and three females also participated as trainees. The participants were selected considering the village of origin, gender and livelihood activities they were engaged in. The broad objective of the workshop was to impart theoretical and practical skills in three climate-smart livelihoods: sustainable farming, agro forestry and water harvesting to the participants from the Yala Wetland Communities. The knowledge acquired by the trainees would be delivered back to the other community members for implementation and helping them in adapting to climate change. The specific objectives were to: understand climate change, the causes and how to adapt to it, and understand the climate smart livelihoods, how to implement them and their contribution towards climate change adaptation. Methods used to facilitate were: power point presentations, hand out notes, group discussions, flip charts, video clips, question and answer sessions, practical and case studies.

## 2.4 Strategy for communication and outreach approaches

Two main activities were implemented in this milestone i.e. schools essay writing competition and participatory climate change education through applied drama, puppetry and radio. The aim of the essay writing competition was to assess the level of understanding and perceptions of young people towards climate change in Siaya. The competition targeted primary and secondary school students around the Yala wetlands and its environs. Both written and artistic submissions were accepted.

Essays competition posters were distributed in 15 schools within Yala wetlands and its environs. This followed prior discussions with the office of the County Director of Education in Siaya and the Siaya County Director of the Environment. Marking of essays was conducted by Ecofinder Kenya staff and volunteers. These followed the guidelines that were developed by Ecofinder with consultations from the County Director of Education and the County Director of the Environment in Siaya. Individual student entries were ranked as follows: awareness shown – 20%, ideas and innovation suggested – 20%, originality – 20%, requirements met – 20%, and relevance, applicability and language – 20%. The schools ranking criteria was based on level of students participation, gender equality and number of winning entries per school. Marking of essays was conducted by Ecofinder Kenya staff and volunteers. These followed the guidelines that were developed by Ecofinder with consultations from the County Director of Education and the County Director of the Environment in Siaya. The winning essays and schools were awarded at a ceremony held at Hawinga Girls' Secondary School in Siaya.

Participatory Educational Theatre, Puppetry and Radio (PETPR) were used for behavior change communication and awareness creation on climate change. It uses cultural appropriate storytelling by taking examples from local heritage, language and cultural symbols. As a result the messages are more easily accepted and owned by the target audiences. Additionally it is entertaining, provocative, and non-intrusive, and causes individuals and the collective to reflect on their current actions and how they can be changed. Participatory Education Theatre (PET) targeting community members and schools going children was implemented in four public locations in Yala wetlands and its environs: Sidundo market, Uhembo primary school, Hawinga secondary school and Kojema market center. Various climate change messages and topics were covered in the different locations e.g. Background, local manifestations, causes and Impacts of Climate Change; Appropriate interventions and coping strategies to Climate Change; The case of Sustainable Farming and Agroforestry; and Climate change adaptation strategies for water harvesting.

Ecofinder Kenya worked with Radio Lake Victoria to broadcast key messages on climate change to the larger population in Siaya County. Radio Lake Victoria was selected because it broadcasts in local Luo language and it is known to promote environmental conservation and related activities including sustainable livelihoods promotion in the Lake Victoria region. The radio station could be tuned live at 92.1 FM or listened to online at [www.osienala.org](http://www.osienala.org). Each 60 minutes broadcast program was played in three components: Approx. 15 minute radio drama on pre-determined topics on climate change was aired; approx. 30 minutes of an expert discussion on the issues that arose in the drama. The expert also responded to questions or comments from the listenership call-ins on various discussion topics. There was a final 15 minutes that provided an opportunity for listeners to call-in and ask a question or share their opinion on the subject matter. This would ensure the programs were interactive and addressed the communities' information needs.



Four episodes with accompanying synopsis were played during the week-long programme: *Jakoyo Household – Climate Change Lamentations and Challenges in farming Jakoyo Family Household Setting*; *Jopur Cooperative Farm – Climate Change Interventions in Farming Group Setting in the Field*; *Two Farmers (sustainable farming) Friends – Climate Change Adaptation through Sustainable Farming Modeled on Farmer-Farmer Exchange among two friends setting*; and *Two Farmers (agroforestry) Friends – Climate Change Adaptation through Agroforestry modeled on Farmer-Farmer Exchange among two friends setting*.

## **2.5 Community Climate Change Adaptation Assessment**

The purpose of conducting Community Climate Change Adaptation Assessment (C3A2) was to compile sufficient information and evidence to answer a set of critical questions that would inform planning for climate change adaptation in the Yala wetlands in Lake Victoria basin. The C3A2 toolkit would help answer the following questions: how is climate vulnerability and change (CVC) perceived and defined by the Yala wetland communities and which events are felt most strongly? Where and who are the communities most exposed to CVC and its influences? Which households/livelihoods/groups/services etc. are perceived by wetland communities as most vulnerable to CVC? What institutions / structures /policies are in place or lacking to help cope and/or adapt to climate stressors?

Two members of the project team were first trained as trainers at a training workshop spearheaded by The PREPARED Project in Kisumu where they gained skills in implementation of the toolkit at the community level. This was followed by an intensive four days training of enumerators selected from target communities (Hawinga/Kaugagi, Barolengo and Nyadorera B) was conducted at the Ecofinder offices in Kisumu. This training was facilitated by the two trainers from Ecofinder Kenya who had received a similar training. The trained community enumerators facilitated C3A2 data collection at the village level in Yala and supervised by the Ecofinder team.

Data were collected at both micro (community) and at the meso (county) levels. Meso level involved two days assessment of adaptation attributes and storytelling from civil society actors and government officers. Adaptation attributes tool was used to collect data through focus group discussions while storytelling involved individual encounter of a story related to climatic changes in the county. At community level the following C3A2 tools were administered for four consecutive days at each of the three villages: community protocol, risk mapping, adaptation attributes, storytelling, community protocol, resilience ranking, techno transect, community calendars and give back.

Community protocol involved plenary discussions with all participating community members at the first meeting encounter with the community. Two focus group discussions (FGD) were conducted each covering hazard mapping and vulnerability mapping while storytelling interviews were conducted for approx. 60members of the community. Techno transect involved mobile interviews with local guides, field photography and photos interpretation on hazards, vulnerability and capacity. Resilience ranking was administered through small and intimate FGDs with participants with wide local knowledge of community members while community adaptation attributes involved FGDs with the community involving elders and local leaders. Community calendars involved ranking of the most important aspects of external risks and community activities through two FGDs.

On the final day a give back session was conducted for each of the three villages through plenary sessions where open discussions ensued with all the community members and the

data collection team. The C3A2 community surveys were conducted using various methodologies for facilitation including the following: group work, flip charts, video coverage, interviews, focus group discussions, mapping, and photography. Others were transect walks, questions and answers.

## **2.6 Community Actions on Climate Smart Livelihoods**

Rapid feasibility study was undertaken by Ecofinder Kenya to identify households for demonstrating climate and ecosystem smart livelihoods in relation to water harvesting, sustainable farming and agroforestry. 20 households/farms and two schools were visited for appraisal. The target three villages of Bar Olengo, Nyadorera B and Hawinga Kaugagi were surveyed for two days each. The feasibility study team was guided in the field visits by respective community mobilizers. The field activities involved visiting households, farms and institutions such as schools for comprehending the issues of concern. The team employed field observations, interviews and photography in gathering the information. In Bar Olengo one school and five households and farms were visited. In Nyadorera B six households and their farms were visited while in Hawinga/Kaugagi eight households and one school were visited.

Community exchange visit was conducted between Yala wetlands community and Tanga Kona Commercial Village in Busia County. The purpose of the exchange visit was to: share experience and skills in implementation of various livelihoods at community level; identify challenges and learn lessons in implementing community-driven livelihood activities; and acquire knowledge and skills to guide the choice of adaptation options for implementation in Yala. 16 participants from Yala wetlands were carefully chosen based on gender, socio-economic activities and willingness to participate and implement new farming strategies. The learning exchange was conducted through plenary presentations, farm visits and on-farm demonstrations. Two cassava farms each measuring 2 acres and 2 sweet potato farms each measuring 1 acre were visited. Challenges facing the commercial village were recorded and lessons learnt enumerated.

A proposal for implementation of climate smart livelihoods was produced and adopted by the community. From this proposal, various activities were implemented by the project at the local level e.g. Berolengo: Water harvesting tank at Bar-olengo secondary school, Establishing 500m<sup>2</sup> agroforestry woodlot and rehabilitation of community water well; Hawinga/Kaugagi: agroforestry demo plot; Nyadorera B: sinking of new water well, pilot cassava and sweet potato production with experience from Tangakona commercial village.

## **2.7 C3A2 Validation & Development of Community Adaptation Plans**

Siaya County Community Climate Change Adaptation Action Plan (C3A2) meso-level assessment involved data collection from two set of respondents: civil society organisations and the employees of the county and national government that included those individuals working in the various departments. The validation was necessary because it was important to authenticate the adaptation attribute information provided by the meso participants in C3A2 before official publication and sharing with the wider community and institutions. The purpose of this validation was to: validate the information collected from the civil society organisations (CSOs) and government officers during C3A2 surveys through a participatory process, and bridge the adaptation attributes gaps identified in the C3A2 report. A

participatory focus group discussions process was followed to achieve the above objectives. The participants were taken through the analyzed results of the community adaptation attributes. Through a careful process led by two moderators, discussions on each adaptation attribute followed based on the analyzed scores of low, medium or high. This provided an opportunity for all the participants to contribute new information based on the works of their departments and organizations.

Community validation of C3A2 was conducted in two days community meetings per community. The objectives of the community validation meetings were to: share and validate the information collected from the community during C3A2 surveys through a participatory process; generate a discussion on key areas of the C3A2 report to fill in the identified gaps in the previously collected data; and produce community adaptation action plan for priority hazards in the community. The objectives were achieved in two days with day one designated for C3A2 validation and filling of data gaps while day two was dedicated for production of community adaptation action plans per community. The process followed was participatory and the methods used included the following: presentations from Ecofinder Team, Plenary discussions, Transect walks and Group work.

### 3 RESULTS AND DISCUSSION

#### 3.1 Summary of project results, outputs and achievements

**Table 1:** Summary of project results, outputs and achievements

<b>Milestone</b>	<b>Deliverable</b>	<b>Achievement/Outputs</b>
<b>A:</b> Work plan and inception report	Work plan and inception report.	<p>1. Project workplan produced, submitted and approved by PREPARED.</p> <p>2. project inception/launch</p> <ul style="list-style-type: none"> <li>➤ 74 participants (38 females and 36 male) from across the community, local CBOs and NGOs participated and climate change and adaptation messages disseminated.</li> <li>➤ 14 local institutions were represented in the meeting.</li> </ul>
<b>B:</b> Climate Change Livelihood Adaptation Trainings	<p>Training Manuals on climate smart livelihoods and climate change</p> <p>Training of Trainers participant lists and training report.</p>	<p>1. Three training manuals produced and approved by PREPARED for community-level trainings on climate-smart livelihoods:</p> <ul style="list-style-type: none"> <li>➤ Agroforestry</li> <li>➤ Sustainable farming</li> <li>➤ Water harvesting techniques</li> </ul> <p>2. Training of trainers (ToT) on climate smart livelihoods:</p> <ul style="list-style-type: none"> <li>➤ 17 (12 men, 5 women) community members trained as ToTs on 3 climate smart livelihoods and climate change</li> <li>➤ Participants trained from 3 communities: Barolengo, Nyadorera B and Hawinga/Kaugagi.</li> </ul>
<b>C:</b> Climate Smart Livelihood trainings	<p>1. Participant lists</p> <p>2. Comprehensive training report.</p>	<p>Community trainings on climate smart livelihoods:</p> <ul style="list-style-type: none"> <li>➤ 64 community participants trained on 3 climate smart livelihoods.</li> <li>➤ Participants included selected members from 3 communities in Yala (Barolengo, Nyadorera B and Hawinga/Kaugagi).</li> <li>➤ Community trainees included 35 male and 27 female participants while a total of 12 youths comprising 9 males and three females also participated as trainees.</li> </ul>
<b>D:</b> Strategy for communication and outreach approaches	<p>1. Strategy for communication and outreach approaches; 2. Video or Voice recording of the radio drama; 3. Example of posers produced (USAID Branded). All communication and outreach material (written or verbal) must be approved</p>	<p>1. Schools essay writing competition:</p> <ul style="list-style-type: none"> <li>➤ Local schools in Yala and its environs were targeted and requested to participate through schools essays poster distribution to 15 schools</li> <li>➤ 11 schools participated (7 Primary and 4 High schools)</li> <li>➤ Primary schools-90entries while High schools-31 entries totalling to 121 entries with 65 and 56 females and males respectively.</li> </ul> <p>2. Four schools and community outreaches:</p> <ul style="list-style-type: none"> <li>➤ Schools outreaches – Uhembo Pri. School and Hawinga Girls’ sec. school,</li> <li>➤ Community outreaches – Sidundo market and Kojema</li> </ul>

	by PREPARED prior to the printing or distribution.	<p>market center.</p> <ul style="list-style-type: none"> <li>➤ Climate change and adaptation messages disseminated to approximately 1000 people during the outreaches</li> </ul> <p>3. Publicity materials:</p> <ul style="list-style-type: none"> <li>➤ 170 t-shirts produced and distributed to participants during live drama outreaches, essay competition and local stakeholders.</li> <li>➤ 2 project banners produced with project information including title, objectives/milestones, duration and sponsors</li> <li>➤ 1000 information leaflets about the project and climate change and adaptation information disseminated.</li> </ul> <p>4. Interactive radio program:</p> <ul style="list-style-type: none"> <li>➤ 4 radio interactive shows were aired on Radio Lake Victoria each lasting 1 hour and included radio drama on climate change and adaptation (15 minutes), expert discussion on issues raised in drama shows (30 minutes), and 15 minutes of radio listeners call-ins and questions and answers.</li> <li>➤ Drama topics included Definition, Causes and Impacts of Climate Change; Multiple Interventions to Climate Change; Case Study of Sustainable Farming &amp; Agroforestry; and Case Study of Water Harvesting</li> <li>➤ Four radio shows podcasts produced on CD and shared with PREPARED for community education on climate change.</li> </ul>
<b>E: Community Climate Change Adaptation Assessments (C3A2)</b>	C3A2 report: methodology, analysis of results, challenges and successes	<p>1. C3A2 Trainings</p> <ul style="list-style-type: none"> <li>➤ 2 Ecofinder staffs (1 male, 1 female) trained for 7 days as trainers (ToT) for C3A2 implementation.</li> <li>➤ 3 Ecofinder staffs (3 males) trained for 3 days on GeoCLIM software for analysis of rainfall and temperature data</li> <li>➤ 14 (10 male, 4 female) community enumerators trained by the Ecofinder ToTs to assist in C3A2 data collection at community level.</li> </ul> <p>2. C3A2 Surveys</p> <ul style="list-style-type: none"> <li>➤ 2 meso-level surveys using C3A2 toolkit conducted in Siaya targeting the civil society and government employees at Siaya County headquarters for 2 days.</li> <li>➤ Community surveys using C3A2 toolkit conducted for a total 12 days in three communities (Hawinga/Kaugagi, Nyadorera B and Barolengo).</li> <li>➤ Each survey lasted 4 days and attended by a total 200 community members per day.</li> </ul>
<b>F: Community Actions on</b>	I. Learning Exchange visit	<p>I. Community actions on climate smart livelihoods:</p> <ul style="list-style-type: none"> <li>➤ Livelihoods feasibility studies conducted in 3</li> </ul>

climate-smart livelihoods	<p>participant list;</p> <p>2. Learning exchange visit video documentation.</p> <p>3. Proposal for pilot activities including household selection and location.</p>	<p>communities within Yala wetlands and sites and beneficiaries identified.</p> <ul style="list-style-type: none"> <li>➤ Learning exchange visit to Tango Kona Commercial Village, Busia County successfully conducted and attended by 20 community members.</li> <li>➤ Proposal for pilot activities prepared and implementation outcome provided (Table II).</li> </ul>
<b>G: C3A2</b> Validation and Development of Community Action Plans	<p>1. Validation meeting reports for 3 communities</p> <p>2. Three community adaptation plans</p>	<p>1. 3 validation reports produced:</p> <ul style="list-style-type: none"> <li>➤ Barolengo</li> <li>➤ Nyadorera B</li> <li>➤ Kaugagi/Hawinga</li> </ul> <p>2. 3 community adaptation action plans developed</p> <ul style="list-style-type: none"> <li>➤ Barolengo</li> <li>➤ Nyadorera B</li> <li>➤ Kaugagi/Hawinga</li> </ul>

### 3.2 Project Inception and Work plan

A total of 74 individuals (38 female and 36 male) attended the project inception and launch at Uhembo primary school in Yala wetlands representing local community members, community based organisations (CBO), non-governmental organizations (NGO) and opinion leaders. Approx. 150 pupils from Uhembo primary school and neighboring schools also attended. The following institutions were represented: Siaya County Department of Tourism, Wildlife Conservation and ICT, Siaya County Department of Environment, Water and Natural Resources, National Environment Management Authority (NEMA)-Siaya County, Kenya Forest Service-Siaya County, Kenya Wildlife Service (KWS), Agricultural Sector Development Support Programme (ASDSP)-Siaya County, Yala Swamp Community Conservancy Organization (YASCCO) and Friends of Yala Swamp Biodiversity. Others were Denge Community Based Organization, Kaugagi-Hawinga Development Trust CBO, Barolengo Outgrowers Group, Kombo Beach Management Unit (BMU), Local administration and Local Community Members.

During the meeting all project activities were verified and fully accepted by the community. All stakeholders present committed to partnering and supporting Ecofinder Kenya towards the success of the project. The local understanding of climate change was enhanced through Presentations by invited stakeholders, Ecofinder Kenya project team, Songs by Primary school pupils and Drama and Puppetry. The messages communicated contained climate change awareness and the need for adaptation at the local scale. Presentations from the local community and opinion formers in Yala praised the project approach and reiterated that rarely had they been involved in any project activities verification before. They expressed their willingness and happiness to support the project and its future activities.

A number of challenges and their likelihood of happening were identified by the local community e.g.

- Human-wildlife conflict was noted mainly depicting the rare semi-aquatic antelope, *Sitatunga*, crop destruction by monkeys, swamp-dependent birds and wild pigs.

- Seasonal crop destruction and loss of livestock through drought and floods.
- Inadequate market for agricultural produce groundnuts and beans.
- Lack of training of local people on how to sustainably utilize the wetland resources among wetland dependent communities.
- Lack of mechanisms to control the excess water during flooding to enhance agricultural production.
- Fear of hijacking of project activities by the local administration without directly benefiting the local community as has been witnessed in previous projects.
- There was also concern to expand the project activities to cover more villages.

### 3.3 Trainings on Climate Smart Livelihoods

Three training manuals were developed for use for training of trainers and community members on three climate smart livelihoods; agroforestry, water harvesting techniques and sustainable farming. The manuals were developed through a consultancy provided by a team of experts in the three respective areas of interest. The contents of the manuals were agreed upon between Ecofinder and the consultant as follows:

1. Agroforestry
  - Introduction to Agroforestry: Definition and Practices
  - Climate Change and Agroforestry
  - Trees and Shrubs for Agroforestry
  - Seed Supply
  - Tree Nursery Management
  - Tree Planting and Management in Agroforestry
  - References: Training needs assessment questionnaire
2. Sustainable and climate smart farming
  - Introduction to Agro-ecosystem
  - Wetland Zonation and Edge farming
  - Farmland Preparation and Management
  - Integrated Pest Management
  - Climate Smart Farming
  - References: Training needs assessment questionnaire
3. Water harvesting
  - Introduction to Water harvesting
  - Rainfall Runoff Analysis
  - Water harvesting systems
  - Water harvesting Techniques
  - Agronomic and Socio-economic aspects of Water harvesting
  - References: Water harvesting survey tool developed and tested for Yala wetlands

A total of 17 participants (4 female, 13 male) completed the training of trainers (ToT) course as community trainers on climate smart livelihoods for six days in Siaya. The participants represented the three project villages; Barolengo, Hawinga/Kaugagi and Nyadorera B. The participants included members of local CBOs, agriculture teachers and youth group leaders representing the three villages. 62 participants (27 female, 35 male) completed six days community trainings on climate smart livelihoods representing the three villages. Both ToT and community trainings used the three climate smart livelihood manuals

to deliver the training at both levels. Community trainees and other community members would use the learned skills to implement some or all of the livelihoods in their respective areas.

### 3.4 Strategy for communication and outreach approaches

Climate change communication and outreaches for climate change adaptation for Yala wetlands communities were implemented using the following strategies:

- Schools essay writing competition
- Participatory Educational Theatre (PET)
- Interactive radio shows

#### 3.4.1 Schools Essay Writing Competition

Out of the expected 16 schools, a total of 11 schools participated in the competition while five schools did not respond to the call. Out of the participating schools, six were primary while five were high schools. Primary schools had the most entries totaling to 90. Out of these, 47 were male entries while 43 were female entries. In high schools, a total of 32 entries were received out of which 10 and 22 were male and female entries respectively.

**Table 2:** Summary of Yala wetlands schools essays competition entries

School	No. of male entries	No. of female entries	Total entries
<b>Primary schools</b>	<b>47</b>	<b>43</b>	<b>90</b>
Barolengo	2	1	3
Magungu	0	1	1
Misori	16	9	25
Sirinde	24	27	51
Uhembo	4	3	7
Uwasi	1	2	3
<b>Secondary schools</b>	<b>9</b>	<b>22</b>	<b>31</b>
Barolengo	8	6	14
Hawinga	0	13	13
St. Joseph	0	1	1
Uwasi	1	2	3
Sirinde	1	0	1
<b>Grand total</b>	<b>56</b>	<b>65</b>	<b>122</b>



## Essay competition winners and awards

### a) Table 3: Essays competition best schools winners

POSITION	SECONDARY SCHOOLS	POINTS
1	Hawinga Girls Secondary School	60.53
2	Bar Olengo Secondary School	56.93
3	Uwasi Mixed Secondary School	56.67
<b>PRIMARY SCHOOLS</b>		
1	Bar Olengo Primary School	53.60
2	Uhembo Primary School	45.50
3	Uwasi Primary School	37.80

### b) Table 4: Essays competition winners of Primary schools category

POSITION	NAME	SCHOOL	MARKS (%)
1	NICOLE ATIENO	MAGUNGU PRIMARY SCHOOL	87
2	RAPHAEL AWITI OYUNDO	BAR OLENGO PRIMARY SCHOOL	74
3	EVANCE OMONDI	UHEMBO PRIMARY SCHOOL	70

#### Awards for winning pupils/students

- 1<sup>ST</sup> PRIZE – Five 120 pages exercise books, a solar lamp, 1 oxford geometric set, 3 ball point pens and a trophy
- 2<sup>ND</sup> PRIZE – Five 120 pages exercise books, a solar lamp, 1 oxford geometric set and 3 ball point pens
- 3<sup>RD</sup> PRIZE – Five 120 pages exercise books, a solar lamp and 3 ball point pens

### c) Table 5: Essays competition winners of secondary schools category

POSITION	NAME	SCHOOL	MARKS (%)
1	ALICE ADIPO	HAWINGA GIRLS SECONDARY SCHOOL	88
2	OMONDI MERCY PENNY	HAWINGA GIRLS SECONDARY SCHOOL	86
3	OWUOR STEPHEN OTIENO	SIRINDE MIXED SECONDARY SCHOOL	85

#### Awards for winning schools

- 1<sup>ST</sup> Prize – A trophy, five 200 pages exercise books, 3 bic fine tip pens, a solar lamp and 1 oxford geometric set

- 2<sup>ND</sup> Prize – Five 200 pages exercise books, 3 bic fine tip pens, a solar lamp and 1 oxford geometric set
- 3<sup>RD</sup> Prize – Five 200pages exercise books, a solar lamp and 3 bic fine tip pens

In addition, all the participants received certificates and t-shirts including the winners.

### 3.4.2 Participatory Educational Theatre

A total of four PET outreaches were conducted in Yala wetlands covering various topics in climate change awareness and adaptation (Table 5). Out of these two PETs were conducted in market centers (Sidundo market and Kojema center) while two were conducted in two schools: Hawinga Girls' Secondary school and Uhembo Primary school. The number of people reached with climate change education messages varied depending on venue and target group giving a total of approx. 400 individuals reached within the community as indicated in Table 5 below.

**Table 6:** Summary of implementation schedule for PETs in Yala wetlands

No	Topic	Venue and time	Target audience	Participants
1.	Background, local manifestations, causes and Impacts of Climate Change	Uhembo Primary school, Saturday 13 February 2016, 3pm-6pm	Primary school pupils and their parents representing various families in the community	150
2.	Appropriate interventions and coping strategies to Climate Change	Sidundo market, Sunday 14 February 2016, 4-6pm	General public and community members	100
3.	The case of Sustainable Farming and Agroforestry	Hawinga Girls Secondary school, Saturday 20 February 2016, 10am-1pm	Secondary school students, teachers	100
4.	Climate change adaptation strategies for water harvesting	Kojema market center, Sunday 21 February 2016, 4pm-6pm	General public and community members	60

### 3.4.3 Interactive Radio program

A total of four radio programs were aired at 7.15pm-8.15pm on Friday 19 February, Tuesday 23 February, Wednesday 24 February and Thursday 25 February 2016. This time was selected because most listeners are expected to be at home with their families after daylong activities. We also assumed that this is the time when most people converge at their homes for supper or dinner hence most families would listen to the radio drama and interactive talk shows.

The drama stories on predetermined topics (Table 6) were aired and listeners' call-ins and discussions ensued. Three hours of total interactive radio drama and listenership was achieved. Approx. 12 call-ins were received per interactive radio drama session giving a total of 36 interactive calls each lasting 1-2 minutes. It was not possible to establish the total

listenership of the interactive radio program but since Radio Lake Victoria broadcasts within Lake Victoria region in the local language we estimated that there was a wider listenership for the program. This was possible since the programme was advertised in the radio for continuous five days prior to the actual broadcasts. A quick encounter with the local Yala wetlands community members revealed that more than 50% of the project villages listened to the interactive radio drama program.

**Table 7:** Summary of interactive radio talk shows program

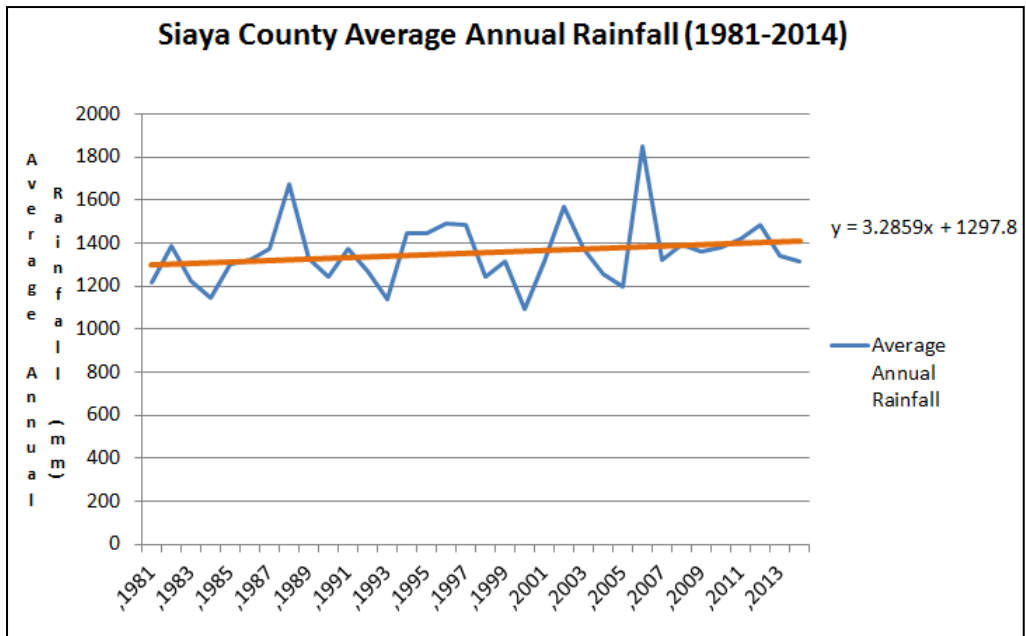
No	Topic	Episode	Synopsis
1.	Definition, Causes and Impacts of Climate Change	Jakoyo Household	Climate Change Lamentations and Challenges in farming Jakoyo Family Household Setting
2.	Multiple Interventions to Climate Change	Jopur Cooperative Farm	Climate Change Interventions in Farming Group Setting in the Field
3.	Case Study of Sustainable Farming	Two Farmers Friends	Climate Change Adaptation through Sustainable Farming Modeled on Farmer-Farmer Exchange among two friends setting
4.	Case Study of Agroforestry	Two Farmers Friends	Climate Change Adaptation through Agroforestry modeled on Farmer-Farmer Exchange among two friends setting

### 3.5 Community Climate Change Adaptation Assessment (C3A2)

#### a) *Climate variability and change in Yala wetlands*

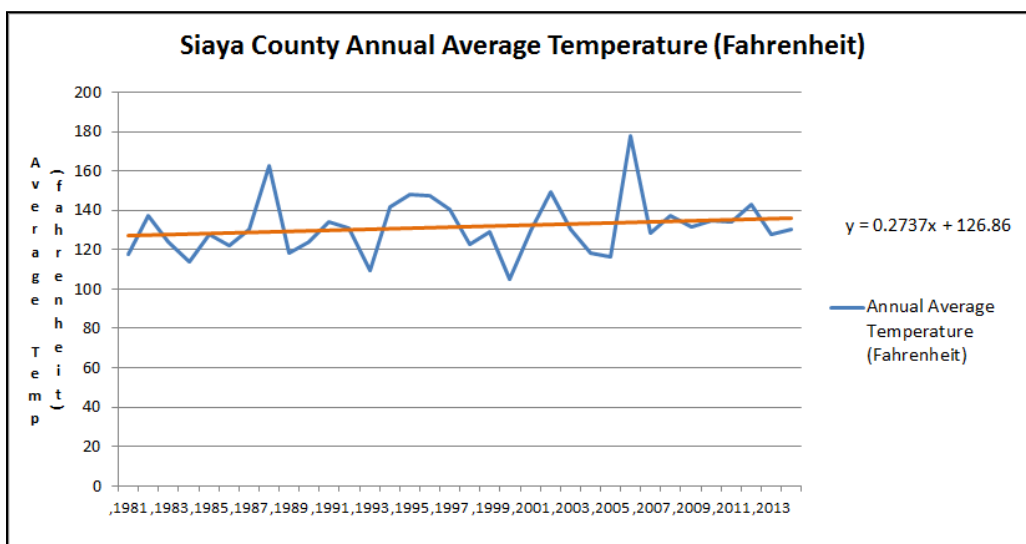
Residents agreed that climate is changing in terms of variation in rainfall patterns including rainfall distribution, duration and amounts affecting crop production and local livelihoods in the area. Presently, there is high temperatures and increased intensity of the sun heat from Mid-December to mid-April. Low temperature that destroys crops in farms locally known as *yugni* is currently experienced in July-August as opposed to the past when it occurred only in June. The frequency of blow of winds from the land towards L. Victoria has also increased locally depicting increasing incidence of dry conditions because such winds are dry as opposed to the wet winds that blow from L. Victoria towards land, which were more common in the past.

Results of Geo-CLIM analysis of rainfall and temperature are presented in Fig. 2 and Fig. 3 respectively. The results indicate that average rainfall for Siaya had two peaks: 1988 and 1997/98 indicating the likelihood of occurrence of high precipitation in a span of approx. ten years. These years also correspond with high peaks in temperature for the previous year. Siaya County has received reducing average rainfall for the last couple of years (2013 and 2014). However, the community confirmed the erratic nature and unpredictability of rainfall currently received in the area.



**Fig. 2:** Average annual rainfall trends in Siaya County (1981-2014)

The area has experienced increasing average annual temperatures for the last 23 years (1981-2014) under investigation as shown in Fig. 3. However, the annual temperature changes is erratic with some years receiving higher average annual temperatures while other years receiving reduced annual average temperatures. This finding is consistent with the community observations who shared a general agreement that the temperature of the area has been increasing for the last couple of decades. This could be attributed to the short rain seasons that leave prolonged dry period and high intensity of the sun heat mainly from December to April. The results also show a close relationship between the changes in temperature and rainfall. Years with increased rainfall figures tended to be preceded with at least a year of high temperature and vice-versa.



**Fig. 3:** Average annual temperature trend in Siaya County (1981-2014)

Climate variability and change are felt within the community who portrayed the climate change manifestations and knowledge in various ways e.g.

- Crops that were doing well in the past are now not doing well,
- Change in lake water temperature, increase in intensity of the sun's heat and drought (high temperatures with no or little rainfall).
- Disappearance of species that were once available in plenty e.g. *Phragmites* sp., Oxpeckers, Ground Hornbill etc.
- Papyrus reeds also grow shorter than their normal height at maturity and replacement of papyrus vegetation by *Typha* grass.
- Shortening of seasons since the rains do not come when they are expected;
- Increase in rainfall variability hence farmers are not able to predict when the rains will come affecting timing for planting
- Unpredictable rains: rains often fail after planting leading to poor harvests;
- Longer dry periods between the short rainy seasons
- When rains come they fall with greater intensity and the heavy downpours lead to runoff, soil erosion, and flooding, destruction of property and increased incidence of water-borne disease.

## **b) Climatic hazards, trends, exposure and coping mechanisms**

### **i. Barolengo community**

A summary of climatic hazards, trends, exposure and coping mechanism are provided in Fig. 8. Hazards identified by the community included drought, floods, soil erosion and human wildlife conflict (HWC). These were categorized as climatic hazards; however, HWC was debatable since the community linked its increase to climatic changes. Climate manifestations in the community include; change in weather patterns hence changes in farming seasons, increased intensity of the sun which also increases drought, longer dry seasons as compared to the past, frequent floods that happen annually and reduction in abundance and diversity of certain species of birds e.g. Ground Hornbill, Oxpeckers etc. Non climatic hazards include impassable roads, human diseases, deforestation, insecurity and famine.

The major climatic events include drought, floods and soil erosion. Barolengo is a drought prone area because the top soils are shallow hence a reduction in amounts of rainfall leads to poor vegetative growth. This is worsened by soil erosion that erodes the top fertile soils during heavy rains. However, the damage caused by floods is massive on crops grown on farms near water bodies. There is also poor drainage during heavy rains because the sub-soil is composed of rocks that are exposed on the surface in eroded areas. The hazards were ranked by the community in the following order: drought, floods, soil erosion and human-wildlife conflicts. Others include impassable roads, human diseases, deforestation, insecurity and famine.

Drought was ranked as the number one hazard both in the C3A2 surveys and in the validation meeting. While reviewing the events calendar in plenary with all the participants, Ecofinder team wanted to know why the community ranked drought as number one. The community revealed that there was drought in the past, but it used to occur once after so many years, but it now occurs more frequently- every year. The severity is mainly between the months of December to mid-April leading to changes in planting seasons. Clearance of land has resulted into no bushes which can block the water, so flooding occurs. Mainly

results from the water sources, they resulting into flooding. Barolengo’s landscape is low lying hence resulting into poor drainage. Frequency and rain intensity have also increased. In the past human population was low so there was no encroachment into the wetlands hence there were no incidents of floods destroying property/farms.

Clearing land leads to washing away of soil when rains are too much. Increased intensity of the rain in the recent past as a result of climate change this intensity leads to soil erosion. Increase in human population in the area has led to increased need for more land for farming, grazing and construction of homesteads. This has resulted into exploitation of new areas that were used by wild animals as habitats and for hideouts. The encroachment into wildlife habitats by locals to perform their socio-economic activities has led to increased human-wildlife conflicts. The intensity of climatic events e.g. drought has also led to encroachment into more fertile and wet areas e.g. wetlands that are presumed to be wildlife habitats. Also during drought there is no enough food for wild animals in the wilderness hence their encroachment into farmlands and homesteads in search for food. During flooding the wild animals migrate to the community lands, and this trespass also contributes to human wildlife conflict. Wild animals in constant conflict with humans in Barolengo include hippos, monkeys, squirrels, wild pigs, *Sitatunga* antelope.

**Table 8:** Summary of climatic hazards, trends, exposure and coping mechanisms in Barolengo community

<b>Climatic Hazard/Risk</b>	<b>Sector</b>	<b>Impact (of hazard on sector)</b>	<b>Coping Mechanism</b>	<b>Exposure (who?)</b>
<b>Drought</b>	Agriculture and Food Security	Crop failure e.g. maize, millet; Reduced pasture for livestock; Decreased food security - lead to malnutrition (health); Less fish available	Change to drought resistant crops, such as cassava; Move the farm closer to the Wetland area (water access); Small-scale horticulture near the Wetlands; Fisher people look for casual labor jobs	Crop farmers, Livestock farmers, Women- walk long distances & less access, Young children- malnutrition, Very poor/poor- less resources to buy water, change livelihood strategy etc.
	Health	Dehydration, Increase of water borne disease, need to get water from unsafe sources’ Whooping cough	Use of herbal/traditional medicine; Distribution of chlorine tablets at water points (NGO); Rain water harvesting	
	Terrestrial Ecosystem	Increased amount of firewood; Burning papyrus and wetland to increase farm area.	Increase charcoal production to compensate for agriculture losses; Planting of fast-maturing trees for building materials e.g. eucalyptus; Increase in human wildlife conflict	
	Water & Aquatic Ecosystems	Drying up of rivers and wetlands; Women & children travel long distances to get drinking water	Rain water harvesting	
<b>Flooding</b>	Agriculture and Food Security	Crop failure, Soil erosion, Increased crop diseases,	Look for alternative livelihoods – migrate to get jobs; Vet services in Siaya to	Crop farmers, Livestock farmers, Very poor households

		Increased livestock diseases, Increased food insecurity/mal nutrition, Positive: increased number of fish	protect livestock from disease (far & expensive)	– with mud houses,
	Health	Increase of water borne diseases- cholera; Increase in number of mosquitos; Decrease in access to safe water	Trained mid-wives that allow for delivery at home (can't access hospital); Community health workers that provide care at home; Chlorine dispensers (free service)	
	Energy & Infrastructure	Roads become impassable – effecting market access; Destruction of human settlements; Household toilets-pit latrines destroyed (vector for disease)	Dig small trenches/drainages around houses; Give Direct (NGO) provides cash transfers, many people convert mud/thatch house to cement house and iron sheet roof which are more resistant to extreme weather events	
	Water & Aquatic Systems	Wetlands and Lake full, River bank erosion	Positive: able to harvest sand (alternative livelihood)	
<b>Soil Erosion</b>	Agriculture & Food Security	Destruction of crops, Poor pasture, Reduced soil fertility - loss of fertile top soil	Building terraces, gabions, Tree planting, Cover crops, Use of organic manure	Crop farmers, Livestock keepers, The poor/poor households
	Health	Malnutrition due to poor harvests		
	Energy & Infrastructure	Destruction of infrastructure e.g. roads	Building gabions	
	Water & Aquatic Systems	Siltation of water bodies like rivers hence reducing water depth leading to flooding	Tree planting	
<b>Human wildlife conflict</b>	Agriculture & Food Security	Crop destruction, Hunger and starvation	Fencing of farms, Wildlife control by KWS, Scaring devices e.g. scarecrow, Guarding farms	Children exposed to hunger, starvation and malnutrition; Farmers cultivating near wetlands; Children removed from schools to guard farms; Women and children exposed to wildlife attacks
	Health	Loss of human life, Injuries and infections, Malnutrition		
	Water & Aquatic Systems	Wildlife mortality	Demarcation and fencing of wildlife reserve, (Potential for) promotion of ecotourism	
<b>Human</b>	Agriculture &	Reduced labor	Sell livestock; Increase child	Crop farmers,

<b>Diseases</b>	Food Security	force/farmers to plant/harvest crops and tend to livestock; Increase in food insecurity; Less money for farm inputs because funds allocated for medicine (selling livestock) – asset depletion	labor – removed from education to farm	Livestock farmers, Children, Woman, Healthcare workers
	Health	Strain on health facility – infrastructure, medicine and personnel; Population more susceptible to other diseases (HIV) if continually sick	Community health workers who treat patients at home; NGOs/CDCs providing home based care, education/sensitization, and medication (ARVs)	

## ii. Nyadorera B community

The people of Nyadorera are faced by many threats and risks in their daily lives. These hazards are brought about by various conditions in the area, both climatic and non-climatic in nature. The hazards that are rampant in the village of Nyadorera B are Striga weeds - it was qualified as a climatic hazard because it is activated by water therefore when there are floods in the area the germination and spread of the weed becomes rampant and this ends up causing a lot of harm to the farms.

Drought - its more frequent nowadays as opposed to the past and it's also influence by human activities such as cutting down of trees; Tsetse fly - its link to climate change because it's abundant during rainy season; Soil erosion - it is associated with heavy rainfall that sweeps away top soil which is fertile and tis ends up reducing the quality and quantity of farm yields; Malaria - its occurrence increases during rainy season, and this therefore classified it as a climatic hazard; and Human animal conflict - this is as a result of human encroaching to the wetland for farming and settlement. There were controversies over qualifying this as a climatic hazard because some of the community members were of the notion that the human wildlife conflict are as a result of human activities and the wild animals encroaching into human settlements and farms.

Further analysis revealed that the reasons for the encroachment were actually because of climatic conditions and the increase in the intensity of these conditions resulted into an increase in the impacts of human wildlife conflicts. Other hazards include Cholera - it occurs both in dry and rainy season and Termites - it's always all the time it was mentioned as a hazard but was not qualified as a climatic hazard.

According to the community, the major climatic events are drought and floods, followed by human-wildlife conflicts and striga weed. This is because these were the two major causes of some of the hazards that they mentioned. Floods particularly, was associated with demerits such as tsetse flies, food insecurity, stinking toilets, cholera, deforestation, storms, soil erosion, human wildlife conflicts and strong winds.



Flooding is brought about by unusually long rain for about two months from mid-April to mid-June in Nyadorera B village. In the past floods used to occur after several years i.e. as events and the community would recognize the major flooding events by naming them. Presently, floods occur more frequently almost on an annual basis. Drought is more frequent presently as opposed to the past. It is nowadays more prolonged than in the past and comes yearly between the months of December and April. Encroachment into wildlife habitats by humans was identified as the major cause of human-wildlife conflict. The hazard was minimal in the past but it has increased to higher levels in the present. Humans need more land for farming, settlement and livestock grazing hence they have encroached into the areas presumed to be the 'homes' of wild animals. This has intensified conflicts between humans and wild animals leading to crop destruction, injuries and deaths. The problem is also intensified by climatic elements like increased temperatures during drought and high intensity rainfall.

The intensity of climatic events like drought has also led to encroachment into more fertile and wet areas e.g. wetlands that are presumed to be wildlife habitats. During drought there isn't enough food for wild animals in the wilderness hence their encroachment into farmlands and homesteads in search for food. Wild animals also migrate to the community lands in search of food and hideout areas causing conflicts with local communities. Animals in conflict with humans in Nyadorera B include the *Sitatunga* antelope, squirrel, wild pig, rats, monkeys. In the past this weed was never a problem to farmers and its existence could be easily controlled by simple crop rotation hence its impact was not widespread. Nowadays the weed has infested many farms in Nyadorera B. The community qualified *Striga* weed as climatic hazard since it's growth is accelerated by availability of water usually following flooding events.

*Striga* weed seeds may be dormant for quite a long duration during drought but at the onset of floods the seeds are able to germinate and grow in farms where they suppress the growth of farmed crops leading to very poor or completely no harvests. Attempts to control the weed have not been successful and people have come up with many theories regarding its control which have also failed locally. However, the human factors that accelerate the spread of *Striga* weed include, poor farming methods e.g. lack of crop rotation, land infertility due to constant ploughing and cultivation of land, excessive use of inorganic manure and poor weed control methods like uprooting after flowering of the weed and uprooting and dumping the weed on cropland.

Some community members have managed to control the weed but after some time the weed still attack the same farms. Hence a long term strategy is required to help the communities tackle the weed. During meso-level validation of C3A2 the following strategies were agreed as effective ways of controlling *striga* weed: promote crop rotation, use of organic manure, avoid burning farmlands aimlessly, uproot and properly dispose the weeds at early stage before flowering, awareness creation and training on *striga* weed management. All the current coping strategies by the community (Table 9) had very low effectiveness because they were either not being implemented in the right manner, there was no proper maintenance of some of the developed structures or the strategies are unaffordable for most of the community members of Nyadorera B because they are a poor community so only a small percentage of the community ends up adopting the said coping mechanisms.

**Table 9:** Summary of climatic hazards, trends, exposure and coping mechanisms in Nyadorera B community

Climatic Hazard/Risk	Sector	Impact (of hazard on sector)	Coping Mechanism	Exposure (who?)
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<b>Floods</b>	Agriculture and food security	Destruction of farmlands hence low yields; Loss of pasture land	Construction of gabions alongside croplands; Planting cover crops; Tree planting; Planting crops than consume more water like yams	People living in low lying areas; The poor – inability to construct permanent houses; Women and children; Crop farmers who are purely dependent on cultivation
	Infrastructure and energy	Destruction of houses, sinking of toilets; High commodity pricing due to poor road accessibility; Destruction of roads, poor accessibility		
	Health	Spread of waterborne diseases like Cholera, typhoid and bilharzia		
<b>Drought</b>	Agriculture and food security	Increased food prices; Hunger and starvation; Low crop yields	Planting drought resistant crops; Tree planting – water catchment  Utilizing underground water; Water harvesting techniques e.g. rainwater harvesting etc.	Women, Children-malnutrition; The poor; People with single sources of livelihood
	Health	Increased disease occurrences like whooping cough and malnutrition		
<b>Human Wildlife Conflict</b>	Agriculture and food security	Destruction of farmlands; Low fam yield – hunger and starvation; Death and injury	Conserving wildlife habitats; Avoiding human encroachment into wildlife territory; Planting crops that the animals don't eat; Scare tactics – scare crows	children – hunger and starvation; Women – crop destruction after farming
<b>Striga weed</b>	Agriculture and Food security	Land infertility; low crop harvest; sug cfpress growth of some crops e.g. maize; Hunger and malnutrition	Crop rotation; Avoid burning farmlands; Use of organic manure; Uprooting and proper disposal of weeds; Capacity building on Striga weed management	Women – farmers, Children – hunger and malnutrition

### iii. Kaugagi/Hawinga community

Climatic and non-climatic hazards were listed by the community during the Community Climate Change Adaptation Assessment (C3A2) surveys in Kaugagi/Hawinga. Climatic hazards included; drought, human wildlife conflicts, soil erosion, strong winds, floods and hailstones. However, Drought, soil erosion and Human wildlife conflicts were ranked as the top priority hazards that required immediate interventions. Non-climatic hazards were listed as; Mosquitoes, alcoholism, Tsetse flies, Deforestation, limited grazing fields and poor/dilapidated roads. These hazards (Table 10) were noted to have existed as a result of anthropogenic activities, or some like tsetse flies and mosquitos, had been in existence way before the realization of climate change. However, there was a general agreement that mosquitoes and tsetse flies infestation are intense during rainy seasons where water and vegetation promote their breeding respectively.

The community revealed that rainfall patterns had changed in the present years with increased temperatures especially from December through February annually, as derived from the C3A2 Community Calendar Analysis. Drought impacts the community negatively due to food shortage hence malnutrition and hunger, crop destruction, change in planting seasons, human diseases, water shortages and disappearance of some fish species among others. The community perceived human/wildlife conflict to have been characterized by climate change due to food shortage in the natural habitats especially during drought as well as during planting and harvesting seasons. This leads to food shortage due to insufficient farm yields, crop destruction by wildlife, Loss of wild and human lives as a result of hunting and direct wildlife attacks respectively. Examples of wild animals that encroach into peoples' farms include; guinea fowl, squirrel, *Sitatunga* antelope, monkeys and wild pigs. The most affected are farmers and they adapt to this through fencing their farms, digging trenches around the farms, using scarecrows such as dogs and lights on their farms throughout the night.

Soil erosion considered to be extremely rampant with increase in rainfall patterns and during flooding in the area, this was very evident in the tech transect maps especially in the area around Misori and Hawinga schools. The area also receives more erratic rainfall that falls with high velocity as opposed to the past. The community also pointed out that in 1972, the then Ministry of Lands and Ministry of Agriculture through the Provincial Administration conducted land adjudication in Hawinga-Kaugagi sub-location that led to land subdivision for the local community whereby demarcation was done from uplands and stretching downstream to wetland areas. The long land stretches has led to soil erosion since it promotes ploughing from uplands to wetlands but does not allow contour ploughing that is recommended for soil conservation. Land adjudication has also promoted social divisions within the community whereby the poor tend to sell their fertile land near the wetland areas to the rich who establish their homes near water bodies and do irrigation with water originating from the wetlands. As a result, the poor tend to occupy and cultivate the dry upland areas with poor soil conservation methods exposing them to the negative impacts of drought during the dry spell.

Moreover, long ago during the colonial period there was a mandate to plant sisal and aloe vera etc. which the locals believed, prevented soil erosion. Due to settlements and change in lifestyles people uprooted all the plants leading to the topsoil being washed down to the swamp. This has led to reduced soil fertility hence less farm productivity. Women are negatively impacted since they are mostly the ones that engage in farm production activities including planting and harvesting. As a coping mechanism some community members build terraces at individual farm level, using manure in their farms after soil erosion, crop rotation, planting cover crops and finding alternative livelihoods to farming when the farms are destroyed, for instance engaging in casual labor.

Floods are considered to result from prolonged rains hence categorized as climatic hazards. In terms of climatic exposure, women are more exposed to floods because they are the ones who have to manage crisis brought about as a result of floods. Women are always at home so they get the first hand bad experience. The poor are also vulnerable and experience primary impact of floods because they have very low capacity to respond to the impact of floods. The area seemingly does not experience severe flooding; however it is faced with the risk of flooding from Huiro stream. This poses a number of challenges to the local people e.g. quarry holes are filled by water leading to the danger of drowning and providing potential habitats for mosquito breeding that spread malaria. Other challenges associated with flooding include crop destruction, destruction of infrastructure e.g. roads, damage to property and loss of lives.

**Table 10:** Summary of climatic hazards, trends, exposure and coping mechanisms in Kaugagi/Hawinga

<b>Climatic Hazard</b>	<b>Sector</b>	<b>Impacts</b>	<b>Coping Mechanisms</b>	<b>Exposure (Who?)</b>
Drought	Agriculture/Food security Water/Aquatic ecosystems	Food shortage, Crop destruction, Change in planting seasons, Human diseases, Water shortages, Reduction in some fish species like tilapia	Wetland encroachment for farming, Encroach for livestock grazing and water for domestic.	Farmers, Women Children
Soil Erosion	Agriculture/Food security	Reduced soil fertility since manure/ fertilizers are washed down.	Building of terraces, Crop rotation, Plantation of cover crops, Reapplication of manure on affected farms, Other people engage in other livelihoods	Farmers, Women
Human Wildlife conflict	Agriculture/Food security	Crops destruction, Low farm yields, Loss of wildlife and human deaths	Fencing Digging trenches around the farms Use of scarecrows such as dogs and lights	Farmers
Flooding	Agriculture/Food security	Crop destruction, Destruction of infrastructure e.g. roads, Damage to property and loss of lives.	Migration to upland areas, Temporary residence in evacuation centers e.g. schools, churches	The poor, Women
Hailstones & strong winds	Agriculture/food security Infrastructure	Destruction of crops and property e.g. buildings		Farmers, Households, Schools

### **c) Community Adaptation Action Planning**

The community Adaptation Action Plans (CAAP) was developed through the participation of the community with guidance from Ecofinder Kenya. The CAAP would serve as a road map to guide the implementation, revision and monitoring of community adaptation options and support financial and resource mobilisation. The climatic hazards identified during the Community Climate Change Adaptation Assessment (C3A2) were prioritized by each community in order of importance and CAAPs developed. Overall, the community was guided through the process of CAAP development using the following steps: identification of the problem/hazard; identification of the causes of the hazard; identification of adaptation options; identification of responsible authority/actors; identification of required resources; identification of barriers/remedial measures; development of indicators; development of Action Plan matrix; implementation; monitoring and evaluation. The CAAP matrices for each respective community are in Appendix 1 to 3.

The CAAPs shall be adopted and implemented by the partner organizations, other interested organizations and institutions including the Government and non-state actors in partnership with the community. The roles played by each implementing organization will be based on an agreement with direct involvement of the respective community and monitored through participatory monitoring and evaluation. The following actors and their responsibilities in implementation of the CAAPs were identified:

- Community: Provide resources e.g. land for project activities implementation; and In-kind contributions e.g. labour, local knowledge, participation.
- County government: Provide institutional framework for implementation; Technical advice and support to the CAAP; Community trainings on project activities; Information dissemination about the CAAP at the county level; and Link project activities with county-level action plans.
- National government: Provide framework for implementation of infrastructural activities e.g. dams, water services etc.; Ensure security through the Ministry of Interior; and ensure that relevant laws and regulations are adhered to at the local level.
- NGOs/CBOs: Resource mobilization and research on new technologies and initiatives; and Capacity building, trainings and awareness creation
- Local administration: Community mobilization and maintenance of security, law and order.

Key indicators for the successful implementation of CAAPs in Yala wetlands include the following: Food secure households; Improved tree cover and environment; ease of accessibility to clean and safe water; alternative farming methods and techniques in use e.g. irrigation, organic farming; fertile soils and improved crop harvests; wildlife live in harmony with humans; and wetland conservation and protection of wetland resources.

### **3.6 Community Actions on Climate Smart Livelihoods**

#### **a) Community exchange visit**

A total of 20 participants visited the Tanga Kona commercial village in Busia out of which sixteen were selected from the three villages (Barolengo, Nyadorera B and Kaugagi/Hawinga). The objectives of the exchange visit were to; share experience and skills in implementation of various livelihoods at community level, identify challenges and learn lessons in implementing community-driven livelihood activities, and acquire knowledge and skills to guide the choice of adaptation options for implementation in Yala. Activities undertaken by the commercial village include the following: Production of cassava and sweet potatoes; Value addition on cassava and sweet potatoes; Marketing of farm produce by linking farmers to buyers of both raw farm produce and value added products; Provision and marketing of certified cassava and sweet potato seeds from selected farmers; Participation in research and extension through partnerships with research institutions e.g. KALRO and Farm Concern International; Creating a forum through which members of 11 local community groups forming Tanga Kona commercial village can market their products and target the wider market; and Organizing and participating in farmers field days with support from willing partners e.g. Farm Concern International.

Two cassava farms each measuring 2 acres and two sweet potato farms measuring 1 acre each were visited. Cassava and sweet potato production was targeted due to the following reasons:

- Both crops are hardy species that can withstand harsh climatic conditions arising from climate variability and change i.e. drought resistant.
- The species require very limited input since they are hardy hence their production is affordable by community members.
- The leaves of certain varieties of cassava and sweet potatoes can be used as vegetables hence providing alternative source of food during drought or famine.
- Orange flesh (Kabode) and Kenspot 5 sweet potatoes varieties promoted by the group have better carotene and vitamin A contents for improved nutrition of children and adults.
- MH95/0183 Cassava variety is locally promoted and it is the most preferred variety because of it is high yielding and fast maturing.
- When grown in large scale the two crops provide higher returns in comparison to sugarcane that is locally grown as the major cash crop.

Key lessons learnt by the Yala swamp community and Ecofinder Kenya were;

- Networking and sharing of ideas among community members, local groups and institutions is critical for sustainability of local projects. Through collaborations and partnership, financial and in-kind support is possible from national and international organizations.
- Communities should be encouraged to start small and grow big with time. Through this they are in a good position to build on their challenges and learn from their mistakes, which they can build on to achieve greater success.
- It is necessary to involve the youth at least in one level of the value chain. It was observed that the youth often move from their traditional homes in search of opportunities elsewhere hence their participation is limited in production oriented livelihoods e.g. farming. However, their involvement is still critical in the whole value chain because they represent the future. Their involvement may lead to smooth succession in project activities hence contributing to sustainability.
- Local organizations and community groups should have their own land legally acquired to undertake various livelihood activities. Through this they may have legal rights of ownership and set up demonstration plots for community trainings and expansion of livelihood activities.
- There are multiple benefits associated with production and value addition of selected climate smart crops, which are drought resistant. These include among others improved nutrition, food security, improved income and proactive local governance through local committees and group organizations.
- The commercial village may be replicated in Yala wetlands through proactive involvement of community members. The Yala community members who participated in the exchange visit were very delighted after learning from the Tango Kona group. With the assurance of availability of cassava and sweet potato seeds, they showed high interest and urged Ecofinder and PREPARED to spearhead such initiative in their communities.
- Community members can develop interest on implementing livelihood activities from practical lessons and experiences from other community members implementing a similar or related activity. This was evident after many community members developed interest and reiterated their willingness to engage in the same when they go back home. Similar community exchange programmes should be organised in future.

### b) Pilot implementation of climate smart livelihoods

The livelihoods feasibility study identified various livelihoods for implementation at pilot level in Yala wetlands. These included sinking of new and rehabilitation of existing wells, pilot cassava and sweet potato production, provision of water harvesting tank for water storage for seedlings watering, agroforestry woodlot and agroforestry demo plot. The status of implementation of pilot livelihood activities is indicated in Table I I.

**Table I I:** Summary of pilot livelihoods implementation in Yala wetlands

Location/ Activity	Description	GPS Coordinate	Climate Change Adaptation Relevance	Remarks
<b>1. Nyadorera B</b>				
Sinking new water well	Sinking new water well at the farm of Mrs. Mercy Othim. Depth of well : 25ft. The well will be used to water crops with approx. 15 households (each having approx. 10 family members) benefiting directly.	N 00.08131 <sup>0</sup> E 034.10740 <sup>0</sup>	Support small scale irrigation and provide watering point for community members during dry seasons	Completed
Climate smart farming: Pilot cassava and sweet potato production with experience from Tangakona commercial village	Planting of certified cassava and sweet potatoes from KALRO Alupe. Arrangements have been made to acquire the certified seeds from Tangokona commercial village in neighbouring Busia County. Mr. James Odhiambo Nyamonye has been identified for the pilot of the same.	N00.08131 <sup>0</sup> E 034.10740 <sup>0</sup>	Support local livelihoods by planting high yielding drought resistant crops that have adapted in local conditions	Poor germination of cassava and sweet potato seeds due to rainfall failure in Nyadorera B. Ecofinder plans to provide seeds for trials with onset of rainfall.
<b>2. Bar Olengo</b>				
Water harvesting tank at Bar-olengo Secondary School	Plastic water tank with total volume of 5,000 liters, complete with water collection gutters and base.	N00.00055 <sup>0</sup> E034.22271 <sup>0</sup>	Provide water for irrigating school woodlot and the farm in school	Completed
Establishing 500m <sup>2</sup> Agroforestry woodlot	Woodlot established with local tree species donated by the community and school from local tree nurseries. Beneficiaries: the schools	N00.0120 <sup>0</sup> E034.21390 <sup>0</sup>	The woodlot will act as windbreak for controlling strong winds in the school and its environs. This will protect the	Completed

	fraternity (students and staff) and surrounding community		physical infrastructure (buildings) and crops from strong blowing winds	
Rehabilitation and fencing of community water well	Securing the well measuring approx. 25ft deep. Beneficiaries: approx. 15 households (each having approx. 10 family members)	N00.00055 <sup>0</sup> E034.2227 <sup>10</sup>	Provide water for irrigation and for domestic use by local community	Completed
<b>3. Hawinga/Kaugagi</b>				
Agroforestry demo plot	Established demonstration plot for agroforestry. Species of trees (donated by local community members) are indicated in the Appendix 3 below	N00.06555 <sup>0</sup> 034.14555 <sup>0</sup>	Trees to act as windbreakers against strong winds. Production of multiple benefit trees for community use e.g. fruits, fodder, firewood, poles etc. Provide seed bank for future tree cropping when the trees mature	Completed

#### 4 CONCLUSION AND RECOMMENDATIONS

The main climatic hazards affecting the community are related to changes in temperature and rainfall variability contributing to floods and drought, soil erosion, human wildlife conflicts and alien species. Although the local communities have developed coping mechanisms to deal with the climatic hazards and risks in the short term, long term adaptation strategies are considered to be critical if they are to realize sustainable adaptation to the impacts of climate variability and change. Local coping mechanisms currently in use by the communities tend to contribute to more challenges in other sectors. For example, withdrawal of children from schools to guard farms against wildlife promotes school dropouts negatively affecting education quality; cultivation of farms near wetland areas as a response to drought affects the integrity and quality of aquatic ecosystems etc. the local coping mechanisms however, are not widely adopted by the community members indicating they are not as effective as they are intended to be. This can be attributed to the lack of capacity in terms of knowledge and material resources to fully implement these adaptation strategies.

Inadequacy is also witnessed in community response to climatic hazards/disasters e.g. there are very few trained midwives and community health workers to respond to health related impacts of floods and other disasters; lack of markets to dispose malnourished livestock during drought; very few KWS officers to respond to human-wildlife conflicts; lack of agricultural extension officers to train all farmers on soil erosion control, proper use of fertilizers and pesticides etc. The adaptive capacity of Yala wetlands communities to respond to climatic hazards is weak.



Although there are local resources that can be sustainably exploited to respond to some of the impacts of the hazards most of the exploitation activities are unsustainable mainly involving overexploitation of the wetland resources. This has caused more harm than good exposing most community members to climatic hazards/disasters. There is also a general tendency among community members that they are poor hence they may only survive climatic hazards with support from external sources. This project has outlined adaptation options for each climatic hazard in the community adaptation action plans, which would contribute to long term adaptation. However, the implementation of the adaptation options would require institutional collaboration for financial and technical support while considering in kind contribution from the local communities.

The scope of this project was small compared to the local population and geographical coverage of Yala wetlands. There is need to expand the scope of the project activities to cover other villages especially the climate smart livelihoods and awareness creation/sensitization. Other recommendations that would improve climate change and adaptation in Yala wetlands include;

- Support the implementation of the CAAPs to address climate variability and change, and promote adaptation to climate change
- More and continuous awareness on climate change and its impacts in Yala to cover all the villages
- Integrate local traditional and scientific knowledge in responding to climatic hazards/disasters
- Promote modern farming techniques and build the capacity of community members on modern farming e.g. fish farming, irrigation farming, greenhouse farming, zero grazing, poultry, pig farming etc.
- Promote ecotourism initiatives as alternative livelihood. This will enhance the conservation of wetland resources and reduce HWC
- Train more community members as community health workers and midwives to bridge the gap on provision of health services
- Develop infrastructure and technical support to respond to serious hazards like floods e.g. construction of dams, dykes etc.
- Enhance agricultural extension services to respond to local farmers' needs
- Support the formation and use of local structures e.g. local hazards/disaster committees, village environmental and agricultural committees etc.

## 5 APPENDICES

### 5.1 Community Adaptation Action Plan Matrix for Barolengo

Hazard/Adaptation options/sub activities	Duration (Months)	Actors	Resources required	Key Results	Estimated Amount(\$)	Remarks
<b>Hazard I: DROUGHT</b>						
<b>1.0 Tree planting</b>					5000 per acre	Amount estimated per sub-activity per acre planted
1.1 Plot clearing	1	Community , KFS	Farm tools e.g. Jembe, panga etc.	Tree nurseries, green ent., improved tree cover		
1.2 Acquisition of seeds	1	KFS, CDA, Community	Seeds, funds			
1.3 Tree nursery construction	1	Ecofinder, YASCO Community	Water, manure, plotting bags			
1.4 Tree planting in farms	2	Community Ecofinder, CDA, KFS	Farm tools, funds, seedlings			
<b>2.0 Planting drought tolerant crops</b>						The amounts given are estimates as per April 2016.
2.1 Acquisition of seeds	1	Community , Ecofinder, YASCO, CDA	Funds, seeds	Good harvest	100 per acre	
2.2 Training of community members	1	Ecofinder, USAID, CDA	Funds, trainers, stationeries	Knowledge shared	100 per household	
2.3 Cultivation of crops in farms	5	Community , CDA	Farm tools, seeds, manure	Improved food security, poverty alleviation	150 per acre	
<b>3.0 Irrigation</b>						The amounts given are estimates as per April 2016.
Acquisition of irrigation equipment	3	USAID, CDA	Funds, equipment/ tools	Modern irrigation equipment available	2000 per acre	
Training on equipment use and irrigation skills	1	USAID, Ecofinder, CDA	Funds for capacity building & training	Skills and knowledge on modern farming	10000	Skills acquired shall improve sustainability and adaptation
3.1 Planting horticultural crops	1	CDF, CDA	Working tools, water pump, seeds and insecticides	Adequate crop yields, food security, no hunger	100 per acre	
<b>4.0 Digging wells/boreholes</b>						The amounts given are estimates as per April 2016.

4.1 Underground water surveys by experts	3	USAID, Care, Ecofinder	Funds, skilled labour	Alternative water sources identified	50000	
4.2 digging and construction of wells/ boreholes	6	Ecofinder, USAID, Care	Funds, labour	Clean water for drinking and irrigation	5000 per borehole/ well	
<b>Hazard 2: HUMAN-WILDLIFE CONFLICTS</b>						
<b>1.0 Farm protection/ keeping away animals</b>						The amounts given are estimates as per April 2016.
1.1 Fencing with treated poles in farms	3	Community, CDA, KWS	Treated poles, wire, nails, cement, ballast, sand, labour	High yield and good health	2000 per acre	
1.4 perimeter fencing of wildlife areas (Wildlife boundary)	6	KWS, County Government	Fencing equipment, tools		300000	Protecting wildlife habitats to limit their movement into farms
<b>2.0 Reducing habitat destruction/ Wetland conservation</b>						The amounts given are estimates as per April 2016.
2.1 Wetland restoration (planting wetland vegetation)	12	KFS, Ecofinder Nature Kenya	Funds and seedlings	Wetland conserved, HWC reduced	2,000 per acre	
<b>3.0 Reducing Encroachment</b>						The amounts given are estimates as per April 2016.
3.1 Sensitization on effects of encroachment	12	Ecofinder, KWS, Media Schools, Admin	Stationeries, chairs, tents, P.A system	Awareness on HWC created	20,000	
3.2 Digging water wells to reduce wetland farming	12	Community, Ecofinder, CDA, Local Admin	Construction and digging equipment	Reduced wetland encroachment	25,000	
3.3 Sensitization campaigns	12	Community	Stationary, chairs, tents, P.A system	Creation of awareness	20,000	
<b>HAZARD 3: SOIL EROSION</b>						
<b>1.0 Planting of trees</b>						The amounts given are estimates as per April 2016.
1.1 Training on tree nursery development	1	KFS, Ecofinder	Funds	To get good harvest	1500 per acre	
1.2 Acquisition of seeds	1	KFS, CDA, Ecofinder	Funds	Prevention of soil erosion		
1.3 Construction of tree nurseries	2	Community, KFS, Ecofinder	Farm tools, funds	Reduced poverty levels		

1.4 Distribution of seedlings	2	YASCO, Ecofinder	Transportation, funds	Provision of fresh air		
1.5 Planting of seedlings	1	Community, Ecofinder, KFS	Funds, farm tools	Improve soil manure		
1.6 Monitoring of trees	8	Community, Ecofinder	Transportation, funds			
<b>2.0 Building terraces</b>					1400 per acre	The amounts given are estimates as per April 2016.
2.1 Acquisition of tools	1	CDA, Ecofinder	Funds and Farm tools	To get good harvest		
2.2 Training	1	CDA, Ecofinder	Trainers, funds, stationeries	To prevent soil erosion		
2.3 Planting trees on terraces	1	Community, YASCO, Ecofinder	Seedlings, farm tools, funds			
2.4 Rehabilitation of terraces	2	Ecofinder, Community	Farm tools, funds			
<b>3.0 Planting Cover Crops</b>					1000 per acre	The amounts given are estimates as per April 2016.
3.1 Buying cover crops	1	CDA, Ecofinder	Funds	To get good harvest		
3.2 Land preparation	1	Community, YASCO	Farm tools	To prevent soil erosion		
3.3 Monitoring	12	Ecofinder, Community	Funds and tools	To improve soil fertility		

- CDA – County Department of Agriculture
- KFS – Kenya Forest Service
- KWS – Kenya Wildlife Service
- YASCO – Yala Swamp Conservation Group

## 5.2 Community Adaptation Action Plan Matrix for Nyadorera B

Hazard I: Floods	Duration (Months)	Lead Org.	Resources	Key Results	Estimated Amount (\$)
<b>1.0 Constructing Physical Structures e.g. Dykes</b>					
<b>1.1 Community Mobilization</b>	1	Chief's Office	Transportation		200
<b>1.2 Resource Mobilization</b>	3	County government, ward admin, land officer, water officer	Training materials Community contribution, Technical staff	Reduced impacts of flooding felt	2000
<b>1.3 Community Work</b>	3	Chiefs, communities	transport, meeting venues, labour	Community participation Functional dyke	700

<b>2.0 Soil Conservation</b>					
<b>2.1 Planting of Trees</b>	2	KEFRI	Training materials, venue, seedlings planting tools	Increased forest cover	100 per acre
<b>2.2. Terracing</b>	3	County government	Farm tools e.g. spade, jembe, panga	Soil erosion controlled	5000
<b>2.3 Training</b>	1	County government		Informed communities	1000
<b>3.0 Desilting Rivers</b>					
<b>3.1 Community Mobilization</b>	1	Area Chief	Transport, human labour	Community support	2000
<b>3.2 Land Survey</b>	1	County ministry of lands, Water department	Transport, labour		4000
<b>3.3 Gabion Construction</b>	3	County public works office, National Youth Service (NYS)	Technical staff, materials, labour	Floods controlled, water depth increased in rivers	7000
<b>Hazard 2: Drought</b>					
<b>1.0 Planting Drought Resistant Crops</b>					
<b>1.1 Farm Clearing</b>	1	Ecofinder Kenya	community, labour, farm equipment, information	Elimination of hunger and poverty, Source of income	500 per farm
<b>1.2 Ploughing</b>	1	ministry of agriculture			500 per farm
<b>1.3 Acquisition of Seeds</b>	1	local agrovet			500
<b>2.0 Tree Planting and Conservation of Wetland</b>					
<b>2.1 Production Of Seedlings</b>	1				1000
<b>2.2 Tree Planting and Monitoring</b>	3	community	funds, water	Alternative source of income	650 per acre
<b>2.3 Afforestation</b>	3	Ecofinder Kenya	potting bags	Increased Tree Cover	1000
<b>3.0 Water Harvesting</b>					
<b>3.1 Land Preparation</b>	2	Ministry of agriculture, Ecofinder Kenya	Funds, farms	Water security	2000
<b>3.2 Construct of Drainage Canals</b>	2				5000
<b>4.0 Efficient use of Water</b>					

<b>4.1 Capacity Building on Efficient use of Water at Home</b>	7	Ecofinder Kenya	Funds	Fight hunger, protection against water-borne diseases	700
<b>Hazard 3: Human-Wildlife Conflict</b>					
<b>1.0 Wetland Restoration for sustainable Agriculture</b>					
<b>1.1 Fencing</b>	3	Ecofinder Kenya, Nature Kenya	Farm tools e.g. jembe, spade Fencing wire	Improved farm yield, improved livelihood	7000
<b>1.2 Awareness Creation</b>	3	Pathfinder, ACE Africa	Transport, training materials, information	reduced encroachment	1000
<b>1.3 Wetland Zonation</b>	3	Ecofinder Kenya, community, County government	Community members Consultancy		2500
<b>2.0 Keeping away Wild Animals</b>					
<b>2.1 Erecting wildlife scaring devices</b>	7	Community, Ecofinder, Osienala	Poles, trees, panga, nail	Improve farm yield	300 per farm
<b>2.2 Digging Terraces to prevent Wildlife from Crossing</b>	1	community,	digging tools	Improved farm yield	3000
<b>2.3 Planting unfavourable crops to Wildlife</b>	2	ACE Africa, Osienala	pesticides, water, money maker pump	Improved farm yield	1000
<b>3.0 Tourism Promotion</b>					
<b>3.1 Awareness on Importance of Tourism</b>	7	Pathfinder, Osienala, County government	Transport Facilitation	Gaining knowledge on importance of tourism	1000
<b>3.2 forming groups and training them</b>	2	Pathfinder, Osienala, County government	Transport Training materials Facilitation	Gaining knowledge on tourism	2000
<b>Hazard 4: Striga Weed</b>					
<b>1.0 Crop Rotation</b>					

<b>1.1 Promote planting of cover crops e.g. beans</b>	1	County government, extension officer	Seeds, manure, farming materials, labour	Improved yields	3000
<b>2.0 Promote use of Compost Manure</b>	1	County government, extension officer	Funds, farming materials, labour	Living standards improved	5000
<b>3.0 Avoid burning</b>					
<b>3.1 Awareness creation to farmers</b>	7	County government, extension officer	Funds, Consultancy Facilitation	Little land burning, knowledgeable farmers	2000
<b>4.0 Uprooting the weed</b>					
<b>4.1 Massive uprooting and dumping the weeds in a dug hole</b>	2	Extension officer	Farmers, Consultancy	Reduced nuisance weeds in the farm	5000

- KEFRI – Kenya Forest Research Institute
- KFS – Kenya Forest Service
- KWS – Kenya Wildlife Service
- YASCO – Yala Swamp Conservation Group

### 5.3 Community Adaptation Action Plan Matrix for Kaugagi/Hawinga

<b>CLIMATE CHANGE ADAPATION ACTION PLAN FOR KAUGAGI/HAWINGA COMMUNITY</b>					
<b>Hazard I: DROUGHT</b>	<b>Duration (Months)</b>	<b>Lead Org.</b>	<b>Description of Resources</b>	<b>Key Results</b>	<b>Estimated Amount (\$)</b>
<b>1.0 Tree planting</b>					5000 per acre
1.1 Plot clearing	1	KFS	Tools	Well established tree nurseries and a green environment	
1.2 Acquisition of seeds	1	KBFG	Seeds, money		
1.3 Tree nursery construction	1	Yala Wetland Conservation Group (YASCO)	Water, manure, plotting bags		
<b>2.0 Planting drought tolerant crops</b>					
2.1 Acquisition of seeds	1	County Dept. of Agriculture	Funds	Good harvest	100 per acre
2.2 Training of community members	1	Ecofinder Kenya, USAID	Training materials & facilitators	Knowledge shared	100 per household

2.3 Cultivation of crops in farms	4	County Dept. of Agriculture	Farm tools	Improved food security, poverty alleviation	150 per acre
<b>3.0 Irrigation</b>					
3.1 Planting horticultural crops	1	Constituency Development Fund	Working tools, water pump, seeds and insecticides	Adequate yield to ensure food security and fight hunger	100 per acre
<b>4.0 Digging wells</b>					
4.1 Searching for water table areas with experts	1	Care Kenya	Money and Man power	Clean water for drinking and irrigation	3000 per well

<b>SOIL EROSION</b>	<b>Duration</b>	<b>Lead Org.</b>	<b>Description of Resources</b>	<b>Key Results</b>	<b>Estimated Amount (\$)</b>
<b>1.0 Planting of trees</b>					1500 per acre
1.1 Training on tree nursery development	1	KFS	Funds	To get good harvest	
1.2 Acquisition of seeds	1	Ministry of Agriculture	Seeds	Prevention of soil erosion	
1.3 Construction of tree nurseries	1	Community		Reduced poverty levels	
1.4 distribution of seedlings	2	YASCO		Provision of fresh air	
1.5 Planting of seedlings	1	Ecofinder Kenya		Improve soil manure	
1.6 monitoring of trees	12	Community			
<b>2.0 Building terraces</b>					1400 per acre
2.1 Acquisition of tools	1	KFS	Funds and Farm tools	To get good harvest	
2.2 Training	1	Ministry of Agriculture		To prevent soil erosion	
2.3 Planting trees on terraces	1	YASCO			
2.4 Rehabilitation of terraces	2	Ecofinder Kenya			
<b>3.0 Planting Cover Crops</b>					1000 per acre
3.1 Buying cover crops	1	Ministry of agriculture	Funds	To get good harvest	
3.2 land preparation	1	YASCO	Tools	To prevent soil erosion	
3.3 Monitoring	12	KFS and Ecofinder Kenya	Funds and tools	To improve soil manure	
<b>Hazard 2: HUMAN-WILDLIFE CONFLICTS</b>	<b>Duration (Months)</b>	<b>Lead Org.</b>	<b>Description of Resources</b>	<b>Key Results</b>	<b>Estimated Amount (\$)</b>



<b>1.0 Farm protection/ keeping away animals</b>					
1.1 Fencing with poles	3	Community, County Dept. of Agriculture, KWS	poles, wire, nails, cement, ballast, sand	High yield and good health	34,000
1.2 Digging holes around the farms	3	Community	Labour, Jembe, Spade, Panga	Improved crop production from farms	15,000
1.3 Fencing with sticks or shrubs	2	Community, County Government	Panga, sticks, Ropes, Nails		6,000
1.4 Fencing (Wildlife boundary)	12	KWS, County Government			64,000
<b>2.0 Reducing habitat destruction/ Wetland conservation</b>					
2.1 Wetland restoration (planting wetland vegetation)	12	Nature Kenya, Ecofinder Kenya, Kenya Forest Service	Funds and seedlings	Wetland conserved and reduced conflicts with wildlife	2000 per acre
<b>3.0 Reducing Encroachment</b>					
3.1 Sensitization on effects of encroachment	12	Local Administration, KWS, Learning institutions, the Media	Stationary, chairs, tents, P.A system	Creation of awareness	20,000
3.2 Digging water wells to reduce wetland farming	12	Community, Ecofinder Kenya, Local Administration, County Department of Agriculture	Construction and digging equipment	Reduced wetland encroachment	25,000
3.3 Sensitization campaigns on reducing habitat destruction	12	Community	Stationary, chairs, tents, P.A system	Creation of awareness	20,000

### **Additional Notes**

- A budget on fencing interventions to address Human wildlife conflicts is subject for further reviews.
- Most of the farm tools/equipment will be donated by the community members as beneficiaries

#### 5.4 Tree species (provided by local community) for agroforestry activities in Yala

<b>1. Indigenous trees</b>			<b>Purpose</b>
<b>Scientific name</b>	<b>Common name</b>	<b>Local name</b>	
<i>Albizia</i> sp.		Ober	Medicinal .Provision of timber for making boats and furniture
<i>Makhamia lutea</i>		Siala	Construction of houses Its termite proof Wood for fuel
<i>Kigelia africana</i>	Sausage tree	Yago	Medicinal Used to make traditional brews to other communities
<i>Sesbania sesban</i>			Fodder crop, wood fuel, add nutrients to the soil
	Neem tree		Medicinal
	Iron wood casia		Wood for fuel and construction
	Yellow oleander		Used in making flowing boarder
<i>Luceane</i> sp.			Fodder crop
<i>Trichilia emetica</i>			Used for fuel Produce oil that is in soap making Provide poles for construction
<b>2. Locally grown exotic trees</b>			
<i>Ficus benjamina</i>			Ornamental trees Provide good shade
<i>Bambusa vulgaris</i>	Golden Bamboo		Used for making fences, poles , furniture, in building and as food and fodder
<i>Citrus senensis</i>	Orange tree	Machunga	All citrus are juicy, full of vitamin c and – used to make jams, jellies. Wood is used as firewood
<b>3. Fruits trees</b>			
<i>Mangifera indica</i>		Maembe	Edible
<i>Citrus cinacia</i>		Ndim	Edible
<i>Tamarinda indica</i>		Chwa	Medicinal