MINISTRY OF ENVIRONMENT
AND FORESTRY

KSG
KENYA SCHOOL OF GOVERNMENT

CASE STUDIES ON CLIMATE CHANGE RESPONSE ACTIONS IN SELECTED DEVOLVED UNITS

COUNTY GOVERNMENT OF KILIFI
PAMOJA TUJENGE

Waste Becomes an Energy Mine

The Biogas Project at Kombeni Girls Secondary School, Kilifi County

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Background

The inaugural climate change training program, *Climate Change Policy, Planning and Budgeting at National and County Level*[1] was held in June 2017. As a follow-up to the Inaugural Training Program, the USAID – UNDP funded Low Emission and Climate Resilient Development (LECRD) Project in collaboration with the Kenya School of Government developed training case studies for use during future climate change training sessions. The training case studies are designed to complement training programs on climate change to enable trainees tease out and practically relate with concepts, theories and ideas presented in class. The cases document climate change initiatives and response actions in the Counties. Based on county presentations made during the climate change training, two counties namely; Kilifi and Narok were selected to showcase progress made and initiatives implemented in response to climate change in their respective counties. The county representatives (*Climate Change Champions*) who attended and successfully completed the training program were involved in the entire case study development process. The *Champions* planned the data collection visits to and identified exemplary climate change initiatives in their respective counties.

The case study development process entailed; a two week data collection exercise in Kilifi and Narok counties in October 2017 and a one week case study writing workshop in November 2017. The data collection exercise involved; Visits to the respective county offices, Focused Group Discussions with county officers and communities and Key Informant Interviews.

During the data collection visits; the case study team explained the purpose of the visit, interviewed the respective officers to identify and select exemplary climate change adaption and mitigation initiatives in the county to focus on, made field visits, collected relevant information, conducted interviews and

1 The Ministry of Environment and Forestry and relevant stakeholders including Kenya School of Government developed a training program on "***Climate Change Policy, Planning and Budgeting at National and County Level***' to enhance the capacity of the public service to comprehensively address climate change challenges. The program targets middle level managers and technical government officers involved in policy formulation, planning, budgeting and implementation of programs in sectors vulnerable to the effects of climate change

collected secondary data. The main areas of focus included clean energy, climate smart agriculture, forestry and water resources.

During the case study development workshop six (6) training case studies; four (4) in Kilifi County and two (2) in Narok County, and their respective teaching guides were developed namely;

1. Victor's Farm: An oasis of plenty in a dry land, Malomani Village, Kilifi County
2. Greening Kilifi County: The Magical Woodlots, Kilifi County
3. Tapping on Clean Energy Sources: Solar Water Driven Borehole Pump Mwawesa, Kilifi County
4. Waste Becomes an Energy Mine: A Case of Biogas Project at Kombeni Girls Secondary School, Kilifi County
5. Towards Food Sufficiency: Exploring Irrigation Potential – The Case of Maji-Moto, Narok County
6. Breathing Life into Enoosupukia ridges: Re-claiming the Sweet Flow from the Hills, Narok County.

The case studies and teaching guides were then presented to the respective County Governments for validation and case release in February 2018.

Objectives of the Training Case Studies

1) To document practical initiatives undertaken in the counties to adapt and mitigate on climate change;
2) To provide a practical training aid on climate change in Kenya and elsewhere around the world;
3) To publish and publicize lessons learnt, best practice and experiences on climate change initiatives from Kenya's devolved units.

Target Audience

The cases targets global, regional, national and county audiences undertaking assignments involving climate change aspects. The targeted audience should possess prior introductory knowledge, skills and competencies on climate change.

The case is suitable for participants undertaking:

a) Specialized training and sensitization programs on climate change;

b) Educational programs on climate change;

c) Conferences, Workshops, Symposia and other forums discussing the climate change agenda at county, national or global level.

Assumptions

It is assumed that at the time of going through the case, the trainee shall have been introduced to basic concepts on climate change and/or have background information on the climate change agenda, discussions and debates.

Acknowledgements

The financial support from United States Agency for International Development (USAID) and United Nations Development Program (UNDP) through the Low Emission and Climate Resilient Development (LECRD) Project and the technical guidance from the Kenya School of Government (KSG) and the Climate Change Directorate is highly acknowledged.

The teaching case studies and accompanying teaching guides were designed, developed and documented through the dedicated efforts of several people who are highly appreciated for their invaluable input throughout the process. A full list the people involved is given in Annex 1.

Waste Becomes an Energy Mine: A Case of Biogas Project at Kombeni Girls Secondary School, Kilifi County

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Case Synopsis

The case focuses on Biogas production at Kombeni Girls Secondary School Kilifi County. In order to address their energy needs and reduce overreliance on biomass, the school has come up with innovative ways of using cow dung and kitchen waste in biogas production. The use of biogas in the school has resulted in availability of alternative energy and cost savings that would have been used to pay electricity bills. It also outlines the specific enterprises enhanced by the use of biogas energy and describes renewable and non-renewable energy.

Case Methodology

The case development exercise was undertaken to document and disseminate best practice in Climate change adaptation and Mitigation initiatives in Kilifi County. Primary data was collected in October 2017 from the County offices and at the project site in Mwawesa Ward, Kilifi County in Kenya. The research team had representation from the Kenya School of government, County Government of Kilifi and Ministry of Environment and Natural Resources- Low Emission Climate Resilience Development project.

Primary data was collected using observations, focus group discussions and one to one interviews: The key respondents were: County Executive Committee Member for Water and Environment; County Executive Committee Member

for Land, Housing and Physical Planning; Directors for Water, Energy and Environment; Chair of the Mwawesa Water Committee; and Local community beneficiaries of the project.

The primary data was complemented by secondary data obtained from relevant National and County documents, books journal and internet sources. The case was documented at a one week case writing workshop.

Case Introduction and Context

Kilifi County is one of the six coastal counties in the Republic of Kenya. The County lies between latitude 2° 20′ and 4° 0′ South and between longitudes 39° 5′ and 40° 14′ East. It borders Kwale County to the southwest, Taita Taveta County to the west, Tana River County to the north, Mombasa County to the south and Indian Ocean to the east. The County covers an area of 12,609.7 km^2. The county can be divided into five Agro-Ecological Zones (AEZ) which define areas that have similar characteristics such as annual mean temperature, vegetation and humidity. Like many parts of Kenya Kilifi County has come face to face with the unprecedented challenge of climate change impacts and the corresponding socio-economic losses to our communities. Over 80 per cent of population in Kilifi County relies on wood biomass for their energy requirements that are mainly from forests. The livelihood needs exerts considerable pressure on forest resources. As a result deforestation in the County has been high.

The Biogas Project

The County Government of Kilifi has been working to support Kombeni Girls since 2013 through its energy projects that targeted installation of clean and renewable energy infrastructure in all secondary schools in the county, Kombeni being one of the beneficiaries. The entire project involved installation of the biogas, technical monitoring of the activity, training on the utilization of the infrastructure and the initial biogas equipment including the cooking jikos and gas lights. The Kombeni Biogas plant cost approximately USD 10,000.

Biogas is gas resulting from anaerobic digestion process whereby a typical biogas plant convert s animal manure, green plants, waste from agro industry and slaughterhouses into combustible gas. The energy content of the gas

depends mainly on its methane content. The biogas yield of a plant depends not only on the feedstock but also on the plant design, fermentation temperature and retention time. It is this ability to utilize the combustible gas that Kombeni Girls Secondary school has embraced to address their alternative energy requirement.

The most common form of biogas generation from livestock waste requires the following inputs;

(i) Minimum of four heads of cattle in a zero grazing unit

(ii) The paved zero grazing unit to allow the collection of the animal waste mixed in urine from the livestock.

(iii) The biogas plant/unit

(iv) Biomass from wood, agricultural residues, and animal and human waste and other sources.

The potential for Biogas is great in the County Government of Kilifi as livestock is being reared in most areas. The Biogas energy generation requirements derived from livestock in Kilifi County is not strictly restricted to livestock keeping but can also be generated through human waste as well by the installation of bio digesters. Kombeni Girls' secondary school currently uses cow dung from 7 cows and kitchen waste with the intention of seeking to utilize human waste in biogas production.

The advantages that arise from the use of biogas is that the school is able to find an alternative means of energy, it also results in the reduction of costs that would rather be put in the settling electricity bills as the school uses readily available materials. The school recently acquired gas reliant lights that will also draw from the biogas generated. This project will also help boost the bread making enterprise

5. Climate Change Response

Kilifi County is highly vulnerable to climate change and the reliability of biomass as a primary energy source in households is insecure. In addition the semi-arid nature of the climate makes major afforestation programs impossible. Thus the community has to be more innovative in adapting to or mitigating climate change.

The proximity of the school to River Kombeni and availability of a large tract of land enhanced the schools benefits from agricultural interventions. All the slurry from the biogas is used to enhance irrigated agricultural activities mainly producing groceries used in the school and surplus sold to the community. The school through its dairy and goat rearing enterprise provides easy raw materials for the biogas. Equally the enterprise benefits from feeds growing in the field that is irrigated and enriched by the slurry.

However to ensure further success there is need to establish a climate change unit in Kilifi County to handle climate change matters as per the requirement of the climate change act 2016. In addition county specific legislation on Climate change will be crucial in order to have more focused allocation of resources and interventions.

6. Lessons Learnt and Sustainability

The bread making enterprise by the school is envisioned to enjoy the major benefit from the biogas installation in the school in addition to supporting the quick and clean cooking of the students meals. The biogas will also reduce eye infections to the workers who have for a long time used firewood that produces so much smoke. In order to manage risks, and strengthen resilience the project has undertaken the following activities: awareness creation amongst students and teachers on the importance of using of renewable energy and ensuring participatory approach in the process; identification and prioritization of sectors as per National Adaptation Plan (2015-2030); invested in communities ability to handle biogas technology; Undertaken County Climate change risk profile research.

Since the inception of the program, there have been notable achievements and successes. The use of biogas has reduced dependence on non-renewable energy

sources. The project utilizes livestock waste (cow dung) and hence significant reduction in tree cutting and farming waste burning has been realized. The project has been duplicated in one other schools that is Malindi High School and also piloted at Mzee Katsole's homestead in Ganze. Other two schools (Godoma & Ganze Secondary) have been approved for biogas initiative. To ensure success and sustainability of the initiative, various strategies have been utilized. The Renewable energy policy tools (MOEP & ERC) – 0% import duties and value added tax exemption on renewable energy material, equipment and accessories; feed-in tariffs at a price level that attracts and simulates new investment in renewable energy sector has been of great advantage to the project, since all new equipment are tax-free. CIDP and Climate risk management framework has been developed but there will be need to allocate direct resource to climate change. The Energy audit report has also been finalized and disseminated. The county has also a Draft County Energy policy. The county has also been engaged in awareness creation through literature provision, social media platforms (whatsapp) workshops, and barazas. In addition enhanced collaboration with other departments and development partners e.g. water, agriculture, infrastructure as ensured ownership.

Training on technology use and awareness creation was key to obtain buy-in/ ownership. Kombeni Secondary science teachers and support staff were trained on technology use at kitchen and agriculture garden. There were plans to use human waste during the project scaling.

7. Conclusion and Recommendations

Overall the Biogas project has been a success but the initiative has not been without barriers and challenges. Some of the challenges faced included: political interferences; Solar products not readily available in Kilifi hence sourced from Nairobi; High initial startup costs for biogas projects; Inadequate capital and lack of local technology capacity; Inadequate financial allocation to climate change activities. The County had allocated funds in climate support projects especially in water and Agriculture projects below USD 300,000 though still rendered inadequate, and leaving out other important sectors like Energy and Environment.

To address this barriers some of the possible solutions include: scaling up the biogas initiative to more households with no access to the electricity grid; use of vernacular Radio stations and road shows for promotion of the project; Adapt and train in emergent technology transfer; Improve energy saving efficient technology for charcoal kilns and use human waste at schools for biogas production; Exploit the high availability of crop/plant biomass for commercial production e.g currently 3 Megawatts of biogas from Kilifi Plantation is connected to main county grid.

Case Synopsis

The case focuses on Biogas production at Kombeni Girls Secondary School Kilifi County. In order to address their energy needs and reduce overreliance on biomass, the school has come up with innovative ways of using cow dung and kitchen waste in biogas production. The use of biogas in the school has resulted in availability of alternative energy and cost savings that would have been used to pay electricity bills. It also outlines the specific enterprises enhanced by the use of biogas energy and describes renewable and non-renewable energy.

Case Objectives

At the end of the case analysis, the participants should be able to:

(a) Identify climatic and environmental impacts that would be reduced by use of the biogas project;

(b) Explain some enterprises that were improved due to the installation of the biogas;

(c) Suggest other enterprises that are environmental and climate friendly that can be developed;

(d) Discuss how biogas energy is an alternative mitigation option to climate change;

(e) Describe the way the biogas project contribute to adaptation to climate change;

(f) Discuss other forms of renewable energy, apart from biogas sources that you are aware of;

(g) Explain advantages of using biogas as opposed to non-renewable sources of fuel.

Target Audience

The cases targets global, regional, national and county audiences undertaking assignments involving climate change aspects. The targeted audience should possess prior introductory knowledge, skills and competencies on climate change.

The case is suitable for participants undertaking:

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Case Teaching Strategies

Case Format: The case can be distributed in printed or multi-media versions that incorporate innovative didactic tools. A "soft copy" template for responding to discussion questions can also be availed to programme participants

Case discussion strategy

The case may be presented to trainees as preparatory work given in advance, within a training session or as takeaway assignment after the session. The trainer can organize the trainees into groups of 3 -5 depending on the size of the class. The suggested duration for each activity is:

i) Case briefing	-	5 minutes
ii) Case Reading	-	5 minutes;
iii) Case discussion	-	15 minutes;
iv) Individual/Group presentations	-	30 minutes
v) Comments at Plenary	-	10 minutes, and
vi) Debrief	-	5 minutes.
		1 hour 10 minutes

Opportunities for scalability

The trainer is at liberty to scale up the depth and breadth of the exercises depending on the program for which the case is being applied. For instance, in formal academic programs, the trainer can allow the trainees/students to do in depth analysis of the case in relation to the National Determined Contribution (NDC), National Adaptation Plan, National Climate Change Action Plan and the Global Climate Change Agenda.

Suggested Questions

(i) What benefits of using biogas energy are evident in the case?

(ii) Which enabling factors contributed to the success of the biogas initiative?

(iii) In what ways has the biogas initiative contributed to climate change adaptation and mitigation?

(iv) What were the challenges experienced during the project?

(v) How would you have addressed the challenges in (d) above?

(vi) What are the key lessons learnt from the biogas initiative in Kilifi County that can be used to enhance similar projects?

(vii) What additional sustainability measures can be used to enhance the project and similar initiatives in other regions?

Annex 1

Ministry of Environment and Forestry			
	Name	Designation	Role in Case Development
1.	Sheila Shefo Mbiru	LECRD Project – Knowledge Management and Capacity Development Officer	Concept development, data collection, case writing, editing and documentation
2.	Mr. Adegu	Directorate of Climate Change – GHG Officer	Case Writing
3	Phanice Mokeira	LECRD Project – Research Assistance	Case Writing
Kenya School of Government			
4.	Dr. Rachel Ngesa	Head of Centre for Research and Advisory Services	Concept development, data collection, case writing, editing and documentation
5.	Mr. Humphrey Mokaya	Director, Learning and Development	Concept development, data collection and case writing
6.	Dr. Patrick Mumo	Senior Lecturer	Data Collection, case writing and editing
7.	Mrs. Jane Mwangi	Deputy Director, Academic Affairs	Case writing
8.	Ephline Okoth	Communication Officer	Editing case studies and teaching guides
County Government of Kilifi			
9.	Elizabeth Sidi Jilani *Climate Change Champion*	Assistant Director, Environment, Kilifi County	Data collection, case writing and validation
10.	Mwachitu Karisa Kiringi	CEC Member	Case validation and release
11.	Wilfred Baya, Irine Jumwa Kenga, Mary M. Kabani, Victor M. Tsenga, Adam Kheri, Tsuma J. Tembo	Kilifi County Officers	Case validation
12.	Mr. Banda Were Mr. Victor Ngowa	Kilifi County Citizens	Data Collection
13.	Ms. Pamela Onyachi	Principal -Kombeni Girls Secondary School	Data Collection
14.	Mr. Newton Mwagambo Sadi	Principal – Basi Primary School	Data Collection

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