CATALYZING LOW COST TECHNOLOGY FOR SUSTAINABLE WATER SERVICES IN KENYA

Crowne Plaza Hotel, Nairobi, 28-29th June 2017

DISSEMINATION MEETING PROCEEDINGS REPORT

GREEN TECHNOLOGY CENTER Korea

CTCN CLIMATE TECHNOLOGY CENTRE & NETWORK

UNEP DTU PARTNERSHIP

WATER SERVICES TRUST FUND

Contents

1. INTRODUCTION

1.1. Project Background

WSTF requested for technical assistance from the Climate Technology Centre and Network (CTCN) to catalyse low cost green technologies for sustainable water service delivery in Northern Kenya and peri-urban areas. The technical assistance comprised of;

a) Development of an extensive water green technology research strategy on existing and potential low cost water green technologies to be adopted within WSTF programmes.
b) Undertaking of a feasibility study on the appropriateness of available green technologies for different ecological/environmental contexts of Kenya, including piloting green water technologies in the various ecological zones in Kenya.
c) Through capacity building workshop, strengthening of WSTF and other climate change and green water technology national actors' institutional capacity in identifying PPP opportunities and engaging the private sector in the water sector
d) Developing a Public Private Partnership business model on the deployment of green water technologies in Kenya based on the feasibility study and identifies funding opportunities (national and international co-investors, national and international funders).

In this regards, the findings of the feasibility studies and PPP have been completed and will be used to catalyse funding for low cost technologies to enhance sustainable water supply. Further, it is anticipated that assessing the applicability and viability of technologies is critical toward improving water supply especially in underserved areas. Therefore, key findings emanating from the study are critical towards informing the water sector in Kenya and especially WSTF on selected technologies and their deployment to guarantee sustainability of the water supply.

1.2. Objective of the workshop

The workshop was aimed at communicating the findings of the feasibility of feasibility and PPP business model report to various stakeholders within the water sector. The workshop theme was focused on catalysing low cost technologies for sustainable water service delivery in Kenya, with the event providing an opportunity to:-

i. Create awareness on the critical issues affecting the performance and sustainability of rural and low-income urban water supplies
ii. initiate discussion and engagement with participants based on the findings of the feasibility and the PPP business model
iii. Open up new partnerships for catalysing finances and implementation of the report findings
iv. Create networks to share good practices, knowledge and experiences

1.3. Participants

The workshop was attended by 52 participants drawn from different organizations working in the water and other related fields. The following summary of participants;

- 12 from the national government

- 8 From the county governments
- 7 from the civil societies
- 3 from water professional associations
- 5 from private sector
- 3 participant from the banking industry
- 3 participants from institutions of higher learning
- 4 from developing partners
- 7 from the study team

The diversity in the participants provided an environment for important debates from different lenses in the water services provision.

1.4. Expected outputs

The expected outcomes of the dissemination workshop were:

i. Participants have developed a deeper understanding of challenges water services provision amid the increased episodes of climate extremes
ii. Participants have a deeper understanding on how embedding of low cost technologies can enhances accessibility and service delivery especially in the ASALs and peri-urban areas
iii. Pool of actors created for the deployment and sustainable financing of climate-proofed water technologies in underserved areas
iv. New background knowledge good practices provided for new/strengthening of the existing policies/laws/strategies

2. MINISTRY OF WATER AND IRRIGATION DEBRIEFING

The study team visited the Principal Secretary (Ministry of Water and Irrigation) in 28th June 2017 to brief him about the study findings. The PS acknowledged the importance of the study findings indicating that;-

i. Rural and peri-urban areas still lags behind in term of water coverage. While issues of poor maintenance of technology, poor management of water system and high cost of O&M continue to affect efficiency in these systems, impacts of climate change will exacerbates water issues in these areas and therefore it is important to address climate change issues explicitly
ii. Enhancing green technology in all sectors is of priority by the national government. Green technology will enable to reduce the cost of production in delivering water services
iii. Reliability of technology is a key consideration towards enhancing successful deployment of low cost green technologies
iv. Private sector provides additional funding to public funds that are already limited due to competing needs. The Ministry of Water and Irrigation (MoWI) is focusing on finding alternative funding to support its development priorities
v. It is necessary that the develop PPP model is piloted so as to transform the industry and trigger more innovation in the sector
vi. Water investment must look beyond drinking water ensuring that they accommodate other productive uses

3. WSTF DEBRIEFING

The debriefing mission continued in the afternoon on 28th June 2017 to give WSTF staff the first and wide opportunity understand the findings. The following are some of the highlights of the debriefing:

i. The wind regime varies rapidly over short distance because mitigation by the relief features and not surprising that most of mechanical wind installation did not perform well. Hybrid systems (solar and wind system) should be considered to complement water provision in different time of day and seasons.
ii. The priority implementation of the feasibility study finding should be for retrofitting the existing water system aimed at raising efficiency in rural water supply schemes
iii. Multiple use of water will go hand in hand in increasing revenues generated from water supply. The PPP should ensure that multiple use of water is addressed to strengthen the business case. It is important that water resources are neglected while championing on the establishment of PPP
iv. Risks of clustering projects need to be well addressed so as to ensure the success of the prescribed business model
v. It is important while championing for a business model in water services delivery, the role of community in the water sector is not neglected. Capacity building for this group is important in ensuring successful deployment of low cost technologies
vi. Piloting of the business model and technologies alike is critical to continuously develop lessons for the future
vii. Water resources availability varies in term of depth, distribution and demand, therefore the success if low-cost technology depends in how well its matched to these factors

4. OPENING REMARKS

The workshop was kicked off with opening remarks from Dr Arthur Onyuka from KIRDI who is the CTCN focal person, Ismael Shaiye WSTF CEO and Prof. Fred H. K. Segor the principal secretary Ministry of Water and Irrigation (MoWI) who was also the Chief Invited Guest.

Dr Onyuka, NDE Coordinator in his opening remarks, highlighted the importance of the study findings since they recognizes priority of developing green technologies in addressing climate change as describe in national development goals such as; Technology Needs Assessment (TNA), National Climate change plan (NCCP), the vision 2030 and the Constitution of Kenya (CoK). Dr Onyuka emphasized the need for understanding the local contexts defined by the dynamism of different parts of the country so as to ensure that these technologies address the local needs. Local context is critical in enhancing the current paradigm shift towards adaptation of green technologies and coupling it with Public Private Partnership (PPP). Finally, Dr Onyuka invited participants to identify other priority areas that can attract Technical Assistance (TA) from CTCN.

Ismael Shaiye, Chief Executive Officer, WSTF highlighted that the impacts of climate change are greatly impacting the provision of water services and especially in the Arid and Semi-Arid Lands (ASAL)

and peri-urban areas. Mr Ismael Shaiye placed emphasis on the need to mainstream climate change in water investment so as to support project longevity and ensure their sustainability.

Prof. Fred. Segor, Principal Secretary (PS), Ministry Water and Irrigation in his opening speech indicated that water scarcity in the country has been a major issue with impacts of climate change further exacerbating the issue of water scarcity. The current drought being experienced in the country evidenced the importance of addressing climate change and especially in the water sector. The PS highlighted the importance of the national and county government to work together in planning for water investments. The County Integrated Development plans (CIDP) are important tools in guiding investments and therefore they must form basis to water investment planning.

The PS acknowledged the importance of WSTF in improving water investment through pooling resources from different partners especially in the underserved areas. Ensuring accessibility to adequate water both in term of quality and quantity will enhance poverty reduction defined in the country blueprint Vision 2030. Inadequate funding levels, low water supply coverage especially in low income urban areas and prolonged droughts are some of the key challenges that have been attributed to not achieving water development targets.

Having attained the middle class level, grants offered to supplement the county public funds are quickly diminishing and therefore the sector is required to come up with various innovative ideas to support water investment. The PS acknowledges the importance of PPP in opening new opportunities for water investment in the country and to leverage on private sector funding. As much as water is viewed both a social and public good, it economic good cannot be neglected.

The findings of the study will go hand in hand in bridging water investment gaps as well as assist in catalyzing more fund for the sector. Higher operation and maintenance cost have been affecting water supply and especially in the rural and peri-urban areas. Green technology will ensure reduction of O&M cost. To mitigate the high installation linked to development of green technology, the PS indicated the importance of using local materials to a greater extent where possible. The PS indicated that a total of 57 dams are being developed in the country of which 10 dams are currently being constructed. These developments will address other water uses beyond drinking water.

Finally, the PS challenged the participants to come up with innovative mechanisms on how water can be managed at the community level, Capacity development and public awareness will go hand in hand in addressing the challenges displayed by community managed water systems.

5. TECHNICAL ASSISTANCE BRIEF

The technical assistance was undertaken at the request of Kenya's Water Services Trust Fund via the National Designated Entity (NED) Kenya Industrial and Development Institute (KIRDI) to the climate Technology Center and Network (CTCN). The Climate Technology Centre and Network (CTCN) is the operational arm of the UNFCCC Technology Mechanism. CTCN promote accelerated, diversified and scaled-up transfer of environmentally sound technologies (EST) in developing countries for climate change mitigation and adaptation, consistent with the national socio-economic and sustainable development priorities of the requesting countries. CTCN has three key service areas namely; technical assistance, knowledge sharing and collaboration and networking.

The technical assistance followed the following steps:

i. Prioritization of technologies
ii. Feasibility study
iii. Private sector engagement
iv. Business model
v. Catalysing of future funding opportunities

Currently, the project is at the catalysing for future funding stage where concept note will be developed to trigger future funding to enable piloting of green technologies and supporting implementation of PPP.

6. PROCEEDINGS OF TECHNICAL FEASIBILITY FINDINGS

6.1. Overview

The feasibility study took place between the months September 2016 to March 2017. The study was undertaken in four phases namely: Selection of low cost technologies for the study, Desk review, data collection and analysis and report development. Three technologies (solar, wind and water pan) were selected among five technologies (solar, wind, djabias, water pan and sand dams) through a multi-criteria analysis. The study took place in four counties namely; Baringo, Embu, Homabay and Isiolo which were a representative of the agro-climatic zones in Kenya. Further, the priority was given to counties identified for WSTF investment programmes funded by the EU and Danida, as these are likely to benefit directly from the results of this study.

The table below represent the data collected disturbed across the four counties:

KEY ISSUE	FINDINGS	RECOMMENDATION
Prevalence of Solar and wind energy	• Use of bucket for abstracting water is a prevalent method in rural areas with 82% against 18% in peri-urban areas • The use of grid electricity in water abstraction is prevent in peri-urban at 53% against 47% in rural set-ups • The use of solar system is most prevalent especially in arid and semi-arid areas with the use of solar being at 93% in rural areas compared to 7% in peri-urban setups. • The is constant use of boreholes in both dry and wet season giving an indication that ground water systems are resilient to seasonal fluctuation • There has been a recent uptake of solar water pumping system from the year 2010	• The high use of bucket in rural areas gives an impetus for solar water pumping system
Capital, operation and maintenance cost	• Most of the observed technology had a low capital budget (< Kes 1 Million (53%), Kes 1- 10 million at 32%) • Most the capital cost contribution is derived from donor at 48%, 465 by government and 19.5 % by communities	• Financial support - comprehensive to ensure long term sustainability and market development • Prioritise operation and

	• 52% of the cost is considered to be the O&M cost with 50% of the revenue being used as energy cost • Rural water supplies highly dependent on donor support	maintenance from planning stage
Ownership, management and equity	• 67% of the observed technologies surveyed are owned by the community • Higher participation of women in management of systems running on grid and solar electricity	• Need to re-think community role in Rural water supplies from Management to Participation • Larger capacity system may require better skilled management • Youth should be incorporated in the management of water system since they represent a dynamic and innovative social group • Rethink communities WS approaches
Technological risks	The key challenges towards successful deployment of green technologies are: • Poor quality and substandard technologies • Poor service conditions • Low financial capabilities (high investment and running cost) • Low demand and preference of the selected technology • Weak planning and design is linked to poor construction and performance • Dispersed water points and technology brands • Grant character of rural water investments resulting to weak or inexistent financing mechanism	• Standardisation or limited options of technology increases sales and reduce the risk of dead stock. • Bring rural and peri-urban water services under regulation of service • Consider clustering technology points to achieve viable scale
Technical skills and capacity	• Rural water supply run by low-skilled people – limited capacity to diagnose fault and scheduled maintenance	Post implementation support and development human capacity specialised in planning and maintenance

6.2. Question and answer

After the presentation of the findings, participants were tasked to a question and answer session in order to deliberate on some of the issues arising in regard to this study. The session provided an interactive ground of the study findings.

Q. The finding indicates that the level of investment as a major predicament towards sustainable water service delivery in Kenya, How can this be improved?

A. The report places emphasis on the limitation of small capital budget on the size and type of water investment. Most of the technology visited had a capital budget of below one million and therefore development of small sized technologies. It is important that both the national and county governments

and other actors in the sector to ensure the size of capital fund is sufficient enough to meet local needs including multiple water use and sustainability. Evidently, small and separate water investments from different actors sum up to bigger capital budget which get lost in due time when the system fails.

Q. Among the technology selected, was there a recommendation for suitability to specific areas?

A. From the findings, both solar pumping systems and water pans can in principle work across all ecological zones, though it was noted to be more prevalent in ASALs. This could be a result of the predominance and need abstract groundwater. Due to variation of solar irradiation especially in humid and semi-humid areas, solar system appears to be less efficient. This consideration should be made in designing solar solutions. It is important that hybrid system of solar and wind system are develop to address fluctuation in power obtain in different time of day and seasons.

Q. The findings of the report mainly targeted to Arid and semi-arid areas, what is the feasibility of these technologies in others area, for example in Meru where demand for irrigation water is high? What other solutions can be recommended?

A. The four counties are a representative of the seven ecological zones in Kenya and therefore they can be applied in all regions. The findings places emphasis on the importance of increasing demand for water by way of ensuring technology type is matched with other productive uses. Increasing water demand increases high chances of revenue generation and acceptability among users.

Q. Some of the technologies implemented appear preordained to fail from the very beginning e.g. water pans developed across natural drainage or solar system being placed in obstructed site.

A. This concerns valid and the problem is not inherent with the technology but in weak planning. Low quality design is often the cause of low quality construction and poor performance. Data collected indicate that approximately 15% of rural water systems are serviced 10-years after installation. O&M component is not address during the planning stage

Q. Kenya Rainwater Harvesting Association has been working in Baringo and have developed 4 water pans. These technologies are providing water across the season. Did the study team come across these technologies in the field?

A. Yes, field survey team came visited Chepkoreyande Water pan that was developed by World Vision and Rainwater Harvesting Association. This water pan is well developed with barrier fence to reduce direct contact with users, silt trap and infiltration gallery. The pan has a capacity of about 30,000$m^{3.}$ The water pan is able to last through dry season. The pan does not have an overflow spillway and therefore a section of embankment had collapsed due to overtopping but it has been repaired. The case of this water pan greatly demonstrates how good planning can result to well developed and sustainable technologies.

Q. What can be done to reduce infiltration and evaporation in water pans?

A. Lining or soil treatment can be used to control infiltration in porous soil. Currently, there are no cheap methods available to minimise evaporation. A Lower surface area to depth ratio reduces losses per stored water volume.

Q. Water quality is an important aspect in provision of water services, what measures have been put in place to address this?

A. The solar systems have been used as power source for water quality for example in Kipsing health centre through reverse osmosis. The system produced small volume of high quality water but very significant in that it made possible for the maternity facility in the health centre to start operating. Generally speaking, affordable energy source makes it possible to incorporate decentralised water quality component both water and water and wastewater. In water pans simple infiltration gallery for example in the one observed in Marigat, Baringo made significant improvement to water quality.

Q. Are environmental factors considered in development of water systems?

A. This is an important factor in planning on water investments, but given the variation in social and environmental condition, this is best considered case by case.

Q. Which factors contributed to successful of technology application?

A. Where a technology supported multiple use of water translated to great enthusiasm among users to manage the system. Good leadership from the local translated to high demand for the technology. Finally, technology having a first-hand degree of benefit promoted the success of the project.

Q. There is significantly high use of grid electricity in peri-urban areas, does this mean solar and wind have not been developed to an up scalable standard?

A. The use of grid electricity was mainly observed in areas with option and easy access to grid electricity especially in peri-urban settings. Probably the availability of land is an additional factors influencing this trend.

Q. Were governance and management issues looked into the study?

A. Governance was not part of this study since it was not with the scope of works. You will notice that in the chapter on risk analysis four broad area of attention are highlighted; *Poor governance and support services, Socio- Economic Situation, Climate and Environmental and Low technology base. This* study focuses on Low technology base potential value adding activities. It was observed that community managed system operates outside regulation while most WSPs confined their operation within urban areas

Q. Whereas emphasising that Ground water sources is more resilient to seasonal fluctuations, where do people obtain water during wet season? Can't the dry season sources be improved to supply water throughout?

A. The use of domestic rainwater harvesting is evidenced especially during wet season. It is important that rain harvesting be explored in different ways so as to assist in complementing the existing system.

Q. To what extent was indigenous knowledge applied in the study?

A. Indigenous knowledge plays a critical role in ensuring sustainability of water developments. It is important that indigenous knowledge is linked with modern science so as to address water challenges from a historical and emerging issues basis

Q. Is there any institution offering education and user awareness in Kenya in ways that support selection and maintenance of technologies?

Technical University of Kenya (TUK) with support of GIZ is in process of developing curriculum in integrated multidisciplinary skills in water management at all levels. Anyhow University must take up the role of research and development to enhance building of new knowledge and promote efficient learning.

Q. Is water a human right or economic good?

A. Universal access is not achievable in the shortest time and therefore the need to develop sustainable water development for the realization of this right. Nonetheless, payment of water services does not translate to denial of rights. Guarantee of water right include a process or framework of acquiring it.

Q. With the call to go green, how can we increase the demand of solar technology?

A. It is important to enhance technological uptake for solar system, service providers need to ensure technology matches up with users' expectation as well as support multiple use of water. In Embu County users regularly paid off for water of irrigation since the technology matches up with users demand.

Q. Whenever a survey like this one is conducted it might create high community expectation, how do we cater for this?

A. By ensuring there are tangible action that follow from the study. In selecting the target study counties, consideration was given to areas where WSTF funding is available

Q. Water especially in the ASALs is very saline; can any of the selected technology provide solution to this?

A. Yes that is possible example of Kipsing they used small reverse osmosis to provide water needed for hospital use. Water pan provide an alternative fresh surface source especially for irrigation and livestock, and with some treatment for human consumption.

7. PROCEEDINGS OF PPP

BUSINESS MODEL FINDINGS

7.1. Overview

To strengthen the findings of the feasibility study, developing a PPP business model to enhance deployment of the selected technologies is critical towards enhancing the provision of water services. Development of this business model is an important tool in

Highlights of proposed model

- The WSTF repackages of international grants and concessional loans
- These fund county-company JV SPCs to install clusters of green water service technology (water pans, solar and wind pumps)
- The JV SPC should then contract and train micro-franchisees in remote ASAL and peri-urban areas.
- These Franchises carry out O&M.
- This model also includes the option for community water services endowment fund (for service extension/renewal)

improving water services delivery, leveraging finance and stimulating the needed sense of competition and accountability in an otherwise public sector.

Towards the development of the PPP report, a PPP stakeholder meeting was carried out between 8th to 12th May involving varied stakeholders within the sector. The consultation meetings were aimed at collecting information, opinion and experiences of PPP in the sector.

The PPP aims at Moving from public to private service providers, from grants to loans and to more professional management of water points. The prescribed model seeks to promote private sector participation but not necessarily PPP proper" defined under the PPP Act 2013

7.2. Questions and Answers

Q. There have been previous attempt to cluster rural water supply scheme (Case of Garissa County by report by GIZ). What lesson can we get from previous clustering approach in the management?

A. The team has not reviewed the report by GIZ on clustering and not sure if referred to urban or rural clusters. Nonetheless, ensuring that specific local conditions are considered before clustering the technology may enhance its success levels. Clustering didn't not necessarily imply takeover of management, but rather creating viable framework to supply whatever functions that are a challenge to community operators.

Additionally, standardizing of technology will complement the clustering process. There is an on-going process to cluster Nzoia for the purposes of increasing reliability as well as reducing O&M cost. Clustering may produce opportunity for certain elements of rural water supply and not in wholesome.

Q. What is the role of Kenyan Banks in the PPP process?

A. The banks have a critical role in proving alternative funding in the water sector either through concessional or commercial loans. Initially commercial were hesitant lend to the water sector, but gradually commercial financing has grown upon OBA framework. Banks are realising the new customer base defined by the sector for instance, equity bank has engaged water engineer to support proposal evaluation – these are sign of maturity. Credibility of water service providers is critical in attracting commercial loans.

7.3. K- water presentation

GCF supported PPP project involving by K-Water of Korea was presented. The project was carried out in Solomon Island off Australian coast in the South Pacific Ocean for the development of Tina Hydro Power plant. The total amount of project is 198 million USD. 25% of equity from K-water and HEC, other 75% is Loan from GCF, ADB, IDA etc. The business model is BOOT which means Build Own Operate and Transfer to Solomon government. The period of the project is 33 years, 3 years for construction and the

other 30 years for operation. The project components are; main dam, power house (15MW) and headrace tunnel to connect each other.

8. PANEL DISCUSSIONS

Towards the end of the workshop panel discussion comprising of three panellist namely: Sylvester Kiai (CEO, Kenya Water Industrial Association), Erik Nissen (CEO, ASAL consultants) and Job Tomno (CEC, Baringo County). The panellist gave views based on their own affiliations.

Job Tomno, CEC, Baringo County highlighted that the findings of the study comprehensively address the pertinent issues in the water sector. The findings is important to county government roles in rural water supplies and probably trigger the start of another journey of reforms in rural water supplies. If the "***the first wave of water sector reforms changed the performance of urban water, the second phase ought to transform the rural water supplies"***.

The county priority in the water sector is geared towards enhancing rural water supply since areas with WSPs jurisdiction are well covered. The role of county government in enhancing rural water supply is through:-

i. Capacity development and post-implementation support
ii. Ensuring quality brands for selected technologies
iii. Managing the O&M component to ensure sustainability
iv. Develop guidelines for solar systems

The county recognises the impacts of environmental degradation on water supply and therefore they have put measures to curb increase in environment degradation.

Job highlighted that the operationalization of the new Water Act should enhance better coordination between the county and national government. Towards placing emphasis on importance of political good will in water development job quoted that:-"**Political Good will is as varied as there are 47 County governments"**. .

Sylvester Kiai CEO, Kenya Water Industrial Association indicated that WSPs have limited capacity to operate rural schemes. Their ability is limited to their area of jurisdiction and more than often WSPs tend to reduce their effectiveness when their jurisdiction is increased to cover some of immediate rural areas case on Malindi water and sewerage Company. Technical Industrial Vocational and Entrepreneurship Training (TIVET) and private sector should couple the deployment of the selected technologies. Need to forger involvement by all stakeholders is critical for successful up scaling of the technologies

It is important that capacity for private sector is supported so as to enable them delivery sustainable water services. Private sector must be given incentives such as tax exemption in order to attract them.

County must take the leading role in creating an environment for the PPP to work in the water sector. There is need to enhance coordination between counties especially on issues to registration. The COG should take a leading role in addressing the issue of incentive for the private environment.

Erik Nissen, CEO, ASAL consultants highlighted that development of water projects in rural areas are not matched to water demand. More than often there is a gap in users' communication and involvement by implementers. More often the problems experienced in rural water supply is not technology failure but rather it actors. There is great tendency to rush water investments based on available funding as opposed to addressing community needs.

8.1. Panel Discussion Comments

Rural focus has had 8 years' experience in operating rural project under the private operator model. During the first five years the company hardly made any profits. One key lesson learn from this project is the importance of creating an enabling environment for the private operator so as to generate the desired revenues. "***Community must understand they need to pay and pay on time as delays have implication on both the operators (low profits) and user (poor service delivery)".***

Political good will is paramount in ensuring project success. Before devolution the project operated fairly but it has been difficult.

9. SUMMARY OF PARTICIPANTS FEEDBACK

The participants were tasked with giving feedback based on the findings of the feasibility study and PPP business model development. The table below summarises some of the feedback from the participants:-

Key Issue	Remark
Feasibility Study	
Innovation in the water sector	• It is anticipated that the findings of these two reports will lead to innovative solution in the water sector. Currently, there are few water innovation being supported • KCIC is interested in supporting enterprises that have innovative solution for improved water services and management
Areas of Improvement	• The cost benefit analysis of the selected technologies need an in-depth analysis • The study discusses the reliability of the technology, it is important that reliability of water sources to be discussed broadly • Studies on water governance and management need to be taken up. Rural water supply system are faced with challenges of governance and management and therefore successful deployment of these technologies requires addressing the underlying factors in their management and governance • Standardization of technology is necessary. Structures to ensure adherence to these standards must be developed
Barriers to successful deployment of technology	• There is lack of skills in operating and managing of these low cost technology and therefore the government need to take up the role of capacity development to ensure sustainability of rural water schemes • Acceptance of the technology by community. Community have a perception that conventional pumping system are more reliable compared to green technology. Public awareness should be take up • High initial cost of developing green technology. Proper financial

	structure must be developed to enable the private sector meet up the capital cost
PPP Business Model	
Areas of consideration	• There is need to show case practical cases of the proposed model: elaborate the model based on local context • Roles of different actors should be made clear • Training, technical support and outreach programme on the business model should be government focus so as to ensure successful PPP
Barriers to business model	• Lack of political goodwill • Lack of acceptance among community to allow a private operator manage their water systems • Limited knowledge on PPP in the water sector

10. CONCLUSIONS AND KEY MESSAGES

Climate change is impacting on provision of water services in Kenya. Whereas climate change is impacting on all sectors, the water sector will highly suffer from these impacts and therefore business as usual cannot guarantee increased coverage and sustainability of water investments. Mainstreaming climate change in water development is necessary and the use of low cost green technology cannot be neglected in this mainstreaming. Leveraging on private financing is necessary to complement the already strained public funds.

The following are some of the key observation from the workshop:

i. Development of water in rural areas is not matched to demand. There is a gap between the users and implementers and especially the way it is linking with youth and employment agenda.
ii. The problem is not with the technology the problem it's 'us', specifically there is generally weakness to operate rural scheme, limited planning and financial capabilities to create and sustain impact
iii. Community and all must understand they need to pay and pay on time - delays has implications for operators and users.

Therefore,

iv. To ensure successful deployment of selected green technologies, quality project preparation is paramount.
v. Promote coordination mechanism between government (county, national and Technical and Vocational Education Training Institutes, TIVET) and between government and private sector. This will forge stronger involvement of all stakeholder and incentivise private sector to participate in the water sector investment.
vi. The Council of Governors (CoG) provide good forum to coordinate inter-county involvement
vii. Develop capacity of water utilities with a priority to rural areas that fall outside licensed water service provision jurisdiction (i) develop skills, (ii) ensure quality brands etc., and (iii) management O&M
viii. Develop guidelines and standards for low-cost green technologies

ix. Grant funding should be used to develop sound project for private sector roles and cushion private sector from social risks. While private sector will often absorb commercial risk, its unfeasible to relegate its participation to failed/non-viable ones schemes, where commercial losses are obvious.

11. ANNEXES

11.1. Workshop Programme

CATALYZING LOW COST GREEN TECHNOLOGIES FOR SUSTAINABLE WATER SERVICE DELIVERY IN KENYA

AGENDA

28th June 2017

08:00–09:30 Study team meeting

Consider final preparations and flow dissemination meetings

10:00–12:00 Debrief WSTF

Instance for the project team and WSTF - the proponent and first beneficiaries - to probe issues, findings and recommendations. Opportunity for more WSTF staff to acquaint with the findings.

14:30–16:00 Debriefing MoWI

Apprise State Department for Water Services with the key Lessons learnt and critical policy decision to be pursued in order to accelerate novel approaches towards technologies development and sustainable rural water supplies

Agenda

Crowne Plaza Hotel, Nairobi, 29th June 2017

8:30 -9:00 Registrations

09:00–09:30 Opening

- *Opening Remarks*
  - *Dr. Arthur Onyuka, (NDE Coordinator, KIRDI*
  - *Ismail Shaiye (CEO- WSTF),*
  - *Prof. Fred H. K. Segor (Principal Secretary, MoWI),*

09:30–10:00 WSTF Water investment in Context - Partnerships and innovations for sustainable water and sanitation in Kenya

- *Mr. Willis Ombai, (Chief Manager Investments and Programmes, WSTF),*
-

09:30–10:30 Feasibility study of green water technologies: solar, wind & water pans – Climate Technology Centre & Network (CTCN) Technical assistance (1)

- *Presentation of CTCN, feasibility study objectives and approach, study design and methodology (Caroline Schaer, UDP), 20 min*

10:30–11:00 Coffee break

11:00–12:30 Feasibility study of green water technologies: solar, wind & water pans (2)

- *Key Results & feasibility of green technologies in water service provision (Wangai Ndirangu, UDP/BeAssociates, 40min)*

- *Summary: Performance, challenges and risk analysis of selected technologies (Wangai Ndirangu, UDP/BeAssociates), 20 min*

- **Q&A** *Ann Nabangala (WSTF) 30 min)*

12:30–13:30 Lunch break

13:30–15:30 PPP potential and Model

- *Key considerations for water services PPPs, clarification of PPP/PSP/PPCP (Ms. Rywon Yang, GTC-K),* 20 min

PPP Model Presentation, *(Hyungju Kim GTC-K), 40 min*

- *Status, challenges and opportunities for water services PPP in Kenya (PPP act, engaging private sector, Stakeholder Consultation)*
- *International and Kenyan water services PPP/PSP Case Studies*
- *Business Model Presentation*

Q&A *Dr. Onyuka (KIRDI),* ***30 min***

15:30–16:00 Coffee break

16:00–17:00 Key Messages and Next Steps

Panel *(45 mins)*

Panel representing different actors to discuss key messages from their viewpoints

Moderator: Sylvester Kiai (KWIA)

Closing remark

- KIRDI
- WSTF

Departure

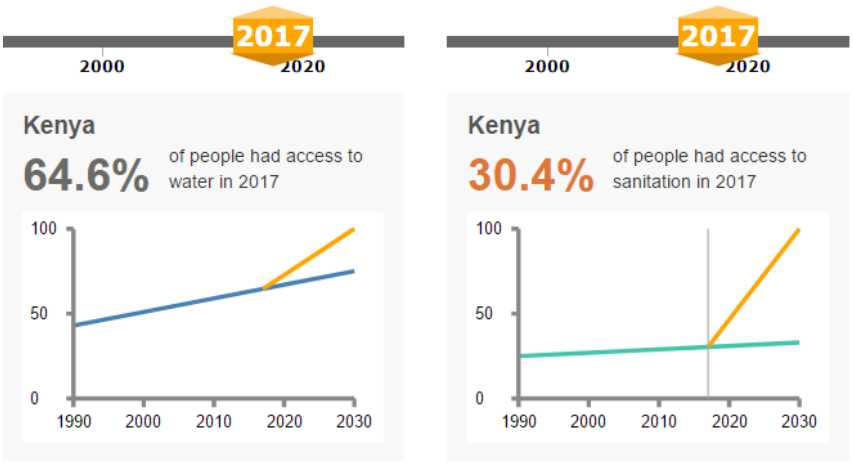
11.2. WORKSHOP BACKGROUND NOTE

WORKSHOP BACKGROUND NOTE

Catalysing Low-cost Green Technologies for Sustainable Water Service Delivery in Kenya

Introduction

Since 1974, the government of Kenya has recognised water supplies as critical for poverty reduction and development. Kenya's economic and social developments Vision 2030 heavily emphasises the need for adequate and sustainable provision of water supply and sanitation services, with a target to achieve universal access by 2030. However, thus far most water development targets have not been achieved. Improvement has been much slower in rural and low income urban areas, and generally the current funding level is inadequate if universal access is to be achieved by 2030.



Over the years, official efforts have been complemented through non-programmatic community and self-help action, but many projects quickly deteriorate after implementation and are rarely functioning 5 years after implementation. Consequently, water services available for the poor in Kenya are often inadequate, unsafe and unsustainable. Weak attention to planning, standards and operations and maintenance, including source and cost of energy of rural and peri-urban water supplies is a key challenge to functionality and sustainability.

In addition, climate change and variability add to a multitude of immediate and long-term impacts on water resources and on sustainable economic growth. Arid and Semi-Arid areas in the Northern part of Kenya and poor peri-urban areas are particularly vulnerable, characterized by low level of water service provision and acute water scarcity, where water demand considerably surpasses availability. Coincidentally, the areas that are affected by poor water services are the same ones that suffer high rate of unemployment and poverty, low economic output and poor provision of basic services such as sanitation, education and health.

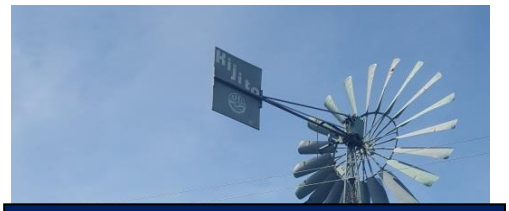
All these issues together highlight the need for improved water access in underserved areas and a more sustainable and strategic management of water resources.

Action

The Water Sector Trust Fund (WSTF) through Kenya Industrial Research and Development Institute (KIRDI), the national designated entity (NDE) organised support from Climate Technology Center Network (CTCN) to "**Catalyse low cost technologies for sustainable water service delivery in Northern Kenya**". The objective of the technical assistance requested was to analyse the technical, economic and social potential of three selected green technologies and the potential for Public Private Partnerships (PPPs). The technologies selected are: water pans, solar and wind pumping systems for supply of water in rural and peri-urban areas.

The report was prepared by the UN Environment-Denmark Technical University Partnership (UDP), the Green Technology Centre in Korea (GTC) and Be Associates, Kenya.

The study examines in-depth the performance and barriers associated with three the technologies and suggests necessary measures to enhance their performance with a view to foster a PPP model complimentary to government efforts towards water supplies in underserved areas.



- 17,860 small dams and water pans by 2030 translate to Ksh 17.8B annual investment. This big investment needs equal professional attention.
- Often capital budget too small to build sustainable projects.
- 85% water pans between 10,000m^3-30,000m^3.
- The majority of 347 mechanical wind pumping deployed in rural Kenya through 1980's to 2000s are not functional. There is very limited use of wind electrical turbines.
- 81% of Solar PV installed have a capacity of less than 1.5kw installed to abstract from low yielding boreholes mostly in ASALs.
- 72.5% of the surveyed water supplies managed by unregulated communities with limited skills, management and financial capabilities.
- Design and planning support is linked to poor construction and performance.
- Dispersed water points, variety of substandard technology brands and low per capita water consumption do not offer attractive platform for private sector roles in rural supplies.
- Cost recovery is 52%. On average 96.5% of revenue goes towards payment for pumping energy.

Study Areas

The study was conducted from October 2016 to May 2017, where primary and secondary data was collected in four counties (Baringo, Embu, Isiolo and Homabay). These counties are representative of the seven agro-climatic zones in Kenya ranging from humid to very arid.

Highlights of Feasibility Study

Kenya Plans to have 17,860 small dams and water pans for an additional 893 Mm^3 water storage by 2030 *(NWMP, 2030). The* rural electrification rate is at about 7% and urban access in 50%, while the government plan to increase electrification rates targets to achieve an ambitious 40% rural electricity access by 2024. This leaves large areas without affordable means of access to modern energy for water supplies, especially rural in North Eastern Kenya.

Water pans and solar technologies for water supplies are predominantly in semi-arid to arid areas accounting for 80% for of the installations observed. Both technologies has increased convenience and reduced efforts required to collect water. However, 80% of the installed solar PV have small capacity of less than 1.5 kW for solar PV while 85% of the water pan are in the range of 10,000m^3 and 30,000m^3.

The study observed that high levels of siltation, infiltration and evaporation rates are among the key challenges affecting water pans. The high non-functionality rate of water pans is caused by poor planning (sizing, siting and site investigation), inadequate construction quality control and poor post-implementation maintenance. Considering these factors altogether, it means that many water pans do not store water for more than 2 months after the rains, and therefore fail to meet water demands when most needed: during the dry season and drought. Almost 100% of solar pumping systems were installed with boreholes. Low borehole yield, in average 4-6m^3/hrs and the 8-hours when the

Solar panels and elevated water storage tanks commonly 5m^3, water back-up scheme can rarely support irrigation

conditions are right for solar pumping operation tend to limit application of boreholes for other uses such as irrigation.

The key challenges of water supply projects in rural and peri-urban areas are mainly related to operation, maintenance and cost recovery aspects. Most of the technology intermediaries invest in water infrastructure development, but rarely in the post-implementation support that is necessary for obtaining sustainability. Rural water supplies in all four counties studied predominantly revolve around community based management (72.5%). Unfortunately, the level of responsibilities is not matched with the requisite capacity. Moreover, the beneficiaries are expected to contribute with capital cost, manage, operate, maintain and pay for water at rates that are often much higher (Ksh100-250/m^3) than the ones paid by urban users.

Finally, it was found that youths and their water needs are seldom included in the planning and management of water supplies.

Highlight of PPP Study

Water is both a social and an economic good, and the Government of Kenya (GoK) has ambition to make water available to all at market price. This would enable user fees to recover operation costs with some remaining revenue for repairs and facility expansion.

Siltation remains key challenge affecting the functionality and durability of water pans

Public-private Partnerships (PPPs)[1] may assists in addressing the problem of low coverage, low quantity and low reliability in rural and peri-urban water supplies. PPPs can play a greater role in injecting sufficient fund for water development and support in maintenance, thus ensuring effective service delivery in these areas. Innovative mechanisms such as clustering of projects and services, the use of IT for billing and monitoring of technology functionality and use of results based aid for financing have indicated positive results to date. Boosting fee collection potential by extending user base, boosting water resource availability and quality as well as enabling additional income generating activities can make water PPPs more attractive to private partners.

[1] *A PPP is a long-term contract (usually 15 to 35 years) between a Public Sector Client and a Private Entity covering the design, construction, maintenance, and financing of an infrastructure asset. Key distinction of PPPs from other forms of procurement is that the risks associated with the ownership and operation of an asset are largely borne by the private sector rather than public sector.*

Alignment of water sector regulation with Kenya's recent political devolution and PPP laws has opened opportunities for water sector PPPs to serve water scarce communities in peri-urban areas and arid and semi-arid lands (ASALs) at county and catchment levels. This provides a window for county governments to form PPP projects for water services under certain conditions. Furthermore, the PPP Project Facilitation Fund Regulations 2015 outline the eligibility of applications to the government support mechanism for PPPs. However, lack of experience, trust, financing, and funding at county level are challenges to the initiation, effectiveness and sustainability of water sector PPPs.

Besides PPP other forms of partnerships with the private sector are available. These may be preferable for commercially challenging rural water services given that PPPs in their pure sense are complex and may require a reasonably mature and competitive market and are often best suited to longer contracts of 20+ years.

Key PPP Recommendations

- Seeking New Finance Partnerships (e.g. Climate Funds, impact investors and commercial banks).
- Ensure consultation, coordination and cooperation at all levels (International, National, Regional, County, Local, and cross-cutting with the private sector and civil society).
- Capacity Building and technical assistance targeted to specific needs at all levels.
- County-Company Joint Ventures to ensure all actors keep « skin in the game » as well as clear roles and responsibilities.
- Move to Sustainable Lifecycle Financing that reflects and allocates total project costs, and earmark grant funds for water resource management for each cluster.
- Separation of EPC and O&M Functions

The study proposes a Private Sector Participation (PSP) Model suitable for rural water supplies in Kenya. This business model proposes that WSTF repackaging of international grants and concessional loans to fund county-company Joint Venture Special Purpose Vehicles (JV SPCs) to install clusters of green technology water service points featuring water pans, solar and wind pumps. The JV SPC should then train and contract local-level water service enterprises to run micro-franchises in remote ASAL and peri-urban areas. The study introduces the option for community-led extension of services where required through a community water services endowment fund.

11.2. List of participants

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11.3. Pictorials

11.4. Feed Back Form

11.4.1. Feasibility study feedback form

CATALYZING LOW COST GREEN TECHNOLOGIES FOR SUSTAINABLE WATER SERVICE DELIVERY IN KENYA

Feedback form on Feasibility study Session

(Please fill in and submit before leaving the workshop)

Name _____ Position _____

Organization _____ Contact details _____

What is your organization's interest in the water pans solar and wind systems and especially for water supply?

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Are the technical feasibility findings clear/easy to understand? (If not, what was unclear?)

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Is there any missing information or unanswered questions?

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Do you see a potential role for your organization in enhancing the deployment of the selected technology for sustainable water services? If yes, please detail. If no, please write why not.

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Do you foresee any barriers/flaws in the deployment of the selected green technologies in Kenya? Please state what they might be and any suggestions to address them.

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Any other comment in regard to the technical feasibility findings?

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Would you like to be contacted for suggestion or clarification?

12.5.2. **PPP business Model Feed Back form**

CATALYZING LOW COST GREEN TECHNOLOGIES FOR SUSTAINABLE WATER SERVICE DELIVERY IN KENYA

Feedback form on PPP Model Session

(Please fill in and submit before leaving the workshop)

Name _____ Position _____

Organization _____ Contact details

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What is your organization's interest in water services PPPs?

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Is the presented model clear/easy to understand? (If not, what was unclear?)

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Was there any missing information or unanswered questions?

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Do you see a potential role for your organization in the presented model? If yes, please detail. If no, please write why not.

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Is the model presented practical in Kenya, do you foresee any barriers/flaws? Please state what they might be and any suggestions to address them.

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Are there any further incentives/requirements your organization would need to participate in the model?

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Please leave any other comments to inform the further development of the model.

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Would you like to be contacted for suggestion or clarification?