18th congress
African Water Association

« SUISTAINABLE ACCESS TO WATER AND SANITATION IN AFRICA »

From 22nd to 26th February 2016

KICC / Naïrobi - KENYA

SUMMARIES BOOK

• 10H00 - 11H30

Room Aberdare: Water and Energy

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Water and Energy
AUTHOR	**Samwel Kiarie** Laboratory technician Nairobi City and Sewerage Company Ltd.
COUNTRY	Kenya
TITLE OF THE DOCUMENT	RENEWABLE ENERGY STRATEGY FOR WATER TREATMENT PLANTS (Case study of NCESC's Ngethu treatment plant)

Introduction

The use of electricity in the supply of water is an important factor in economic growth and sustainability.

Since electricity is a costly input to water treatment, on site renewable energy generation becomes the best option for adaptation for water treatment plants like Ngethu.
With pumps, motors and other equipment operating for 24 hours a day, then water treatment plants become one of the largest consumer of electricity within the company.

NCWSC's Ngethu treatment plant produces an average 476,045 cubic meters of water per day. this requires a lot of electric units (2,085 Kwh per day). This amount to Ksh. 50,652/= per day.
The average monthly water production at Ngethu is 14,281,371 cubic meters (operation report (2013 -2014) electric units used against this production on average is 62,532 Kwh.

This amounts to an average Ksh. 1,519,546 monthly (maintenance report – 2013 -2014).

Introduction

The use of electricity in the supply of water is an important factor in economic growth and sustainability.

Since electricity is a costly input to water treatment, on site renewable energy generation becomes the best option for adaptation for water treatment plants like Ngethu.
With pumps, motors and other equipment operating for 24 hours a day, then water treatment plants become one of the largest consumer of electricity within the company.

NCWSC's Ngethu treatment plant produces an average 476,045 cubic meters of water per day. this requires a lot of electric units (2,085 Kwh per day). This amount to Ksh. 50,652/= per day.
The average monthly water production at Ngethu is 14,281,371 cubic meters (operation report (2013 -2014) electric units used against this production on average is 62,532 Kwh.

This amounts to an average Ksh. 1,519,546 monthly (maintenance report – 2013 -2014).

This project proposal is aimed at using Photovoltaics (PV) process, which is a method of converting solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect. This will reduce the electricity cost by 75%, thus the importance of this project.
A photovoltaic system employs solar panels composed of a number of solar cells to supply usable solar power. Ngethu has a total rooftop area of 4,075m2 making it ideal for this project.
Strathmore University has embraced this technology by installing a 600 kW roof top solar plant which is connected to the national grid. The same technology has also been implemented at the UN offices at Gigiri.

Problem Statement

Since electricity is a costly input to water treatment, on site renewable energy generation becomes the best option for adaptation for water treatment plants like Ngethu.
With pumps, motors and other equipment operating for 24 hours a day, then water treatment plants becomes one of the largest consumer of electricity within the company.
By using Photovoltaics (PV) process, which is a method of converting

solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect, electricity cost will reduce by 75%, thus the importance of this project.

Objectives of the study

The project objective is to describe the benefits of energy efficiency in water treatment facilities and set an approach to improving energy efficiency in new and existing water treatment plants by implementing on-site renewable energy generation by installing solar panels. Thus reducing energy cost by 75%.

Water treatment facilities with adequate land or roof area could install on-site renewable energy, complementing their efforts to reduce GHG emissions through energy efficiency.

Justification of the Study

This study will be useful to NCWSC, AWSB, the GOK and other stake holders in providing information on how water and wastewater facilities can lead by example and achieve multiple benefits by improving the energy efficiency of their new, existing, and renovated buildings and their day-to-day operations.

It is designed to be used by facility managers, energy and environment staff and local govern¬ment officials.

LITERATURE REVIEW

The trend in unit electricity consumption increase due to age of machines / equipment and increased requirement for improved standards which for example will require more frequencies in backwashing. This results in more energy needs and thus more cost.

Electricity use accounts for 25–40 percent of the operating budgets for wastewater utilities and approximately 80 percent of drinking water processing and distribution costs (NYSERDA, 2008).

Water companies can reduce energy use at water and wastewater facilities through measures such as water conservation, water loss prevention, stormwater reduction, and sewer system repairs to prevent ground¬water infiltration. Measures to reduce water consump¬tion, water loss, and wastewater lead to reductions in energy use, and result in savings associated with recovering and treating lower quantities of wastewater and treating and delivering lower quantities of water.

Water and wastewater utilities can also reduce energy use by promoting the efficient use of water, which reduces the amount of energy needed to treat

and distribute water. In California, for example, urban water use accounts for 70% of the electricity associated with water supply and treatment (Elkind, 2011). Water use efficiency can also help avoid the need to develop new water supplies and infrastructure. This project provides some information on approaches to improve water use efficiency and energy efficiency improvements in facilities.

Opportunities for improving energy effi¬ciency in a facility like Ngethu fall into three basic categories:

1) Equipment upgrades,
2) Operational modifications, and
3) Modifications to facility buildings.

Equipment upgrades focus on replacing items such as pumps and blowers with more efficient models.

Operational modifications involve reducing the amount of energy required to perform specific functions.

Operational modifications typically result in greater savings than equipment upgrades, and may not require capital investments (U.S. EPA, 2002).

Modifications to buildings, such as installing energy-efficient lighting, and heating equipment, reduce the amount of energy consumed by facilities.

Improving energy efficiency in Ngethu can produce a range of environmental and economic benefits e.g.

- Reduce production cost
- Reduce energy cost.
- Reduction of greenhouse gas emission
- Extend the life of infrastructure / equipment

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Water and Energy
AUTHOR	Khaled ZAABAR Head of the Electric Energy Control Division of SONEDE
COUNTRY	TUNISIA
TITLE OF THE DOCUMENT	CONTROLING ENERGY AT SONEDE: ASSESSMENT AND FUTURE ACTIONS

The mission of the Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE) (National Water Utility is to supply drinking water across the country. It has worked for decades for the development, operation, maintenance and renewal of a complex and diverse water infrastructure that covers the whole country and is 50,000 km long. That infrastructure comprises 1,300 of pumping and water production stations and 1,000 tanks, which have enabled it to achieve a 100% coverage rate in urban areas and 94% in rural areas.

The production, transmission and distribution of water through this important infrastructure require large amounts of energy, which makes SONEDE one of the biggest energy consumers in Tunisia. Indeed in 2014, its consumption reached 370 GWh of electricity equivalent to 27 million euros, which represents 23% of the utility's turnover.

Aware of the challenges in energy costs to its financial balance, SONEDE has, for several years, taken several measures to control energy costs on all of its pumping stations, mainly through reducing pumping in periods when electricity is billed at high prices, improving maintenance programs, enhancing technical diagnostics operations and training and continuously informing its operating staff on energy management techniques.

In addition, and to compensate for the increase in energy prices since 2004, other projects have been developed in the field of energy efficiency and renewable energy (energy audits, installing variable speed drives, photovoltaics, rehabilitation of some stations, ...).
The success and sustainability of these actions during the last 16 years were ensured by coordination and dialogue among the stakeholders, especially by direct contacts through meetings, seminars and periodic training sessions and popularized technical assistance.

However, to preserve the balance between supply and demand for water in the future, SONEDE will be obliged, in addition to its water conservation program, to resort to increasingly energy intensive water production and supply solutions, consisting mainly of the mobilization of all the resources available, the strengthening of the water transmission over long distances, and the use of large-scale unconventional resources such as the desalination of brackish and sea waters.

In this situation and with the prospects of increased significant energy consumption at persistently high and volatile prices, SONEDE has implemented a strategy in the areas of energy efficiency and renewable

energy.

Regarding energy efficiency, SONEDE planned actions in pumping and water production stations, in the buildings and for the rolling stock, conducting energy audits, setting up an energy management system in accordance with the ISO 50001 standard, organizing training sessions to ensure lasting awareness of all stakeholders and actors involved in energy control at SONEDE. This will help save 15% of energy by the year 2030.

In accordance with the energy strategy, several projects in renewable energies (wind, solar, photovoltaic, CSP solar and hydropower) are planned or are being studied, enabling SONEDE to be part of the momentum enjoyed by this sector, which has grown rapidly in recent years with a considerable drop in related prices. The objectives is the inclusion of up to 30% renewable energy in the total consumption of energy by 2030. The use of renewable energy on a large scale is a strategic opportunity for SONEDE. Indeed, the inclusion of renewable energies will limit the impact of energy costs on the cost of water in the future. Nevertheless, their implementation requires the mobilization of relatively substantial funding (15 years): 200 million Euros and this is a great challenge in terms of projects, technologies and operation.

The funding and development of partnerships, cooperation, technical assistance and research programs with national and international institutions and agencies in the field of energy conservation remains an important focus of the energy strategy of SONEDE to meet the challenges of the water-energy interaction in the future on a national or regional scale. The most relevant actions of this component include:

-Financing (donation) by JICA of an efficient desalination plant including the largest photovoltaic plant in Tunisia (212 kWc). It was inaugurated in 2013.

-Funding by AFD of a series of pilot projects in the field of energy efficiency and renewable energy.

-Financing by KfW of the first sea water desalination plant that will include high energy performance technology.

-Financing by the World Bank of the energy rehabilitation of two large pumping stations that feed the capital, Tunis, and the Cap Bon region, Sahel and Sfax.

-The implementation in 2012, as part of the cooperation with GIZ, of the energy audits of some major pumping stations and the

determination of the hydroelectric potential of SONEDE's drinking water network.

-The cooperation with Arab water and sanitation utilities to develop a guideline on energy efficiency in the drinking water sector adapted to the Arab countries, under the cover of ACWUA and with the technical and financial assistance and GIZ.

The proposed paper will include:

-The methodology used, which led to the relative success of this program,
-The presentation and analysis of the results achieved,
-A critical analysis of the water-energy interaction,
-Future energy prospects in Tunisia and at SONEDE,
-The basic elements for the development of the strategic planning of energy control at SONEDE,
-Future major projects of SONEDE and the energy efficiency solutions selected,
-The orientations of SONEDE in renewable energy.
-Research Partnerships

Keywords: ***Interaction, methodology, results, critical, prospects, strategy, efficiency, renewable, research***

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Water and Energy
AUTHOR	Yénizanga KONÉ
COUNTRY	MALI
TITLE OF THE DOCUMENT	STUDY AND IMPLEMENTATION OF AN ENERGY EFFICIENCY SOLUTION OFTHE REACTIVE ENERGY COMPENSATION CASE OF SOMAGEP

The depletion of aquifers or the need to tap fresh water sources that are increasingly distant adds to energy expenses.
Water utilities must annually provide additional water to meet the growing consumption by installing new facilities whose long-term viability is questionable in view of the limited supplies of fresh water.
Rain has become increasingly irregular, population growth and rising energy prices leave no other choice for water utilities than to solve the

difficult equation between meeting the water demand in urban areas and cost minimization.
Energy efficiency initiatives in the production of water by these water utilities may be viable alternatives. For example, many water utilities in developing countries have up to 30% losses in their operating systems. Recent studies have shown that there are various options to reduce peak demand, adjust and resize pumps to meet specific requirements. These measures lead to reasonable operating costs and require modest investments and have an interesting return on investment.
By focusing on the elimination of inefficiencies linked to energy in water distribution operations (both small and large scale), the quality and quantity of water produced by water utilities in poor areas could radically improve.
In the context of restructuring the water and energy sectors in the Republic of Mali, which resulted in the separation of water and energy and the creation of two water utilities, one for the development of the sector and management of the assets (SOMAPEP-SA) and the other for the technical and commercial operation (SOMAGEP-SA), the issue of energy efficiency became the prime concern. Thus, our utility, SOMAGEP-SA, embraced this new dynamics which aims to:

-Reduce our electricity bill by reducing our consumption of reactive power;
-Optimize the size of our electrical systems by increasing their available powers and reducing the footprint of our equipment (transformer, cables, ...);
-Improve the power quality and the longevity of our equipment;
-Contribute to the preservation of the environment by reducing losses in transmission and distribution networks;
-Increase the service continuity by eliminating shutdown risks due to the inadvertent tripping of the power grid.
This dynamics should have three major impacts:

- Economic: limit the impact of energy prices on the production and operating costs of SOMAGEP-SA, which is vital to the development of our business;
- Social: allow equal access to water and energy;
- Environmental: reduce the effects of global warming.

It thus seems essential for us to have an accurate view of risk issues and energy opportunities.
To this end, only one question should be asked.

What policies should we implement to reconcile our energy needs and our business challenges?

Thus, SOMAGEP-SA embarked on an energy efficiency program using the compensation of the reactive energy solution at its drinking water production and distribution facilities.

Keywords: ***water production, electrical networks, technical losses, energy efficiency, active energy, reactive energy, global warming, conservation of the environment.***

Presentators

SUB THEME	**Innovations for Improving Access to the Continuing Water Service**
SUGGESTED TOPIC	**Water and Energy**
AUTHOR	**Jimmy Thuo** *Network Administrator Coordinator Nairobi Water And Sewerage Company* **Philip Oruoch** *Customer Care Coordinator Nairobi Water And Sewerage Company* **Elenah wambura** *Data Analyst Coordinator Nairobi Water And Sewerage Company* **Edwin Angima** *Customer Care Coordinator Nairobi Water And Sewerage Company*
COUNTRY	**KENYA**
TITLE OF THE DOCUMENT	**Efficient Energy Management at Nairobi City Water and Sewerage Company**

Energy management is the process of monitoring, controlling, and conserving energy in a building or organization. It typically involves the following activities; metering the energy consumption and data collection, identifying opportunities for energy saving, taking action to target the opportunities and finally tracking progress by doing some data analysis. This paper looked at the above activities at a select number of installations at the Nairobi City Water and Sewerage Company. A number of areas were identified as energy saving opportunities such as use of energy efficient motors, Pump and motor shaft alignment; change from electromagnetic to electronic ballasts in fluorescent tubes, use of LED lights in lieu of mercury vapour flood lights, awareness campaigns amongst others.

Introduction

Nairobi City Water and Sewerage Company (NCWSC) provides water and sewerage services to the approximate 4 million residents of Nairobi City County, the capital city of Kenya. The company has been in operation for 10 years and operates through six administrative business centers in Nairobi, with three dam station installations, one spring installation, three clean water treatment plants and two waste water treatment plants. As the company is run on commercial principles, its workforce is integrated into a competitive and productive environment that is customer focused and results oriented.

Energy Management

Energy management is the process of monitoring, controlling, and conserving energy in a building or organization. Improving energy efficiency is one of the most cost-effective strategies a company can use to manage rising energy costs and growing concerns over greenhouse gas emissions.
Introducing strong and robust energy management systems and ways to identify performance improvements can drive significant cost savings, competitive advantages and mitigate against energy price volatility. Companies that have an in-depth knowledge and understanding of their energy use and systems to manage it, have demonstrated increased productivity, better staff engagement, and reputational benefits.

This is reflected in their share value and attractiveness to institutional investors. It typically involves the following activities; metering the energy consumption and data collection, identifying opportunities for energy saving, taking action to target the opportunities and finally tracking progress by doing some data analysis. Energy management is the key to saving energy in any organization. Much of the importance of energy saving stems from the global need to save energy - this global need affects energy prices, emissions targets, and legislation, all of which lead to several compelling reasons why one should save energy at the organization.
Saving energy globally helps us reduce the damage we are doing to our planet and also reduces our dependence on fossil fuels which are becoming increasingly limited in supply. At the organization level, Energy management will enable the organization to reduce costs, reduce carbon emissions and environmental damage and ultimately reduce risks associated with energy price increases which is increasingly becoming important as energy costs rise.

Materials and Methods

Some of the materials used in the research include an energy audit report done on a section of the company's installations and offices and data collected from energy consumption over the period of review.

Results and Conclusions

The results of this study shall help the company critically assess its energy use and form a guideline on energy management.

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Water and Energy
AUTHOR	Kevin M. Nyagetuba Electrical Engineer Nairobi City and Sewerage Company Ltd.
COUNTRY	KENYA
TITLE OF THE DOCUMENT	ASSESSMENT OF SMALL SCALE HYDROPOWER OPPORTUNITIES IN THE WATER SUPPLY INDUSTRY IN KENYA (CASE STUDY:- WATER TRANSMISSION LINE FROM MWAGU OUTFALL TO GIGIRI RESERVOIRS

The need to reduce the cost of energy used in the treatment of water, supply of water and discharge of wastewater has grown as one of the major concerns of the water industry over the last few years. The main reason for this is due to the high cost of electricity as a result of high oil prices and heavy consumption of electricity in the treatment processes. Most of the electricity consumption is due to pumping, raw water treatment and wastewater treatment processes.

Nairobi City Water and Sewerage Company (NCWSC) spends over KES30million monthly on electricity. Most of the energy used is for lifting water from one place to another which involves pumping water to distribution reservoirs at high head in order to allow flow via gravity to a wider area, case in point Gigiri pumping station among others. Pumping stations account for 67 percent while water and wastewater treatment facilities account for 20 percent of the electricity consumption incurred at NCWSC. The other 13 percent results from non-core activities such as street lighting, workshops, administration and office works. These figures are likely to increase in future as a result of the

rise in population rate, together with the expansion of industrial activities, the increasingly stringent water quality coupled with the future need to supplement water supply by treating wastewater for reuse.

This trend is substantiated worldwide over. In most of the developed countries, for instance the UK, water and wastewater treatment processes are energy intensive accounting for around 30 to 80 percent of the industry production cost. Addressing the problems of energy sustainability in the water and wastewater industry requires a thorough review, and research into technologies that are cost effective and sustainable.

Micro hydropower as a resource that is readily available at the door step of the water companies has been identified as the solution to a sustainable energy option for the industry. This study focuses on electricity generation by micro-hydro plants integrated in water supply systems, which convert the potential energy of water flowing in pipes into electric power at the lower end of the pipes, particularly the water transmission line from Mwagu Outfall to Gigiri Reservoirs. The transmission line aforementioned consists of; raw water transmission line from Mwagu outfall to Ng'ethu Treatment Works (NTW), Ng'ethu water production plant and treated water transmission line from NTW to Gigiri reservoirs. The most convenient locations for hydropower generation in water supply systems are water supply lines located before the water treatment or distribution network.

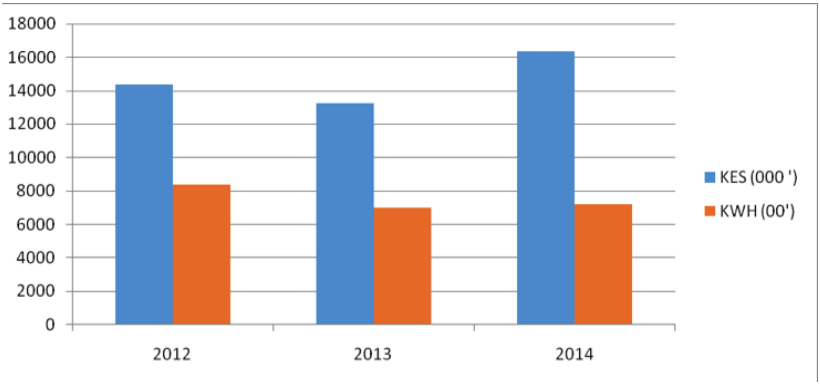
While other European countries, such as Switzerland, Italy and Germany have widely invested in this technology, African states, more so Kenya is still below its potential development level. As such, this presents a huge opportunity for exploitation of hydropower resource which will in effect achieve least cost power development plan adopted by the Kenyan government over the next 15 years.

NTW receives a substantial and consistent supply of raw water from Thika Dam and diversions of the rivers aforementioned via gravity. This significantly cuts cost on energy that would otherwise have been used to pump raw water from the source to the treatment plants. Significant potential can be tapped from the raw water feeding NTW from Mwagu outfall, and treated water flowing through transmission pipelines to Gigiri reservoirs in Nairobi. In addition, a pre-feasibility study was done showed significant potential that could be exploited to sustain one of the phases and street lighting within Ng'ethu facilities at the draw off point of phase 2. In-pipe turbine generators can be adopted in the water supply pipelines

to supplement the power generated at phase 2 draw off point in order to generate substantial power to supply the entire treatment plant and the staff quarters at Ng'ethu.

Problem Statement

NCWSC spends over KES 30 million monthly on electricity. This figure represents a significant percentage of the annual revenues collected (5 percent). Treatment facilities currently account for 20 percent of the total electricity consumption. NTW accounts for approximately



50 percent of the total 20 percent consumption of the water and wastewater treatment facilities under NCWSC. This makes NTW one of the biggest single consumers of electricity with a monthly electricity bill of around KES 1.8 million. More so, the cost per unit of electricity has continued to escalate at NTW, with an increase of 13 percent from 2012 to 2014 although the electricity consumption in 2012 was 14 percent lower than in 2014 as shown in the bar graph below.

These figures are likely to increase in the near future as a result of the rise in population rate, together with the increase of industrial activities, the increasingly stringent water quality coupled with the future need to supplement water supply by treating wastewater for reuse and expansion of the existing treatment facilities.

Statement of Objective

The general objective of this study is to investigate viability of integrating a micro hydropower scheme in the water supply system at Ng'ethu treatment facilities in order to offset electricity costs incurred

by NCWSC. Also, this can be a good model for best practise for water service providers in Kenya.

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Water and Energy
AUTHOR	Alec Kimathi
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Decreasing Costs for Water Utilities through Energy Efficiency and Renewable Energy Interventions

Electricity costs are usually between 5 to 30 percent of total operating costs among Water and Wastewater Utilities (WWUs). The share is usually higher in developing countries and can go up to 40 percent or more in some countries. Such energy costs often contribute to high and unsustainable operating costs that directly affect the financial health of WWUs. Improving EE is at the core of measures to reduce operational cost at WWUs. Since energy represents the largest controllable operational expenditure of most WWUs, and many EE measures have a payback period of less than five years, investing in EE supports quicker and greater expansion of clean water access for the poor by making the system cheaper to operate. {Source: “A Primer on Energy Efficiency for Municipal Water and Wastewater Utilities” Technical Report 1 / 2012 by ESMAP- Energy Sector Management Assistance Program, International Bank for Reconstruction and Development / World Bank Group}

Water Utilities across Kenya operate under a regulated water tariff that is calculated to recover Operation & Maintenance (O&M) costs such as personnel, chemicals and electricity; the largest of which is electricity. Currently, electricity costs for water utilities account for between 35 to 50 percent of their total operating costs.

OBJECTIVE

The overall objective of this paper is to show the benefits of energy

audits to mitigate the high energy costs and overall energy inefficiencies within water utilities that are quite costly.

METHODOLOGY

To support water utilities in finding ways to reduce their energy consumption, Energy Audits for 29 WSPs were conducted in early 2012. These were sponsored by the German Partnership Project SWAP-bfz and the reports officially launched in July 2012.

The audit reports identified solutions that can improve on Energy Efficiency (EE) as well as on the most suitable Renewable Energy (RE) alternatives that Water utilities can tap into without reliance on electricity from the grid.

In 2013, water utilities took up the challenge and started implementing the recommendations of the reports. Some of the EE solutions did not require any investment; yet even the ones requiring little investment had the potential for significant immediate cost reduction. An example of an EE intervention requiring no investment was tariff migration.

RESULTS

Energy Efficiency Measures

The most common EE measures implemented so far were:

6. Tariff Migration
7. Capacitors for Power Factor Correction
8. LED Lighting Retrofit
9. High Efficiency Pumps
10. Energy Efficient Motors

1. Under tariff migration to a low cost electricity tariff, four (4) Utilities could save between KES 2,504,743/- per year. {Source: Summary Energy Audit Report for Water Service Providers in Kenya, 2012 by James Wakaba, Greenworld Energy Ltd}
2. Power Factor Correction (PFC), if PFC falls below 0.90%, the water utility is penalized 1.5% of its total electricity bill per month. Through quick installation of capacitors for power factor correction, 18 water utilities could immediately save between KES 7,478,730 per year. {Source: Summary Energy Audit Report for Water Service

Providers in Kenya, 2012 by James Wakaba, Greenworld Energy Ltd}

3. LED Lighting retrofit, addressed the problem of conventional uses of HP sodium lamps, incandescent bulbs, mercury vapor lamps and compact fluorescent lamps with initial cheap investment but high maintenance costs for utilities. As an alternative, LED (Light Emitting Diode) are more efficient. Through LED lighting retrofit, 19 water utilities could save between KES 5,405,229 per year. {Source: Summary Energy Audit Report for Water Service Providers in Kenya, 2012 by James Wakaba, Greenworld Energy Ltd}

8. Electric motors that were installed on pumps with energy efficiency motors ratings of atleast IE2 and above (IE3), saw a potential number of 10 water utilities that could save KES 16,674,163 annually in O & M costs. {Source: Summary Energy Audit Report for Water Service Providers in Kenya, 2012 by James Wakaba, Greenworld Energy Ltd}

There are additional EE measures that were recommended by the energy auditors which required high financial investment. These EE measures include variable speed drives, operational improvements, electricity monitoring systems, piping, pressure switch installation, soft starter installations, overhead tank installations, centralized printing, motor load optimization, pump repair and servicing, computer screen replacement and introduction of the SCADA system.

In 2013, Thika Water and Sewerage Company Ltd was voted as the best implementing utility from the water sector with energy savings amounting to KES 2,235,600/-. {Source: Centre for Energy Efficiency and Conservation, Kenya Association of Manufacturers, October 2013}

Renewable Energy Measures

A number of water utilities had potential for Renewable Energy to supplement if not replace their dependence on electricity from the grid. These range from mini-hydro, solar pumping, solar powered lighting, to biogas and wind.

There were 10 water utilities with potential to implement mini-hydro ranging from 10kW to 13MW. 20 water utilities with potential to implement solar powered lighting while 15 utilities with a total of over 50 boreholes had solar powered pumping potential. Four WSPs were noted to have the potential to implement biogas plants especially to run the energy-intensive wastewater treatment plants. Three had

significant wind energy harnessing potential.

Financing

Because most of the EE & RE measures require financing, there are partner institutions interested in assisting WSP's implement some of these measures.
The Regional Technical Assistance Program (RTAP) -KAM that is supported by the French Development Agency (AFD), have a financing and technical scheme for energy audits as well as implementation of energy efficiency and renewable energy interventions. {Source: Centre for Energy Efficiency and Conservation, Kenya Association of Manufacturers}
The Sustainable Water & Sanitation for Africa project (SUWASA), supported by USAID, Washington DC guarantee, has a financing scheme with local financing institutions such as Kenya Commercial Bank, Housing Finance, K-Rep and Family Bank. For SUWASA, the energy efficiency investments are short-term with immediate impact and a short payback period making for very attractive investment for any commercial bank. {Source: SUWASA-USAID}

Keywords
Energy Audits ; Energy Efficiency ; Renewable Energy ; Smart energy investments ; Short payback period ; low operational costs ; commercial financing;

- Lenana Room : INSTITUTIONAL DEVELOPMENT AND CAPACITY BUILDING FOR WATER AND SANITATION

Presentators

SUB THEME	Governance and Performance Improvement Tools
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	ECHELAI GILBERT AKOL
COUNTRY	UGANDA
TITLE OF THE DOCUMENT	Improving Utility Performance through Capacity Building in GIS: The NWSC experience through utility partnerships in the East African region.

I hold a Second Class Upper Bachelors Degree in Economics obtained from Makerere University, awarded in 2003. Since then, I have undertaken several trainings, responsibilities and assignments within the Decision Support Systems Unit of National Water and Sewerage Corporation (NWSC) in Kampala. To date, I am the head of the GIS Unit, as well as Lead Auditor of the Quality Management System (QMS ISO9001:2008). I am a trained and certified Lead Auditor of QMS. I am also a member of NWSC External services consulting unit, contributing in areas of QMS and the use of GIS as a decision support tool for administrative, commercial and technical operations in a utility. I am currently doing my MSC Research Thesis, titled: "Asset Management: Using GIS as a Decision Support Tool in Meter Replacement Planning in National Water and Sewerage Corporation". This is for the award of a Master of Science in Geographical Information Systems which is a collaboration programme between Lund University in Sweden and ITC, University of Twente, in Holland. It is a distance learning programme.

National Water and Sewerage Corporation (NWSC) is a fully owned government parastatal that was established by the Government of Uganda in 1972 with help from the World Bank; United Nations Development Programme (UNDP) and the World Health Organisation (WHO). The mandate of the corporation is defined in the National Water & Sewerage Corporation Statute of 1995, Section 5 (1), is to operate and provide potable water and sewerage services in all areas entrusted to it, on a sound, commercial and viable basis. The NWSC operations were initially in three towns of Kampala, Jinja, and Entebbe. Currently, NWSC operates in 84 urban centres spread across the country.

Presentators

SUB THEME	Governance and Performance Improvement Tools
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	FOFANA BIRIHIMA
COUNTRY	CÔTE D'IVOIRE
TITLE OF THE DOCUMENT	Improving Utility Performance through Capacity Building in GIS: The NWSC experience through utility partnerships in the East African region.

The strong commitment of the senior management and shareholders to ensure a sustainable performance of our company by improving individual and collective performance of employees led to a strategic thinking on human resources through general conferences. Our approach is designed as a human resources management method. To achieve this goal, we have two main ambitions:

- Provide managers with a tool for managing and developing the skills of their employees,
- Support the development and sustainability of the company.

The registered deficiencies or malfunctioning highlighted the needs for skills development. An action plan has therefore been set up for each process with a focus on skills management, which is a guarantee of sustainable performance.

Managed as a project, the approach is a structuring element of the company's performance.
This presentation includes five chapters:

- The strategic importance of the approach,
- The scopes of action,
- The working methodology
- The results
- The way forward

This approach involves strategic issues at all levels of the company :

- For the company, it helps the company adapt to changes in its environment while working on the adaptation of employee skills to changes in their jobs.
- For the supervisor, it helps anticipate the risks of skills disruptions, manage skills effectively (evaluate, correct, develop skills and develop employees) and develop greater versatility in the teams.
- For the employee, it helps develop his professionalism and career plan (career paths, training) and enhance his employability.

The scope of the approach, focused initially on the core professions, will be adjusted after the diagnosis of the deployment of the pilot phase. Beyond the items that make up the approach, it takes into account;

• The identification and validation of the profession and jobs of the enterprises;

• The identification of the key competencies required for each job;

• The verification (by an evaluation system) of the control of those competencies by the employee for each job and, if necessary, the implementation of competency improvement or development actions.

The aim is to equip the company with a skill reference, which will be used as a medium for best professional practices for employees and their line managers.

We chose a participatory methodology based on the discussion and question sessions within a multifunctional team of operators and HR managers.

The method followed four steps:

1. The Constitution of Working Groups

Our teams worked with eight employees appointed for each job class along with a manager of the job for the validation of the first level.

2. The Progress of the Work

The work started with the training of all contributors (operators and HRM). The objective of this training was to familiarize the participants with the methodology and validate a single understanding of the concept of competence.

Our skill reference built on the model of Elisabeth Lecoeur is innovative. The collected data are translated into large missions. For each mission, we keep the best business practices that bring added value and effectively contribute to its successful implementation. We have therefore identified the training or strengthening material that will help the manager address effectively the skill gaps and the soft skills required for a perfect implementation of the identified practices. A glossary was designed to allow all employees to use the deliverables in order to better understand our professions.

3. Validation of the Work

The validation was done at 3 levels:

• Employees of the working groups,
• The skill reference for each profession,
• The heads of the poles concerned.

4. Deployment

Two major steps:

• The training all employees of the poles concerned during a tour of our entire perimeter. The awareness of the employees was raised on the need to mobilize their expertise to ensure the company's performance. Each employee was given a copy of his job's skill reference.

• The training of line managers in charge of evaluating the employees on the control of the skills identified.

26 skill references along with lexicons of the technical words used were made available for consultation purposes. These skill references were made available to the various players. This pilot phase involved 1,211 employees working in the operation and technical poles.
The skill references identify skills that are becoming critical in the water and sanitation sector jobs. Some of these skills are new and are becoming increasingly important as job technologies change.

We can divide these skills into 3 main groups:

• Using the new technologies,

• Designing and developing the differentiation arrangement based on the inventory of skills,

• Managing one's own continuing education.

• Operation Pole (Drinking Water): 4 professions and 18 skill references

- Profession 1: The Billing of the Service (4 jobs)
- Profession 2: Customer Management and Recovery (8 jobs)
- Profession 3: The Operation of the Assets and Networks (3 jobs)
- Profession 4: The Maintenance of the Assets and Networks (3 jobs)

• Technical Pole (Sanitation): 2 professions and 8 skill references

- Profession 1: Operation and Maintenance of the Networks (5 jobs dealt with)
- Profession 2: Operation and Maintenance of the Plants (3 jobs dealt with)

The deployment of the 28 skill references completed will result in an assessment of the skills of individual employees in the jobs dealt with.

This stage will enable the validation of the relevance of the approach (feedback) and the building on the achievements for a wider deployment. The gaps will be addressed by the skill strengthening plans.

This validation of the relevance of the approach will help answer questions such as:

• Are the identified skills really new, that is, do they define a new profession?

• Do the skill represent a break, or are they still at the core of the professions?

The competence approach is an innovative project for our company. It strongly contributes to improving our skills and performance.

Skills cannot be separated from professions.

Succeeding in the Human/skill-related job adequacy requires the development of the professionalization of water and sanitation professions.

Presentators

SUB THEME	**Governance and Performance Improvement Tools**
SUGGESTED TOPIC	**Instituional development and capacity building for water and sanitation, Performance-based contract for improved access to water and sanitation**
AUTHOR	**FEMI COCKER, Engineer Water and Sanitation, Head of the Ouémé Water Service (Benin).**
COUNTRY	**BENIN**
TITLE OF THE DOCUMENT	**Development and ownership of sanitation and water supply (WS) assets management tools by local elected officials: Leasing as a performing management tool.**

Access to safe water and adequate sanitation services is essential for the development of all countries in general, and especially those in Africa. The promotion and effective management of its sectors continue to attract the attention of the players, so that the steady increase in the rate of access to drinking water is one of the major challenges. Despite the failure of most African countries to fulfill the MDGs, great efforts were made, which have resulted in important achievements from 2000 to 2015, a period devoted by 193 UN Member States, and at least 23 international organizations, to the MDGs.

In a context of global change, it is urgent that strategies be put in place for the sustainable management of the achievements of the MDGs. One

of the most important lessons learned during the last decade is probably that if we give people in rural areas the means to control their own destiny, they will know best how to manage it. It is important for governance policies and performance improvement tools to be mostly developed and promoted in rural areas.

This paper is related to this issue and aims at sharing the good practices of Benin in the decentralization process of the water public service, and particularly with regard to the lease system of water assets. «The development and ownership of management tools for sanitation and water supply (WS) assets by local elected officials» are essential for the control of facilities and their sustainable management in the context of decentralization.

The skills of the grassroots through local representatives should be strengthened to enable them to play the role of leaders in the water and sanitation public service sectors in order to meet a need of general interest. The public service provided by local representatives in these sectors is already practiced in some African countries, and in Benin in particular, and deserves to be supported and strengthened for the transfer of skills and resources to be effective.

This is based on three fundamental principles, namely:

- The principle of the public service continuity;
- The principle of adapting the public service to global change;
- The principle of the equality of users before the public service.

To set up a water public service that complies with these principles, local institutions or authorities should establish an organization that relies on:

- The delegation of the assets management;
- The sale of water in volume;
- A framework for efficient maintenance;
- The monitoring of the water service.

For a sustainable management of water resources and the maintenance of an adequate public service in this sector, the subcontracting system, which involves the delegation of the management of water assets to a leaser (private company or consumer association) would be appropriate. The local institution (the municipality in the case of Benin) in this framework remains the owner of the water assets and equipment. Its role

is therefore limited to the monitoring and control to ensure the viability and sustainability of the assets.

The money from the sale of water is used to:

- Ensure the operation and maintenance of the system,
- Ensure the renewal and extensions,
- Pay a fee to local institutions,
- Possibly pay a royalty to departmental technical services under the Water Act,
- Ensuring the profit of the leaser.

To achieve these objectives, local elected representatives must take ownership of the following tools:

- Tools for monitoring the financial management of the assets,
- Tools for monitoring the condition of the facilities,
- Tools for monitoring the service quality.

These practices need to be promoted and strengthened to enable the sustainable management of water resources.

Keywords: ***water, sanitation, management, local elected official, tools, subcontracting, sustainable.***

Presentators

SUB THEME	Governance and Performance Improvement Tools
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	FPaul Kirui Planning , Monitoring and Evaluation Coordinator Nairobi City and Sewerage Company Ltd.
COUNTRY	KENYA
TITLE OF THE DOCUMENT	FROM THEORY TO PRACTICE: EXPERIENCE OF NAIROBI CITY WATER AND SEWERAGE COMPANY IN IMPLEMENTATION OF STRATEGIC PLANS

Contemporary management has seen a paradigm shift that has incorporated the strategic planning in improving the performance of organizations. A basic theoretical model for strategic planning offers a step-by step process of strategic planning. For successful implementation of these plans means that, time, persons involved in

planning and the strategy adopted are of critical importance. In practice, the implementation of these plans is usually very low owing either to the lack of skills and commitment by the implementers, lack of adequate resources or that the plan was not communicated well. Because of the above reasons some well formulated strategic plans still end up in the shelves rather being implemented.

Process of Strategic planning

Strategic planning is a concept in modern management that has seen organizations transform from being non-performing to excellent performers and as such the implementation of the plan is of paramount importance. B.C Forbes (2011) has given a five-step Strategic planning process .In the last step of this process he has emphasized review of the plans. He advances that one should ensure the plan performs as designed, and thus the plan ought to be frequently subjected to reviews. Persons vested with the responsibility of overseeing the implementation of the plan should hold regularly scheduled formal reviews of the process and refine as necessary.
NCWSC Experience with Strategic Planning

The NCWSC, since its inception in 2004, has always adopted strategic planning as a way to guide its day to day operations. So far NCWSC has had four strategic plans, one transitional one which guided the operations as the company was taking over from the then Nairobi City Council's department of water. The transitional strategic plan covered the period 2004/05-2006/07. This plan was facilitated by Price Water house. The second one was also a three-year Strategic covering the period 2007/08-2009/10.This was followed by the third five-year strategic plan spanning the period 2010/11-2014/15. The implementation status of this third strategic plan was estimated to have been 74%.The current five-year strategic plan covers the period 2014/15-2018/19 and is in tandem with the Government of Kenya's current economic blueprint; the Vision 2030 and its five-year Medium-Term implementation plans. The implementation status of the current strategic plan, from July 2014-March 2015, has been estimated to be 75%. Over the coming years this performance will continue to be measured and reported on quarterly basis.

Generally, the practice of the Strategic Planning in the Company is an open show of a good focus that ensures Physical, Human and technological resources are utilized efficiently and effectively leading to productivity of the Company. It will guarantee its stakeholders of company's productivity and smooth service delivery that gives value to its customers.. This is

guaranteed through practice of strategic planning. This paper therefore helps to bring out clearly the practice of strategic planning and, the rate of implementation, benefits and contribution of Strategic plans in helping organizations grow, and gives an example of the NCWSC.

Presentators

SUB THEME	Governance and Performance Improvement Tools
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	WASPA
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Performance enhancement of water and sanitation utilities in Kenya through benchmarking and collective learning

-ROOM EXPO 1 : Appropriate Technologies for Private Sewage Disposal

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Appropriate technologies for private sewage disposal.
AUTHOR	Amadou Gueye, Mbaye Mbéguéré, Cheickh Diop, Seydou Niang, Linda Strande
COUNTRY	SENEGAL
TITLE OF THE DOCUMENT	Planted drying beds treating domestic fecal sludge: effect of the place species on the elimination of nitrogen and phosphorus

The fecal sludge management is now a new sanitation issue for many African countries. Solving this problem requires, among others, the technological choice of a treatment suitable to the context of these countries. Given the poor performance and the unsuitability of conventional systems, much focus has been put on phytopurification in recent decades. Several types of technologies exist, but the planted

bed seems to be part of the relevant solutions for the treatment and recovery of fecal sludge, notably because of its simplicity, effectiveness and cost.

In this study conducted at the wastewater treatment plant of Cambérène (Dakar, Senegal), the objective was to evaluate the effect of plant species on the reduction of phosphorus and nitrogen contents in domestic fecal sludge. To this end, an experimental device consisting of drums of 200 liters each was used and four forage species (Echinochloa crus-galli, Echinochloa pyramidalis, Paspalidium geminatum, Paspalum vaginatum) were tested. The filter layer of the bed is made up, from the top to the bottom, of a coarse gravel layer (10 cm), a layer of fine gravel (10 cm), and 15 cm of sand. At the base of the filter layer, there is a drainage device comprising a perforated PVC pipe.

The results obtained showed that all species tested significantly reduce the nitrogen and phosphorus, with over 80% yields. However, the differences between the species are not significant. These results thus show that these species can be used as plant support for the treatment of fecal sludge in the context of African cities. Because, in addition to their purifying power, they produce an important biomass, they can also be used to feed the cattle.

Keywords: ***Fecal Sludge, planted bed, forage species, nitrogen, phosphorus.***

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Appropriate technologies for private sewage disposal.
AUTHOR	Jean Marius d'Alexandris
COUNTRY	FRANCE
TITLE OF THE DOCUMENT	Biological sanitation

Lyseconcept is developing a concept of sewage treatment and immediate recycling of domestic wastewater.
The concept comes in the shape of a project in which the Lyseconcept «Organic Tank» process operates following the configuration of the

place of origin of the effluent and the volume of wastewater to be treated. The water released by the process is directed to a complementary vegetated outlet for a purifying performance of the entire device of more than 98%.

Domestic wastewater preserved in its original state, without additives of chemical pollutant by the application of the «biology attitude» charter, is organic. Recycled by a biological process that releases, at the end of the treatment, a biological effluent which is recycled immediately by sending it to a vegetated outlet, a complement of the process that will purify the soil from diffuse pollution for purifying performance of the entire device at more than 98% without producing muddy residues, thus removing any need to drain.

The biology attitude applied in the habitat by water users generates wastewater that has kept its organic characteristics. This wastewater can then be treated by the Lyseconcept «Organic Tank», which, at the end of the sewage treatment, will release an immediately recyclable organic water. This water is spread over a vegetated outlet which, as an addition to the purification process, will purify the soil from the diffuse pollution contained naturally in wastewater: nitrate, potash, phosphate, nitrogen, urea, ammonia etc.

This biotechnological concept eliminates any risk of pollution of the natural water environment and especially groundwater. It preserves a rare resource: water.

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Appropriate technologies for private sewage disposal.
AUTHOR	Mbaye Mbéguéré
COUNTRY	SENEGAL
TITLE OF THE DOCUMENT	The Omni-processor: An innovative technology for the recovery of faecal sludge

The Bill & Melinda Gates Foundation has granted ONAS the privilege of experimenting the first prototype of the Omni-processor in Dakar. In fact, this unit was set up at the sludge treatment plant (STBV) of Niayes early this year 2015. It is operated and monitored in close cooperation with the private consortium delegatee of the management of the three STBV of Dakar. The «Omni Processor» (OP) is an electricity and heat cogeneration unit, which converts faecal sludge and solid combustible wastes into electricity, hot water and ashes. This technology is developed by the company Janicki Industries, under the aegis of the «Water, Sanitation and Hygiene» program of the Bill & Melinda Gates Foundation, which funds important research for innovative technological solutions in the treatment and recovery of sanitation products in developing countries.

What is the Omni-processor?

The concept of this technology is simple but effective. Burning material generates energy which can produce steam at high pressure. The steam drives a reciprocating piston engine that is connected to an electric generator. The piston engine exhaust steam supplies a device that dries the incoming sludge, before being recovered for other hot water applications, or cooled. The combustion residue (ash) is composed of non-combustible material (minerals) contained in the wastes. The steam engine, the central element of this technology, is manufactured with standard auto parts for easy maintenance and repair. Car mechanics locally available may well be responsible for the repair. The Omni Processor, operating at full capacity, consumes 7 tons of dry combustible matter per day. It delivers a net power of 125 kW of electricity, with an annual production of 1,000 MWh of electricity, that is, an operation of 8,000 hours per year and can produce up to 28 m3 of hot water per day. The waste to be processed must contain at least 20% dry matter and can be thickened sludge, municipal solid waste, or any combustible material. Hot water without pathogens produced by the system can be used for applications on site or in neighboring establishments (slaughterhouses, hospitals etc.) or cooled and used in construction, agriculture etc. Phosphorus and potassium rich ash can be used as fertilizers, or in the manufacture of bricks for building. The Omni-Processor takes little space (120 m2) compared to a STBV, without an unloading tank and residue storage area. Its small footprint allows it to fit into any existing STBV or STEP and thus modify the processing and recovery chain of the sludge.

The challenges

For the specific treatment of faecal sludge, the daily capacity of the Omni-processor corresponds to over 450 m3 of raw sludge with 1.5% dry matter, that is, more than the combined capacity of the three STBV of Cambérène, Niayes and Rufisque, sized for maximum loads of 120 m3, 60 m3 and 60 m3 per day respectively. With the Omni-processor, the quantities of solid post-treatment products to manage, the sludge treatment time (drying) and odors associated with the explosion of sludge in the open air are significantly reduced.

Furthermore, the electricity generated can be sold back to SENELEC to generate nearly 75 million CFA per year of income or self-consumed to empower treatment facilities, thus enabling savings on energy costs. The Omni-processor paves the way, given its treatment capacity, to a partnership between Onas and local governments, for an integrated sanitation management in urban areas.

The acquisition costs, freight and installation of the Omni Processor is about two million USD or one billion CFA francs. The annual maintenance, spare parts and remote control 24/24 are provided by the manufacturer «Janicki Industries» for about 27.5 million CFA francs per year. One qualified technician is sufficient to fully control the Omni Processor.

Keywords: ***Omni-processor, Faecal Sludge***

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Appropriate technologies for private sewage disposal.
AUTHOR	BOUHLAL ABDELAZIZ
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	Optimization of domestic wastewater treatment of the Aïn taoujdate center (Region de Meknès- Morocco) through the use of the vetiver grass (Chrosopogon zizanioides L.)

In Morocco, the annual volume of wastewater discharge was estimated to be 370 million m3 in 1990 and 500 million m3 in 1999. That figure will reach 900 million m3 in 2020. This raw untreated sewage seriously pollutes the environment and water resources. However, the

water resources of Morocco are limited and subject to extreme cyclical variations. Thus, the sustained increase in the demand for drinking water and universal awareness on the need to preserve the environment make wastewater a growing area of investigation.

Indeed, an Ain Taoujdate treatment plant (Meknes Region) of natural lagoonage type was built in July 2004. It was designed to purify a nominal flow rate of 1500m3/day until 2015. This STEP consists of pretreatment assets, four anaerobic ponds and two facultative ponds.

Furthermore, the recorded performance during the year 2012 showed an average reduction in the output of both facultative ponds of 59% TSS, 68%BDO5, 60% and 100% COD parasites (helminth eggs).

In addition, the qualitative monitoring of the discharge from this station shows that despite the rusticity of this system and its ability to support minimum maintenance and supervision, it treats wastewater up to secondary level. This secondary level is only to ensure compliance with domestic discharge standards (Decree No1607-1606 of 29 Jumada II 1427, July 25. 2006). Nevertheless and for the future reuse of this treated water, it is possible to reduce the maximum pollution load by equipping the AïnTaoujdate station with an additional biological treatment level.

The objective of this project is the use of the Vetiver grass. In fact, laboratory tests have shown that this plant has a power. In addition to reducing the pollutant load, it has an exceptional ability to absorb and tolerate high levels of nutrients and to significantly improve the quality of the purified water. The analysis results showed a significant reduction in carbon pollution: 86% TSS, BOD5 90%, 88% COD.

Consequently, using the Vetiver System for the treatment of domestic wastewater is an innovative phytoremediation technology. The Vetiver System is a natural, green, simple, feasible and profitable solution.

Keywords: ***Aïntaoujdate, wastewater, natural lagoonage, vetiver grass, purification performance.***

- Salle EXPO 2 : Efficient and sustainable sludge management
Social marketing for sustainable sanitation in Africa

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Sludge Efficient and Sustainable Management
AUTHOR	Alsane Seck*, Cheikh Diop*, Moritz Gold***, Seydou Niang**, Linda Strande
COUNTRY	SENEGAL
TITLE OF THE DOCUMENT	Alternative Filter Media for Faecal Sludge Drying Beds: Increased Resource Recovery, Decreased Costs?

Introduction

The sanitation needs of 2.7billion people worldwide are served by onsite sanitation technologies, and in Sub-Saharan Africa, that represents 65-100% of sanitation access in urban areas (Strande et al., 2014). In Dakar, Senegal there are 2.5 million residents, generating 6000m3 FS per day, with an estimated 75% being dumped directly in urban areas, resulting in pervasive environmental pollution (Bill and Melinda Gates Foundation., 2011).To ensure the safe enduse or disposal of FS, cost effective treatment methods need to be developed. This study evaluated the possibility of using different waste streams as filter media in drying beds, to increase treatment performance and provide affordable technologies with resource recovery. The examined media were sawdust, crushed shells, industrial flint byproduct, and crushed glass.

Method

This research was conducted at a pilot-scale research facility at the Cambérène Faecal Sludge Treatment Plant in Dakar, Senegal. The experimental treatment chain consisted of a settling-thickening tank followed by thirty barrels (0.25m x 0.3m). The barrels were filled with 10 cm coarse gravel, 10 cm fine gravel, and 5 cm filter media layer. The filter media were sand (as a control), crushed shell, industrial flint

byproduct, sawdust, and crushed glass. Eight drying cycles with three different loading rates (150, 300 and 450 kgTS/m2*year) and two different diameters of filter media (0.2-0.6 mm and 0.6-3 mm) were monitored over a period of seven months. Loading rates were calculated based on an assumed drying rate of 14 days, “effective” loading rates were then calculated based on the actual number of days it took to get to 90 % dryness. In general, Dakar is served by septic tanks and the FS has a low solids content, hence, the FS was thickened for one week prior to loading on the beds. Samples of the thickened FS and leachate were analyzed for physical and biochemical parameters following standard methods.

Results

Preliminary results showed that other than sawdust, all filter media was equivalent for achieving drying of FS. However, drying rates were faster with the larger diameter media. At two weeks, FS was 60%TS with the 0.2-0.6mm media, and 90%TS for 0.6-3mm. In general, all of the smaller diameter filter media had increased removal efficiencies with lower concentrations in the leachate of TS, TVS, COD and TKN. For example, the result with sand for smaller and larger diameter were: 2.16 and 2.20 g/l TS; 0.85 and 0.93 g/l TVS; 0.28 and 0.34 g/l COD; and 0.012 and 0.043 g/lTNK respectively.

Turning of FS also had a major influence on drying rates. In average, the target 90%TS drying was achieved in 12 days in all filter diameters with 175kgTS/m2*year loading. These results were confirmed by Seck et al. (2015).

The volume of FS had a strong impact on effective loading rate/drying times, and quantity of leachate. The time to reach 90% dryness took longer with increased loading. The effective loading rates for 150, 300 and 450 kgTS/m2*year were 175, 235 and 252 kgTS/m2*year.

The quantity of percolate was more important with bigger volume applied because the average volumes obtained were (3.83- 4.40) L, (7.85-8.76) Land (12.57-13.80) Lrespectively for (150, 300 and 450) kgTS/m2*year. However the percentage of percolate collected was slightly better with bigger filter diameter (46.92 and 54.46)% for 150kgTS/m2*year, (47.23 and 52.40)% for 300kgTS/m2*year and (51.35 and 55.82)% for 450kgTS/m2*year. Increasing the hydraulic loading rate resulted in increased wetted surface and a higher percentage of the pore volume became accessible to the water, as also suggested by (Sharvelle et al., 2008).

Conclusion

For all filters media, except sawdust, were able to perform the same as the control (sand). Drying rates were faster with larger diameter media, but treatment performance was better with smaller diameter. Turning of FS also increased drying rates. Other than glass, all media evaluated in this study had the same cost as sand, which is normally used for drying beds, indicating their potential benefit if sand is unavailable, or more expensive depending on the local market conditions. Column tests are currently underway to investigate effects of filter media on bed clogging with longer-term loadings.

Keywords: ***Resource recovery, faecal sludge management, Africa***

Presentators

SUB THEME	**Sanitation and Environment**
SUGGESTED TOPIC	**Sludge Efficient and Sustainable Management**
AUTHOR	**Peter M Mawioo, Christine M Hooijmans, Hector A Garcia, Damir Brdjanovic**
COUNTRY	**THE NETHERLANDS / KENYA**
TITLE OF THE DOCUMENT	**Evaluation of a microwave based reactor for faecal sludge treatment in emergency situations**

A novel lab-scale system using microwave (MW) irradiation technology was applied to treat faecal sludge (FS). Temperature variation and weight reduction were observed during the MW treatment process. Furthermore, the ability of the MW unit to inactivate pathogenic organisms was examined using the total coliforms in the FS. The results obtained under the test conditions demonstrated that the MW irradiation technology is rapid and efficient in reducing weight and the bacterial pathogens to over 80% in the FS. The results also demonstrated that the MW operational conditions including the input power and contact time can be varied to achieve various levels of weight and pathogens reduction as desired. Based on the results obtained from the current lab-scale study, MW technology presents an opportunity that can be further explored for possible scale up to

provide a rapid option for emergency FS treatment.

Keywords: ***Emergency sanitation; Faecal sludge; Microwave irradiation; weight reduction; Pathogen inactivation***

Introduction

Heavy usage of onsite sanitation facilities in emergency settings result in high accumulation rates of raw faecal sludge (FS) which must be removed and disposed of safely. FS contains various pollutants including high levels of organic matter, inorganic matter, and pathogens. Human pathogenic organisms are found in FS including bacteria, viruses, protozoa, and helminthes (Hong et al., 2004). These organisms form a major concern in the final disposal of the sludge, so they should be inactivated to safe levels to minimize the risk to public health.

Various challenges in emergency situations such as limited land space usually limit the application of the conventional FS treatment approaches e.g. drying (in sludge drying beds), composting, co-digestion with solid waste (producing biogas), and co-treatment in wastewater treatment plants (Ingallinella et al., 2002). This situation has prompted the humanitarian actors to engage in a continuous search for appropriate FS treatment technologies with characteristics that they are fast, efficient and well adapted to emergency contexts; microwave (MW) irradiation can be one of these technologies.

Inspired by the acknowledged need for appropriate FS management solutions in the emergency sector, the authors explored the applicability of MW technology in the emergency FS treatment. Therefore, the objective of this study was to investigate the potential of a MW based technology for the treatment of faecal sludge. The study focused on two aspects of treatment including pathogen inactivation, sludge and weight reduction.

Materials and methods

Faecal sludge samples

FS samples were obtained from the fresh life® urine diverting dry toilets in the slums of Nairobi, Kenya. Three toilets were identified from which equal but large portions of the fresh FS were transferred into bucket and thoroughly mixed to attain a homogenous sample. Three smaller samples were then drawn from the homogeneous sample and placed into small plastic sampling containers. The samples were then transported to the

research laboratory and stored at 4oC prior to the experiments. The proximate characteristics of the raw FS are presented in Table 1.

Table 1 - Physico-chemical characteristics of raw black water

PARAMETER	AVERAGE	STDEV
Total Solids, TS %	26	2,02
Volatile Solids ,VS/TS	0.92	0,005
Total COD, TCOD (mg/g TS)	5,2*105	12697
TN, mg N/g TS	1,5*104	1713
TP, mg P/g TS	>3.5	
Water content (%)	74	2,12
Total coliforms (CFU/g TS)	4,04E+08	8,43E+07

Microwave treatments

The test samples were prepared in triplicates by placing 100 g and 200 g of FS in a 1L and 2 L glass beaker respectively. The glass beaker was placed in the MW cavity and the sample was exposed to MW irradiation at 465, 1085, and 1550 W for 0.5, 1, 3, 5, 7, and 10 min. Once the respective target treatment settings were achieved, the sample was removed from the MW cavity and its temperature measured immediately. The sample was then covered with sanitized aluminium foil and cooled to room temperature for subsequent analysis. The analysis included measurement of physico-chemical and microbial parameters. All parameters were measured according to the procedures outlined in the Standard Methods for the Examination of Water and Wastewater (APHA, 1995).

Results

Temperature evolution

Temperature variation profiles for the 100 g and 200 g treatments are shown in Fig. 1 and 2 respectively. In both cases three temperature growth phases were observed during the MW heating of the samples

at the respective input power levels tested. These phases were classified as the preliminary phase with a general rapid rise in sludge temperature, the essential phase with a fairly constant and minimal rise in temperature, and the final drying phase with rapid rise in temperature. The above

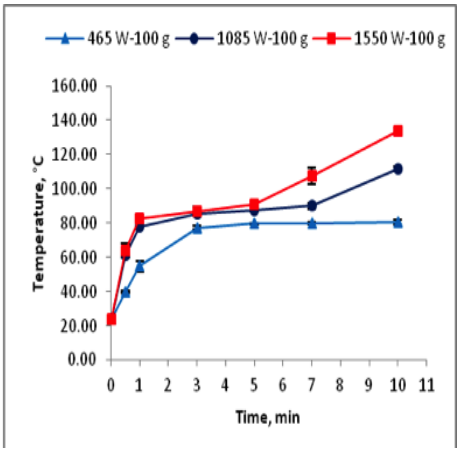


FIG. 1.
Effect of microwave irradiation on temperature evolution in the 100 g sludge sample

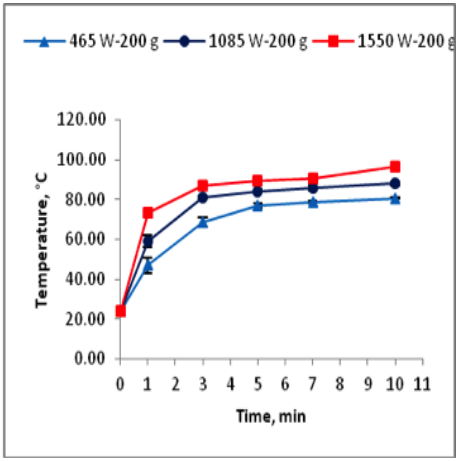


FIG. 2.
Effect of microwave irradiation on temperature evolution in the 200 g sludge sample

phases and temperature trends conform to those reported in other drying methods such as convection and conduction (Flaga, 2005). Similar trends were also observed in several other studies involving sewage sludge heating with MW (Hong et al., 2004, Yu et al., 2010).

Weight reduction and energy requirements

Fig. 3 and 4 shows the respective weight reductions in the two sample sizes tested. The weight reduction is mainly associated with the

temperature changes, the resulting moisture loss in the irradiated FS, and the drying phases discussed above.

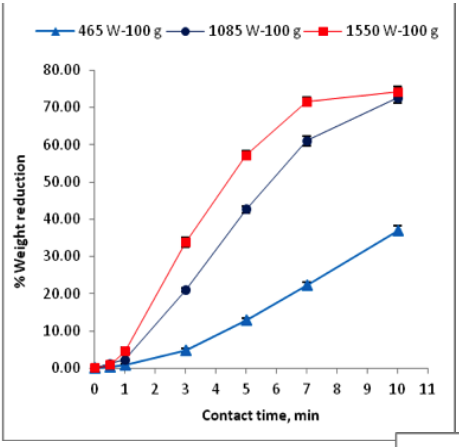


FIG. 3.
Effect of mw irradiation on sludge weight in 100 g sample

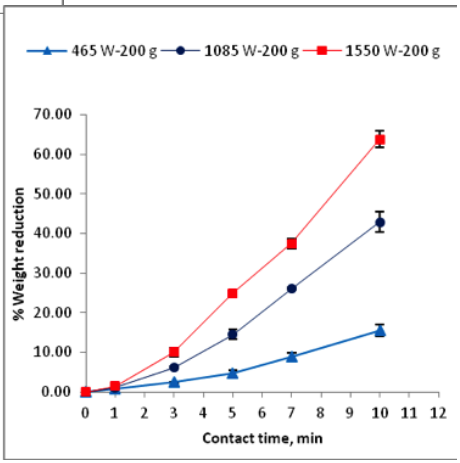


FIG. 4.
Effect of mw irradiation on sludge weight in 200 g sample

In the both sample sizes, the preliminary drying phase lasted up to 1 min at all power levels applied. Low weight reductions observed at this phase can be attributed to low moisture loss as most of the initial MW energy is utilized in raising the sludge temperature to the boiling point. In the following essential drying phase, high but relatively constant weight reduction rate is observed. This is mainly due to the removal of the free (unbound) water which requires relatively low energy. Subsequently, the final drying phase was observed and depicted in the lowest observed weight loss attributable to the removal of the bound water which requires more energy. Furthermore, the observed energy consumption profiles during the MW heating are presented in Fig. 5 and 6 and show trends corresponding with the three drying phases mentioned above (see).

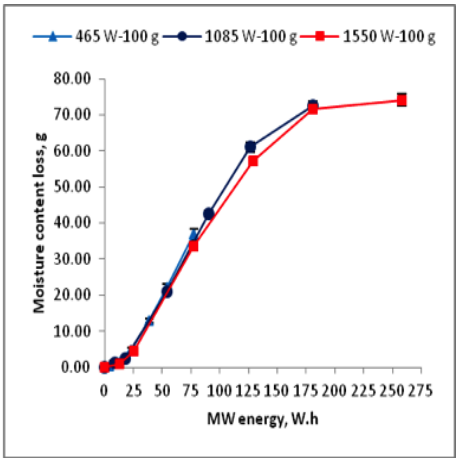


FIG. 5
Weight reduction and mw energy demand in the 100 g sample

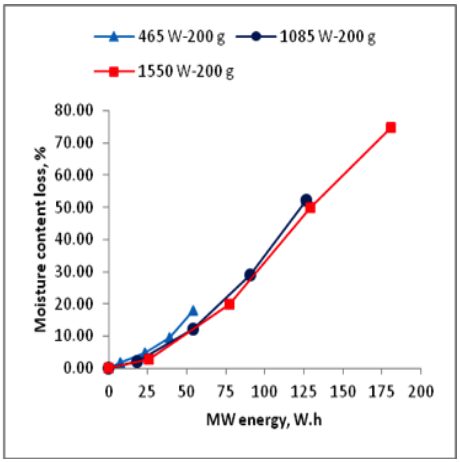


FIG. 6
weight reduction and mw energy demand in the 200 g sample

Generally, during the essential drying phase the energy demand per unit weight loss was similar at all power levels for the same sample size. However, there was observed difference in the energy demand per unit weight loss between the two sample sizes i.e. ≈ 2.7 kWh/g and ≈ 3.9 kWh/g for the 100 g and 200 g sample respectively. Based on the weight and energy consumption profiles above, it is evident that weight reductions of up to 80% can be achieved with MW irradiation of FS.

Pathogen inactivation

The inactivation of the total coliforms was measured at various MW power levels and contact times for both sample sizes (see Fig. 6 and 7).

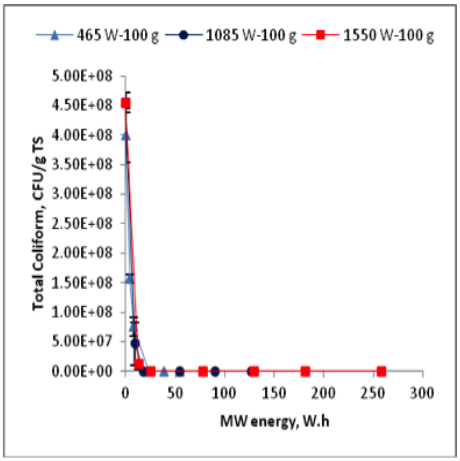


FIG. 7
Effect of microwave energy on the total coliforms in 100 g sample

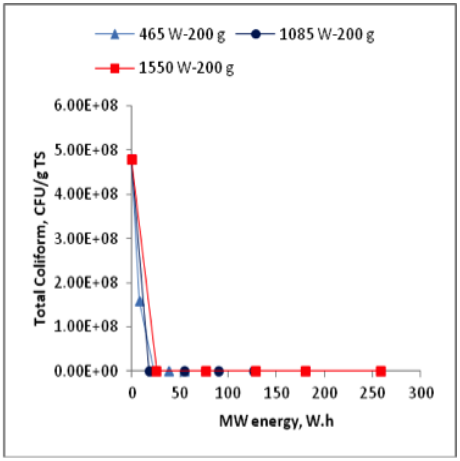


FIG. 8
Effect of microwave energy on the total coliforms in 200 g sample

The energy demand for complete inactivation of total coliforms increases with the increased sample size. E.g. while the 100 g sample required ≈ 26 Wh, the 200 g sample required ≈ 39 Wh for complete inactivation. Since the respective inactivation energy levels are achieved faster with high power levels, it is economical to use the highest MW power possible in order to reduce the reactor's footprint.

Conclusions

MW irradiation can achieve substantial weight reduction and complete bacterial inactivation in faecal sludge. However, a relatively higher amount of energy will be required for weight reduction than bacterial

inactivation. The MW technology presents a potential solution for emergency FS management.

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Sludge Efficient and Sustainable Management
AUTHOR	Mlle. Ndeye Fatou Diongue
COUNTRY	SENEGAL
TITLE OF THE DOCUMENT	Alternative Filter Media for Faecal Sludge Drying Beds: Increased Resource Recovery, Decreased Costs?

Presentators

SUB THEME	Innovative financing mechanisms
SUGGESTED TOPIC	State Mechanisms for the Sustainable Financing of Water and Sanitation Infrastructures
AUTHOR	Assita SIRIBIE / TRAORE: Sanitary Engineer/ONEA Juliette SANOU / BICABA: Sanitary Engineer/ONEA
COUNTRY	BURKINA-FASO
TITLE OF THE DOCUMENT	Financial support of ONEA to secondary cities for the implementation of their strategic sanitation plans for wastewater and excreta (PSA)

Since 2013, the Directorate of the National Water and Sanitation Office of Burkina Faso embarked on a decentralization process in the sanitation sector in order to allow better mobilization of the actors and resources. The objective is the local development of underprivileged urban communities with more than 10,000 inhabitants. So to benefit from the financial support of ONEA, the municipality must have a strategic plan adopted in a sanitation council: a partnership protocol must be formalized between the two bodies to determine the collaboration axes and funding arrangements; an operational plan of the activities to be carried annually must be developed in a workshop; a deposit account must opened in a commercial bank or public

treasury with a sample of the check co-signatories' signatures.
This funding mechanism consists in implementing, on a large-scale in secondary cities, the recommendations of the PSA study and in testing the technological, institutional and financial feasibility of actions using an approach based on endogenous forces.

Keywords: ***PSA, ONEA, mode of financing, co-signing of check, endogenous forces***

Presentators

SUB THEME	**Innovative financing mechanisms**
SUGGESTED TOPIC	**Communication and marketing tools for the service improvement**
AUTHOR	**Bassirou SOW**
COUNTRY	**SENEGAL**
TITLE OF THE DOCUMENT	**Management of faecal sludge: An innovative marketing and communication approach to decrease the emptying cost**

The market structuring program for faecal sludge (PSMBV) is implemented in Dakar, Senegal, in an area inhabited by low-income populations and with a rapid population growth, where about 75% of them have on-site sanitation and therefore produce a substantial amount of faecal sludge.

This situation has negative impacts on hygiene and a significant impact on the health and living conditions of the populations, due, among other things, to the practice of manual emptying by the households, the indiscriminate dumping practiced by some emptying operators and the non-compliance technology of the septic trucks.

To provide solutions to the situation of the faecal sludge sector, the National Sanitation Office of Senegal (ONAS) has established, with financial support from the Bill & Melinda Gates Foundation, an ambitious program called «Program for Structuring the Faecal Sludge Market (PSMBV)», designed to take into account the whole value chain of faecal sludge management in the departments of Pikine and Guediawaye (Region of Dakar). The objectives of this program are to allow access of the poorest households to mechanical emptying

services at the lowest possible cost, healthy competition between emptying operators via a call center, household access to adequate sanitation facilities, promotion with the population, good hygiene practices, particularly hand washing with soap and abandonment of manual emptying for mechanical draining, the regulation of the activity of emptying companies along with the implementation of the certification of these companies and the improvement of the management and operation of the STBVs through the delegation of their management to the private sector.

To support the execution of this ambitious program, a new and rather innovative approach for marketing, communication and awareness-raising was developed and implemented. This has enabled the program to meet, at its mid-term review, almost all of its performance indicators. To the extent that it has de facto benefitted from an extension with the arrival and the real test of a new component now making sanitation a commercial activity: the omni-processor that converts faecal sludge into energy, as drinking water and ashes can be used as fertilizer for agriculture.

The communication objectives

The communication of the PSMBV aims at mobilizing all stakeholders in the faecal sludge industry to get them to take ownership of the program for the achievement of its objectives, namely:

- Access of the poorest households to mechanical emptying services at the lowest possible cost through:
- Household access to adequate sanitation facilities;
- The adoption, by the people, of good hygiene practices (washing hands with soap and abandonment of manual emptying for mechanical emptying);
- The establishment of a call center to bring the supply closer to the demand and contribute to lowering the emptying cost;
- The establishment and enforcement of a regulation for the activity of emptying enterprises (certification); and
- The delegation of the STBV management to the private sector.

The issues related to communication:
Communication about the PSMBV includes five main issues: information issues, positioning issues, mobilization issues and relationship issues.

- Information issues with tools for information dissemination as well as the content of the messages well designed and adapted to the different targets of the program that are the implementation partners, households, emptying operators, state actors and local authorities , technical and financial partners, etc.
- Positioning and identity issues to position the PSMBV as the tool of choice for the development of the faecal sludge sector and help give institutional recognition to the program.
- The mobilization issues to enable the mobilization of all faecal sludge industry players by encouraging ownership by the actors involved in the process.
- The relationship issues for an excellent relationship between the household, mechanical emptying operator and the service regulator (ONAS).

The methodology of the communication strategy of the PSMBV
The communication strategy is structured around two approaches:

- A mass communication approach aimed at reaching the public beyond the limits of the program area;
- And a local approach specifically targeting the program area with state and local institutions inputs to the family, the community and the school.

It consisted in: (i) Popularizing the issues relating to the various links in the management chain of faecal sludge, (ii) Bringing demand and supply closer to each other to help improve the mechanical emptying service (iii) Promoting good hygiene behaviors. This strategy relied primarily on a marketing approach – using action-research with the setting up of a call center, on information, on awareness-raising and communication, all in an integrative and participatory approach.

First lessons learnt

The lessons learned from communication and the operation of the call center revealed that achieving the objectives requires:

- A good knowledge of the program by the institutional actors, the beneficiaries and emptying operators. As an illustration, the latter agree to renew their fleet of trucks through the guarantee fund put in place by the program;

- A consensus of all actors for the certification of emptying operators around the establishment of an accreditation;

- Increasingly important use of the call center by both populations and emptying operators;

- Emptying operators organized, trained and committed to the path of the modernization of their work;

- Proper involvement of emptying operators throughout the whole call center set-up process;

- Ongoing coaching of mechanical emptying operators for their suitable participation in tenders;

- The establishment of a support mechanism for emptying operators (such as guarantee funds) to get them to take ownership of the program and in particular to meet the requirements for certification;

- Adequate communication to households and emptying operators on the service provided by the call center and its benefits; which helped increase from 48% to 34.5%, the number of households in the program area, who continues to use manual emptying, in accordance with the last mid-term review. For, the call center is increasingly used to make emptying applications;

- The establishment of a robust technical solution for the call center to handle and track calls whatever their volume;

- Phasing of the operation of the call center, starting at a very small scale and gradually expanding to wider areas;

- Regular updating of the database on emptying operators to take into account the constant changes in the sector;

- The gradual establishment of a database on the characteristics of the pits (volume and accessibility);

- The daily monitoring of the call center by an experienced team;

- The design of a business model adapted to the sustainable financing of the operation of the call center, without impacting negatively

the cost of draining.

- The practice of handwashing with soap at critical moments is experiencing a resurgence of interest in the program area;

Keywords: ***Marketing- communication, call center, faecal sludge***

Presentators

SUB THEME	Sanitation and Environment
SUGGESTED TOPIC	Social Marketing for sustainable sanitation in Africa
AUTHOR	SALOU BACHIROU Zoulkifl, AMOUKPO Hermione, HOUNDONOUGBO Macaire, FIOSSI Méricia, JOHNSON Roch Christian
COUNTRY	BENIN
TITLE OF THE DOCUMENT	Promotion of hygiene and sanitation: impact of the PHAST method on the behavior of people regarding hygiene and sanitation in the districts of Ahomadégbe (Municipality of Lalo) and Sèdje-denou (Municipality of Zè) in the Republic of Benin 2014 – 2015

The lack of hygiene and sanitation in schools and households is a thorny environmental and health problem, especially in rural areas. This project was implemented in two districts in Benin, Ahomadégbé (Lalo) and Sèdjè-Dénou (Zè).

The objective is to contribute to promoting the right to health in terms of availability, accessibility, acceptability and quality by improving significantly the level of hygiene and sanitation for the population of the districts of Sèdjè-Dénou and Ahomadégbé. The target of this activity is schoolchildren, users (women and men) who come to the health centers of Ahomadégbé and Sèdjè-Dénou; women and men from groups or associations.

Methodology: In order to implement this project, awareness-raising sessions for men and women from groupings as well as women coming for prenatal care to the health centers were organized following the PHAST approach. There were also awareness-raising sessions for schoolchildren in some primary and public schools of the two project areas. “aKOP” and FBC analyses were also performed.

Result: 550 schoolchildren, including 265 boys and 285 girls in

Ahomadégbé, and 573 schoolchildren in Sèdjè-Dénou, including 304 boys and 269 girls, were impacted by the project activities. The performed activities include hand washing before and after meals; hand washing after defecation; personal hygiene; maintenance of drinking water containers; cleaning of the classrooms and playground. 170 men and women in both districts participated in the awareness-raising sessions based on the PHAST method step by step.

Keywords: ***hygiene - sanitation - PHAST - Sédjè - Dénou and Ahomadégbé.***

● 11h45 - 13h15

- Aberdare room : Watersheds and water access management
Solutions for sustainable access to water
for underprivileged people

Presentators

SUB THEME	Innovations for improved access to the continued water service
SUGGESTED TOPIC	Watersheds and water access management
AUTHOR	Justine Tirogo[1], Angelbert Biaou[1], Anne Jost[2], Youssouf Koussoubé[3], Pierre Ribstein[2] [1] Institut International de l'Ingénierie de l'Eau et l'Environnement, Ouagadougou [2] UPMC Univ Paris 06, UMR 7619 Metis, Paris [3] Université de Ouagadougou,
COUNTRY	BURKINA FASO
TITLE OF THE DOCUMENT	Sustainable management of ground waters through the hydrogeological modeling and remote management: Case of the Kou watershed in Burkina Faso

Fresh water is a scarce commodity across the globe. It represents only 2.8% of the total reserves, of which over two thirds are made up of ice and permanent snow. Groundwater accounts for over 80% of the rest of the available fresh water. In addition, it is distributed very unevenly because more than half the world's supply of fresh water is shared by only nine countries (United Nations, 2006). Burkina Faso, a country located in the Sudano-Sahelian zone, is one of the poorer

areas in water. Meeting the main water needs relies on the mobilization of groundwater; hence the need to know it in order to better manage and preserve it.

This is why this research focuses on the ground water of the Kou watershed, which is quite important at the socio-economic level. Indeed, it is an important reserve of groundwater, the source of important streams that have an exceptional flow in the sub-region (over 6,000 m^3/h in 2011). These streams ensure the sustainability of the river called «Kou». Groundwater is used for irrigation but also for various industries and the water supply (ws) of many communities, including the second city, Bobo Dioulasso. The current use is estimated to be more than 20 million m^3 per year.

The water needs across the watershed are increasing while there has been a decline in the ground water level and a decrease in the flow of the streams. Under the influence of climatic conditions, a decrease in the recharge has been noted from approximately 250 mm/year in the 1960s to less than 100 mm today. The use, which was just under 5,000 m^3/day in 1960, is currently more than 70,000 m^3/day. The dynamics of the ground water is not very well controlled compared to this pressure on the resource. In this paper, we try to provide answers to these questions through hydrogeological modeling. The calibrated model in regulated then transient flow will be used to test scenarios in relation to the climate and samples and to define water management rules adapted to the conditions of the current and future uses of the resource. The results of the modeling will be used, in the long run, to set up a management tool based on remote management for near real-time monitoring of the ground water.

The code adopted for the modeling is developed in Visual Modflow © Fortran that enables the numerical solution of the diffusivity equation by the finite-difference method. The hydrogeological model of the Kou watershed is made in three dimensions, taking into account the five aquifers that constitute the area.

The regulated flow model has enabled the calibration of the hydraulic conductivity of the various layers and the setting of the recharge at about 95 mm over the reference period (1995-1999). The statistical analysis of the model calibration results has acceptable values. The correlation coefficient between the piezometry simulated and the observed piezometry is very close to one (about 0.99). Residues range

from a maximum of 0.024 m to a minimum of -6.2 m with an average of 0.75 m. These results are quite satisfactory in terms of reliability and uncertainties in some data (static levels, dimensions of observation points, water levels of rivers, etc.) The main flows transiting in the model come from the recharge of the aquifer (57%) and from upstream (42%). The flows of water coming out of the ground water inside the Kou watershed mainly originate from the streams but account for only 23% of the total flows that pass through the watershed. The rest of the flows exit through the Mouhoun River (38%) or downstream (39). The samples represent 5% of the flows passing through the area.

The transitional water regime whose calibration is in progress will help to provide answers to the issue of the decrease in the flow of the streams and in the level of the ground water. The calibrated model will help set alert levels for the establishment of a remote management system for continuous monitoring in near real-time of the resource's state.

Keywords: ***Groundwater, hydrogeological model, water balance, water management, Kou watershed***

Presentators

SUB THEME	**Innovations for improved access to the continued water service**
SUGGESTED TOPIC	**Watersheds and water access management**
AUTHOR	**Chris Kiruja** **Nairobi City and Sewerage Company Ltd.**
COUNTRY	**KENYA**
TITLE OF THE DOCUMENT	**Multi-faceted approach to wetland management and combating climate change.**

Despite Kenya being water scarce country with annual renewable fresh water per capita at 647 cubic meters against the United Nation's recommended minimum of 1,000 cubic meters, and that the country depends on rainfall as its primary source of water the continued uncertainty of rainfall and perennial droughts has impacted negatively on reliability of water in the country. Therefore the extent and scope of climate change impact will depend on the degree of mitigation strategies and activities undertaken

It's also important to understand that Nairobi City Water and Sewerage

Company (NCWSC) which is based in the capital city of Kenya is the largest water company in East and Central Africa and serves a night population of 3.6 Million as per the 2009 Kenyan Population and Housing as well as commercial/industrial purposes. The company has also set out to be the leading water service provider in Africa
It is against the above background that we are developing this paper towards undertaking research that will come up with multi-faceted approach that can enhance the Company's efforts of combating climate change.

The key to developing a strategy for addressing wetland and climate change is to first understand its causes thereafter techniques and procedures can be developed to specifically to tackle each of the causal component in the order of priority.

The overall objective of the project will be to provide guidance on how to mainstream responses to climate change within economic development planning, with natural resource management as an overarching theme and this will based by a research that will accomplish the following

- Review the principal impacts and vulnerabilities to climate change for Kenya as a country upon the information from international and national assessments.
- Identify national development and environmental plans as well as donor funded projects that bear upon sectors and regions vulnerable to climate change impacts, and assess the degree of current attention to climate change in such plans and projects.
- Conduct an in-depth analyses of a project undertaken in Kenya based on climate change

Possible methods that can be used evaluate the success of the proposed strategy include

1. Cost Benefit Analysis

Cost Benefit Analysis will assist to assign economic values to the various consequences of our activities which will therefore be crucial in decision making process. The analysis can include criteria on both economic and financial outcomes.

2. Decision Analytic methods

This will focus on making decisions under conditions of uncertainty.

3. Sustainable Development Analysis

This will involve the incorporation of environmental and social concerns into the economic policy framework of human society.

4. Multi-objective analysis

This can be applied where different environmental and social indicators may be developed, side by side with economic costs and benefits. Thus, more explicit recognition is given to the fact that a variety of both monetary and non-monetary objectives and indicators may influence policy decisions. Therefore multi-objective analysis will be useful in comparing and ranking different outcomes, even though a variety of indicators are used.

5. Cost Effectiveness Analysis

This will be useful when benefits cannot be quantitatively measured. The most widespread application to the climate change problem is perhaps where one seeks to identify the least-cost option to achieve given levels of carbon emission reductions, without any explicit attempt to specify what the benefits of the level of emission reduction may be.

6. Action Impact Assessment

This will assist identify projects both local and national development efforts more sustainable with respect to climate change, the approach can identify central intersections between development efforts and climate change issues like vulnerability, impacts and adaptation.

Conclusion

This diagnostic approach, followed by the practical implementation of solutions which are practicable and achievable, can be applied to Nairobi City Water and Sewerage Company, to develop a strategy that can address climate change.

Key words: ***climate change, strategy, wetland***

Presentators

SUB THEME	Innovations for improved access to the continued water service
SUGGESTED TOPIC	Watersheds and water access management
AUTHOR	Maji Wazi concept
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Developing a smart water system for Nairobi's informal settlements

Presentators

SUB THEME	Innovations for improved access to the continued water service
SUGGESTED TOPIC	Watersheds and water access management
AUTHOR	Hamred Chungani
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Sustainable Water Provision and Hygiene in Informal Settlements

Presentators

SUB THEME	Innovations for improved access to the continued water service
SUGGESTED TOPIC	Watersheds and water access management
AUTHOR	N.R. Levy and A.S. Hansen
COUNTRY	DENMARK
TITLE OF THE DOCUMENT	Innovative solutions for sustainable water supply to the underserved urban and rural population poor

- Salle Lenana : INSTITUTIONAL DEVELOPMENT AND CAPACITY BUILDING FOR WATER AND SANITATION

Presentators

SUB THEME	Governance and performance improvement tools
SUGGESTED TOPIC	Institutional development and capacity building for water and sanitation
AUTHOR	Amara Fofana
COUNTRY	GUINEA / CONAKRY
TITLE OF THE DOCUMENT	Knowledge transfer tools

In a globalized world, to ensure its survival, a company must remain competitive. A better control of knowledge transfer can help the organization and its members achieve that objective.

This paper proposes knowledge transfer tools that our water and sewerage utilities can adopt to improve their knowledge transfer practices (KT).

These tools are designed for people interested in knowledge transfer and in the performance of their company, namely supervisors, middle-level managers, intermediaries, members of the management, including human resources departments or any other party within of the company. The language used in the paper is accessible to all and examples of tools are provided.

You will find in this paper:

- A presentation of the new challenges to the survival of companies, including knowledge transfer;
- An explanation of key concepts learned on KT;
- A three-step approach to knowledge transfer, a success;
- Some statements evaluating KT practices in accordance with the three preferred steps;
- A selection of tools based on the knowledge transfer process.

The recommended approach will be based on the diagnosis of knowledge and needs. Then, the company must have or develop three capacities for there to be transfer, that is, capacity generation, dissemination and absorption. Finally, the company must integrate KT and promote the ability to adapt to challenge of the knowledge transfer system used.

In the end, the company and its members will understand better the importance and benefits of knowledge transfer. The company will make an initial assessment of its KT practices. Following that diagnosis, it may consult the tool bank records to better understand which ones will be more suitable for the areas to improve.

Globalization and global competition are present in all market areas and organizations that want to remain competitive in this environment must ensure the establishment of a good knowledge transfer system within their companies. The labor market has changed significantly in recent years, creating an increasingly demanding work environment. A work organization that includes the flattening of hierarchies implies increased responsibilities. Demographic changes, including the aging of the working population, herald many retirements leading to an increased shortage of labor. Workers therefore face an environment of change and adaptation, which reiterates the importance of knowledge transfer in organizations to increase their efficiency, performance and thereby help address the globalization challenge.

The labor market is changing. We need to produce more and better with less human and financial resources. To this end, companies carry out various arrangements, ranging from new technological solutions to governance changes in order to remain competitive in a globalized world. Considering this need, often urgent, to remain competitive, work is changing. Previously, work was mostly mechanical and operational, with specific instructions. Workers used to perform their work according to specific guidelines. Now employees are made more accountable so that they may contribute to supporting and improving productivity. However, sometimes changes are imposed to them without their being consulting, while at other times, their opinions are sought with clear expectations. They must therefore demonstrate a high degree of adaptability involving more openness and versatility in everyday life. The more experienced workers have witnessed many a change in recent years with reorganizations, restructurings, re-engineering and massive job losses sometimes causing some skepticism on their part. Paradoxically, change has become the only constant in the world of work.

Companies are also facing new demographic constraints. For example, the aging population and retirements cause difficulties regarding the renewal of the workforce. In the near future, there will be a decrease in the working population (all persons of working age). Added to this is the late arrival of young people on the labor market, given that for some, the period of study is longer today. Therefore, the most experienced people leave work when the youngest take a long time entering, creating a future labor shortage and a possible loss of knowledge and experience.

Most organizations will not be able to recover all the knowledge lost when workers retire. We can already note this, especially in the training of younger people, when sometimes, due to time or budget constraints, their training is neglected and the consequences can be serious. Knowledge transfer (KT) is an option that can help maintain and improve the long-term effectiveness of organizations.

To date, few companies have thought about the process and the establishment of tools to facilitate knowledge transfer between members of their organization. The lack of a formal internal knowledge transfer process combined with the significant loss of critical knowledge may lead to a considerable efficiency loss. Without a knowledge transfer process, younger or new workers will have to improvise, learn again and take ownership again of the behaviors and knowledge inherent in their environment.

Key words: ***Tools, Transfer, Knowledge, Company, Workers.***

Presentators

SUB THEME	Governance and performance improvement tools
SUGGESTED TOPIC	Institutional development and capacity building for water and sanitation
AUTHOR	Eng. Timothy Mubbala
COUNTRY	UGANDA
TITLE OF THE DOCUMENT	Capacity Requirements for NRW reduction

NRW is the difference between volume of water delivered to the distribution system and the volume of water sold expressed as a % of water delivered. It is composed of Commercial losses, physical losses and unbilled Authorized consumption

In African Cities NRW stands at 60% on average, the lowest being 20% and the highest being 70%. The biggest challenge is the limited knowledge on NRW and the absence of resources to invest in NRW reduction.

The global volume of non-revenue water (NRW) is staggering In many low-income countries – (50-70%). Each year billions m3 of treated water are lost through leakages and additional billions m3 per are delivered to customers but not invoiced because of theft, poor metering, or corruption. A conservative estimate of the total annual cost to water utilities worldwide is US$14 billion. Saving just half of this amount would supply water to an additional 100 million people without further investment

This paper addresses the aspect of limited knowledge specifically by decision makers at the strategic level of management.

In my eleven year career operation in management and provision of consultancy services in regard to urban piped water management, I have noted that most CEOs and decision makers seem not to appreciate the fact that NRW management requires specialized skills and tools.

The paper will discuss the technical skills required for effective NRW management in regard to;

1. Selection of performance indicators and target setting
2. Action Plan Preparation
3. System input Volume Determination (flow measurements, installation and calibration of production)
4. Management of Physical Losses
5. Consumer meter selection, installation, operation and maintenance
6. Management of Water theft
7. Capacity and awareness of the technical staff
8. Mapping
9. Water Auditing and balancing

The expected output is the awareness and a drive for specialized services in regard to NRW management ranging from the regulatory, management and operational levels.

The participants will certainly benefit from my 11 years exposure and insight in the field of NRW management and consultancy service provision through NWSC's External Services Unit

Presentators

SUB THEME	Governance and performance improvement tools
SUGGESTED TOPIC	Institutional development and capacity building for water and sanitation
AUTHOR	Jean Antoine Faby, Director of the Water for All Chair
COUNTRY	MONTPELLIER, FRANCE
TITLE OF THE DOCUMENT	The International Executive Master OpT, a capacity building program for managers of urban water services. About 120 managers trained in 6 years on 4 continents, including 90 in Africa

Inaugurated in 2009 and driven by particularly ParisTech, and especially by AgroParisTech, MinesParisTech, and Suez Environment in the corporate world, the ParisTech SUEZ ENVIRONNEMENT «Water for All» Education and Research Chair offers an innovative six year vocational training course for managers of urban drinking water and sanitation services from emerging, in transition and developing countries. Wishing to move away from the logic of the university and scientific institute technical training program, the program of the International Executive Master OpT (IEM OPT) is based on the premise that the poor's access to water and sanitation is related to the deficiencies of senior executives and leaders in executive management teams of service operators and to the necessary managerial capacity building of supervisory and management personnel.

Since 2009 and with the 6th class of 2015-2016 (36 trainees overall, including 28 Sub-Saharan Africans) named Mamadou Dia, more than 120 trainees from nearly 35 countries, mostly from Africa to date, but also from Asia, Central Europe and America and the Caribbean have been trained. Since 2013, the training courses take place in parallel in both English and French. Each trainee (experienced executive and professional in a company) is selected by its General Management among its talent pool. After the training, each trained individual comes up with a strategic action plan for his mission area, in the urban area he covers. This is shared with his management and teams on his

return to the field and implemented in his whole area or part of his area. The management training for these services depends on fifty professional trainers from SUEZ ENVIRONNEMENT, thirty coaches and mentors, and a specific program based on five pillars:

1. Policy and Governance in suitable institutional frameworks that will evolve with time,
2. Manager competencies to strengthen the desire to take the leadership,
3. Management of the supply and demand for services with a good control of the technical solutions and costs, which are also part of a good asset management,
4. Contractual, financial, urban and social engineering, which includes of course a sharp sense of ethics,
5. Strategy and prospects both in terms of vision and knowledge of the factors of change, be they demographic, socioeconomic, etc. and this, for the purpose of building short term, medium term and long term plans.

This program takes place over 2 times 3 months alternately (with the trainer's service) over a total period of 16 months and the degree is awarded after a professional thesis (the Strategic Action Plan, in fact), assessed by the official exam committee of AgroParisTech.
A training program close to the field

To be close to management conditions on the ground, EMI OPT, with the support of the French Development Agency (AFD) and other French water stakeholders (Water Agencies), decided to partner with vocational training operators of international reputation in Africa to anchor four weeks out of the 6 months face to face courses close to local services in Ouagadougou (ONEA) and Kampala (NWSC). The training partners are 2IE and NWSC.

4 weeks are spent in Kampala for Anglophones and Ouagadougou for Francophones, with courses in customer management and access to water and sanitation in informal and peripheral settlements on water/energy and urban planning/sanitation, and finally with interactive case studies giving rise to role play and in-depth analysis of the history of the water services (ONEA and NWSC) that spearheaded the change in 20 years.

The program and its first results

The program currently takes place alternately with 2 times 3 months of face to face training and 2 times 5 to 6 months in the company. It promotes the taking of perspectives between observations and analyses, implementation of actions and prospects; it relies mainly on trainers from the professional world and not primarily on academics, including experienced executives from Suez Environment and its subsidiaries. The training also offers a formidable field of educational innovation through the internalization of changes designed during the training course by the trainee who works jointly with his general management on his return to the company.

The training has a strong thematic consistency geared toward the practice of all the components that shape a business manager (behavior, social, political, finance, customer management), rather than being ex cathedra teaching. Thus, some of the strategic actions plans developed by our first classes are already implemented on the field, especially for those who became managers immediately on their return (almost 15 trainees were appointed in senior positions after their return).

Besides efforts to communicate and share the challenges with stakeholders in the water sector in a city such as political and institutional actors who are peripheral to their companies, the trainees also instilled a spirit of cooperation and internal organization by establishing new top down and down to top channels of communication.

Forsaking an individual conception of success for a collective dynamics, they are all committed to promoting a professional ethics of responsibility, exemplarity and respect for the subscribers and staff.

Applications for the 2017-2018 program are already being taken with the support of training grants from SUEZ ENVIRONNEMENT, AFD, Water Agencies and other donors for the best application dossiers:
www.agroparistech.fr/-OpT-EaupourTous

Keywords : ***Capacity building, water, sanitation, management, training, governance, performance, leadership, guidance, vocational training***

Presentators

SUB THEME	Governance and performance improvement tools
SUGGESTED TOPIC	Institutional development and capacity building for water and sanitation
AUTHOR	Nicholas Imbukhure Lumosi , water operator , Nairobi City and Sewerage Company Ltd.
COUNTRY	KENYA
TITLE OF THE DOCUMENT	CONTRIBUTION TOWARDS NAIROBI CITY WATER AND SEWERAGE COMPANY ON WASTE WATER DISCHARGE, SANITATION AND ENVIRONMENT CONSERVATION IN TREATMENT PLANTS

INTRODUCTION

Environmental conservation is the major growing problem in the world, currently most environmental experts are looking on ways of reducing water pollution and increasing water reliability, specifically with this growing water demand in urban, In Ncwsc has to recycle improved services and proper management of sludge as done with other developed nations.

A major consideration in environmental protection is the proper handling of wastes generated by water treatment facilities. Historically, the production and disposal of solids have been considered to be of primary importance. More recently concern has been expressed about the toxicity of some of the metals in the wastes, such as aluminum and manganese. PL 92-500 as amended permitted the USEPA to formally declare public water supplies an industry. However, unlike the case of many other «industries,» for which guidance documents were developed for various categories of industrial waste, such national effluent guidelines were not adopted for the water supply industry.
The current USEPA policy governing wastes from water treatment plants is set forth in 49 Federal Register 38026 (September 26, 1984). According to this policy, discharge requirements for clarifier residues and filter backwashes are best determined at the local permitting level, with due consideration given to appropriate technology-based effluent limits and water quality standards. This in effect requires professional judgment at the state level rather than the application of uniform national effluent requirements.
In order to meet established in-stream water quality standards at the edge of the mixing zone, discharge decisions are made either by the regional Nema or by the state office. In the development of technology-

based effluent limitations, a controlled release of wastes from water treatment plants in a manner that meets water quality standards may, in appropriate circumstances, be considered to be technology-based controls (AWWA, 1987). This issue remains to be resolved in Illinois. The necessity for treating wastes from water works will stimulate the development of new methods for reduced sludge production, solids dewatering, and ultimate disposal. For example, the use of polymers in coagulation has proven effective in reducing sludge volume. Recovering spent chemicals and recycling may become more attractive. The resolubilization of aluminum hydroxide as a function of some treatment techniques will have to be explored, and the reaction of the solids to disposal in an anaerobic environment, such as a landfill, will require monitoring. All parties must be mindful of the possibilities of creating hazardous conditions where such conditions do not now exist in the handling and ultimate disposal of wastes from water treatment plants.

Recycling and chemical reclamation are encouraged by the regulations of the RCRA, PL 94-580. The recovery of treatment chemicals and re-use of process wastewater flow may reduce the cost of waste treatment and water production. To minimize the impact of water plant waste treatment on the production cost of water, it is essential that these additional costs be kept to a minimum (Fulton, 1978a). The waste treatment process should not introduce complexities in operation, control, and maintenance, and should not require additional staff time if possible. Some new water treatment technologies that have focused on these issues are discussed by Randtke (1980).

In Section 1004 of the RCRA (PL 94-580), sludge is defined specifically to include the wastes generated by a water treatment plant. In many cases, water plant sludges contain elevated levels of metals and radioactive materials from the raw water. These sludges must be disposed of in compliance with hazardous waste regulations promulgated under the RCRA. The disposal of concentrated hazardous wastes will continue to pose a serious problem. According to Robertson (1980), sludge disposal will require increasingly greater consideration in future water works designs, regardless of the treatment process selected.

The RCRA also emphasizes municipal water conservation. According to Gloriod (1980), municipal water conservation may impact the water industry not only in the area of plant operations but also in regard to

customer relations, rate structure, design and timing of production, and transmission facilities. Increased costs of sludge treatment and disposal due to the imposition of industrial cost recovery charges will accelerate the need for more effective means of sludge reduction and disposal.

PL 93-523 provides that the states do not have to report to the USEPA except yearly, and some of those reports required by regulations are years away from delivery. The regulations were designed for a team approach to solving environmental protection problems. The state is recognized to be the primary enforcement power. There is a state/federal partnership, and it requires the full cooperation of local populations. Shaw (1980) reported adverse impacts of federal regulations in South Carolina. Prior to the federal program, when a water quality violation occurred the state agency would send a qualified engineer to the system to provide technical assistance in correcting the problem,when a violation occurs the state sends the violator a letter saying it must notify its customers of the violation. In reality, the state agency still sends an engineer out to investigate the water quality violation, but nowhere in the federal reporting system does the USEPA ask the states how much time and effort was spent in correcting that water quality problem.

Presentators

SUB THEME	Governance and performance improvement tools
SUGGESTED TOPIC	Institutional development and capacity building for water and sanitation
AUTHOR	A. A. Ibrahim
COUNTRY	NIGER
TITLE OF THE DOCUMENT	PROSPECTIVE DEVELOPMENT OF SKILLS: THE CASE OF SOCIÉTÉ D'EXPLOITATION DES EAUX DU NIGER

- Room Expo 1 : RESEARCH AND INNOVATIONS FOR SUSTAINABLE ACCESS TO WATER

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	Laura Szczuczak
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	USING ICT TOOLS TO IMPROVE UTILITIES' FINANCIAL AND OPERATIONAL PERFORMANCE – A PARTICIPATORY NEEDS ASSESSMENT

The majority of African water utilities are faced with the triple challenge of fast growing cities, limited means and ageing networks. The pressing need to expand access to new communities, whist remaining efficient and providing a quality service, has many utilities seeking innovative answers. At the same time, there has been explosive growth in innovations to do with Information and Communications Technology (ICT). Cellphones, smartphonesand cloud-based systems are all now widely available. As such tools become more affordableand better understood, utilities are expressing interest in harnessing them to help them keep up with rapid urbanisation and growing demand.

ICT tools assist African water utilities in a range of ways. Commercial departments across the continent are exploring how innovations such as mobile money can assist with bill payment. Technical departments are looking at how cellphone reporting and GIS databases can open up different ways of monitoring supply and improving 'asset management'. Planning departments are using satellite imagery and data from cellphone companies to better understand current demand and anticipate future needs.

For managers the potential for easing communication between field staff and head-office is clear, whilst the potential to improve engagement with customers is also enticing. Smartphones and software systems can offer not just a modern alternative to paper-based approaches, but open up new possibilities for both transmitting and analysing a wide range of financial and technical data. Some utilities have already harnessed these tools while others are still contemplating how best to proceed – and whilst many such tools 'pay for themselves', not

all utilities have the internal capacity to tackle the change management involved.

Amidst all this creativity, there is a lack of practical analysis of what the actual benefits of specific approaches are, what the 'paths for adoption' might be and a general lack of guidance to utilities (particularly that based on the actual experience of those that have implemented such innovation).

This paper draws on a participatory research project that focuses on such ICT-oriented innovation by African water providers, based on research interviews and testimonials from actual utilities (both those that have such systems in place and those who do not). The paper focuses on the specific needs and challenges of different departments within African utilities (including, but not limited to, the commercial, technical and planning departments). A focus is on how simple ICT tools and innovations can solve practical problems – and how an iterative approach to adopting innovation can enhance utilities' efficiency and reinforce their efforts to expand access to water supply.

Interviews with utility staff in both Anglophone and Francophone Africa shed light on what actual needs are, what existing experience with ICT is and where they see the most potential for ICT tools.

The paper is not intended to be overly 'academic' in nature although SeeSaw's large experience in providing ICT tools and systems to water providers across the continent does provide a strong knowledge base (as well as an inherent understanding of what is sensible and relevant). In particular the fact that SeeSaw provides both consulting and training to such utilities means that we are experienced in 'actively' listening to water providers and encouraging them to adapt tools to meet their specific needs (and not vice versa, as some would have it).

Keyswords: ***Information and Communication Technologies, Innovations, Change Management, Performance, Transparency***

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	Enos Malambala[1], Andrew Ssenyange[2] and Juliet Kyesimira[2] [1] National Water and Sewerage Corporation, Uganda [2] Kyambogo University, Uganda
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	UNDERSTANDING DIURNAL ALGAE DYNAMICS AT A TROPICAL WATER TREATMENT PLANT

Many tropical water treatment plants abstract surface water that is subject to diurnal variations in the quality of raw water. One such example is the Ggaba water works complex that serves Kampala city. The variation of raw water quality during day time makes treatment of water a difficult undertaking. The main driver of diurnal raw water quality changes is the growth of algae but no known trend has been documented. This has hindered optimum chemical application, since Laboratory Technicians and plant operators cannot predict when to reduce or increase chemicals without carrying out a lengthy jar test. The unpredictability of the raw water quality requires at least a jar test after every 2 hours, which is practically impossible.

Algae growth keeps changing with fluctuating conditions, for example, nutrient accumulation, light penetration and availability of carbon dioxide. This subsequently leads to variable chemical dosage requirements at times of the day during the treatment process. Poor or insufficient dosage to kill algae affects the treatment process by clogging the intake pipes and filter lines. This usually leads to low production in an effort to continuously meet the drinking water standards.

This paper asses the diurnal rate of accumulation of algae in raw water at Ggaba treatment plant, and develops a correlation between algae and pH that can be used to predict water quality changes and aid chemical optimisation.

Water samples were picked from the raw water equalization tank from 8:00 hours to 16:00 hours at two hour intervals. The samples were then analysed for chlorophyll ‘a’ concentration and algae species identification and enumeration in the laboratory, pH was measured in-situ.

The results showed algae in raw water increasing from morning and peaking at midday. It then started decreasing in the evening. The pH of the raw water also increased from morning up to midday, decreased at 2:00pm then increased again in the evening. Blue-green algae were the most abundant algae species as compared to green algae. The algae species identified were Microcystis sp., Anabaena sp. and Cladophora sp.

There was a positive correlation between chlorophyll 'a' concentration and pH, implying that the latter can be used to predict raw water quality in respect to changes caused by the former. However, this can only explain 77 % of the water quality changes. Thus by continuous monitoring of pH during the day one can easily predict day time algae increase by a 77 % certainty and start pre-chlorination where necessary in order to avoid filter clogging.

Keywords: ***Water Treatment, algae dynamics, chemical optimisation, water quality.***

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	PROF H C KASAN
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	INNOVATIVE APPROACH TO SOLUTION FOCUSED RESEARCH AND CAPACITY BUILDING OF SCIENTISTS IN A WATER UTILITY, RAND WATER

The need for and importance of solution focused research and capacity building of scientists in the water sector cannot be overemphasised. One of the key challenges facing water utilities in South Africa and the African continent is the need for competent human resources. In order for water utilities to provide water on a continuous basis of good quality at affordable price, staff need to be competent, focused and motivated to strive for excellence. After much consideration of various approaches, an innovative approach was formulated for implementation at Rand Water. The approach comprised of eight (8) steps, viz., 1.

Articulating key research challenges over a 10 year horizon with annual review, 2. Identifying discipline related expertise at various levels to focus on addressing research challenges, 3. Acquisition of best local expertise to drive programmes of research, 4. Developing skilled expertise to ensure sustainability, 5. Motivating and empowering staff to undertake postgraduate qualifications, 6. Inculcating a culture of solution based research across the division, 7. Establishing additional talent pipelines for excellence and sustainability and, 8. Collaboration with best in class institutions for mutual benefit.

Some of the key outcomes and benefits of the implementation include;

- Utilisation of best South African expertise to focus on research challenges
- Development of young South African scientists by seasoned mentors via graduate development programmes and postgraduate studies
- Generating and implementing solutions to improve Rand Water technologies, methodologies, processes and public health, and,
- Creating talent pipelines to deal with current and future water sector challenges.

Some of the key lessons that have been learnt include:

- Articulation of key research challenges requires expert skills and knowledge and must be afforded sufficient time
- Inculcating a culture of solution focused innovative thinking is challenging but well worth the effort
- Collaboration with best in class done properly has major value.

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	Alexandre Fiorito
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	MANAGEMENT OF MAJOR TRANSFERS

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	J. Sang et al
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	DUAL ECHO SOUNDER BATHYMETRIC SURVEY FOR ENHANCED MANAGEMENT OF RUIRU RESERVOIR KENYA

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	Dr. G. Mucai
COUNTRY	KENYA
TITLE OF THE DOCUMENT	EMERGING WATER TREATMENT TECHNOLOGIES; THE CASE FOR NAIROBI CITY WATER AND SEWERAGE COMPANY LTD.

Presentators

SUB THEME	Smart and Innovative Solutions
SUGGESTED TOPIC	Research and Innovations for Sustainable Access to Water
AUTHOR	M. Mametja
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	RAND WATER'S APPROACH TO WATER RISK MANAGEMENT

- Room Expo 2 : RECYCLING FOR THE RECOVERY OF ENERGY AND NUTRIENTS

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Recycling for the Recovery of Energy and Nutrients
AUTHOR	Joy Riungu[1], Mariska Ronteltap[1], Jules B. van Lier[1],
COUNTRY	KENYA
TITLE OF THE DOCUMENT	ASSESSING ASCARIS EGGS AND E.COLI REMOVAL IN UDDT FEACES FROM LOW INCOME URBAN AREAS: EFFECT OF MIX RATIOS, PH AND VFA BUILD-UP

As an innovative approach for slum sanitation, UDDT toilets are offered on a pay and use basis in the form of serviced shared facilities in Mukuru Kwa Njenga and Mukuru Kwa Reuben informal slum settlements, Nairobi, Kenya. Merely the addition of saw dust or ash is not sufficient to kill pathogens, hence an extra pathogen die-off step is required. Anaerobic digestion offers an attractive alternative where the produced heat, VFA's, pH can serve as pathogen inactivator. By adding another organic substrate such as organic market waste this effect can be enhanced. As such, the objective of this study is to evaluate the feasibility of hydrolysis stage as a pre-step in anaerobic digestion and co-digestion of UDDT faeces (UDDT F) and mixed organic market waste (MMW) in the deactivation of Ascaris eggs and E.coli. Experiments were conducted using laboratory batch scale reactors with a substrate concentration of 40g VS/l, at unchanged substrate pH level and at a fixed level of 4.8. Substrates tested were UDDT F and UDDT:MMW samples ratios of; UDDT F, 4:1, 2:1, 1:1, 1:1,2:1,1:4 and MMW.

Mixing UDDT F with MMW led to higher VFA build-up and lower pH values, with increasing MMW fraction in the substrate, and the better was the E. coli removal. Under the test conditions, Ascaris eggs deactivation was achieved at a shorter time interval than E.coli, with all eggs testing non-viable after a two day treatment for all substrates tested. Whereas E.coli removal improved with higher VFA build-up and lower pH levels, ascaris egg deactivation in addition, may have

been effected by the CO2 gas permeating into the cell membrane, thus interfering with the cell structure.
As such, anaerobic digestion with enhanced hydrolysis pre-step would help achieve better sanitization in the entire anaerobic digestion process. Morever, this would enhance sanitization of the UDDT waste and thus better sanitation within the slum settlements, as well as using the digestate as fertilizers to enhance soil fertility.

Introduction

As an innovative solution to enhancing sanitation in low income urban areas, UDDT toilets are offered on a pay and use basis in the form of serviced shared facilities. Merely the addition of saw dust or ash is not sufficient to kill pathogens; hence an extra pathogen die-off step is required after waste collection. Anaerobic digestion offers an attractive alternative where the produced heat, VFA's, pH can serve as pathogen inactivator. However, unsatisfactory pathogen reduction has been reported (Chaggu, 2004).
Addition of readily degradable carbon source to feedstock/ overloading digester increase VFA build-up thus higher pathogen deactivation (Kunte et al., 2000). As such, this study seeks to investigate the potential for hydrolysis stage as a pre-step in anaerobic digestion as an option for waste sanitization, with MMW being added to UDDT F to enhance VFA build-up. Different mix ratios of UDDT F and MMW were tested: UDDT F, MMW, UDDT F:MMW=4:1, 2:1, 1:1, 1:2 and 1:4. Laboratory scale batch reactors were utilized in which waste samples are anaerobically incubated at 35oC and volatile fatty acids (VFA), pH, Ascaris eggs and E.coli monitored over a 4 day period. All waste samples were collected from Mukuru Kwa Njenga informal slum settlement.

Experimental setup

Batch experiments were conducted in test flasks of 0.1 L serum bottles, working volume of 80mls. Each batch was carried out in triplicate. Three batches were conducted using waste from different days and locations. Each reactor contained on average 4 g VS/100 mL solution in order to enhance acidification of the reactor content. Experiments were conducted at two pH levels: 4.8 and normal substrate pH. In addition, UDDT faeces samples were set to pH 7. All samples were spiked with fertilized ascaris lumbricoides eggs at a concentration of

20 eggs/ 1mls sample. Table 1 shows the substrate mixing ratio, initial pH values, final VFA and pH values.

Table 1: Experimental setups used for the laboratory batch scale studies and VFA and pH results

Substrate ID	Substrate composition	Initial pH	Final VFA (4 days) (Meq/g TS added)		Final pH	
			VFA	STDEV	pH	STDEV
A1	UDDT F:MMW=1:4	4.8	2.27	0.26	3.34	0.14
A2	UDDT F:MMW=1:4	5.48	2.53	0.10	3.43	0.16
B1	UDDT F:MMW=1:2	4.8	3.24	0.10	3.45	0.07
B2	UDDT F:MMW=1:2	5.56	3.38	0.20	3.55	0.05
C1	UDDT F:MMW=1:1	4.8	2.83	0.45	3.43	0.25
C2	UDDT F:MMW=1:1	5.6	2.96	0.78	3.70	0.33
D1	UDDT F	4.8	1.56	0.67	4.89	0.18
D2	UDDT F	5.74	1.73	0.72	5.19	0.23
E1	UDDT F	7	1.56	0.06	5.82	0.04
E2	UDDT F:MMW=2:1	4.8	2.55	0.31	3.74	0.03
F1	UDDT F:MMW=2:1	5.7	2.81	0.17	4.14	0.03
F2	UDDT F:MMW=4:1	4.8	2.31	0.10	4.64	0.06
G1	UDDT F:MMW=4:1	5.82	1.95	0.13	5.16	0.06
G2	MMW	4.8	1.53	0.18	3.36	0.11
H1	MMW	5.27	1.57	0.18	3.44	0.05

Reactors were incubated at 35oC for 4 days; mixing was done manually after every two hours during the day. No mixing was done at night. Parameters measured were pH, volatile solids, volatile fatty acids, E.coli and Ascaris eggs, all according to standard methods.

Results

All substrates showed an increase in VFA build-up with time (Table 1). However, higher build-up was recorded in co-digestion than in single substrate digestion for both UDDT F and MMW, with highest VFA recorded in UDDT F:MMW=1:2, pH 5.56 at 3.37 meq/g TS added.
The higher the MMW fraction in the mixture, the lower was the pH decline. While the substrates MMW, UDDT F:MMW=1:4, 1:2 and 1:1 showed an ongoing decline in pH values over the four day retention time, all other substrates showed a decline followed by a pH rise (Table 1). Lowest pH of 3.34 was recorded during the anaerobic digestion of MMW. Substrates that showed a decline in pH levels over the 4 day period had E.coli removal to below detectable limits in 2 days (Fig 1). UDDT F, at all pH levels had E.coli removal in greater than four days with pH 7 showing less removal. For E. coli, the higher the VFA build-

up and lower pH levels, the better was the removal. MMW improved the E.coli removal from the substrates: the higher the proportion of MMW in a given substrate, the higher the removal.

Whereas number of days for E. coli deactivation among the substrates varied, no viable ascaris egg was observed after two days of treatment in all samples. Studies have reported that CO_2 , which is one of the gases produced during hydrolysis, is effective in deactivation of Ascaris eggs (Mun et al., 2012). It inhibits some key cellular components involving the process of embryonation through penetrating the thick shell of egg. As such, in addition to pH and VFA rise, CO_2 plays a role in ascaris egg deactivation.

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Recycling for the Recovery of Energy and Nutrients
AUTHOR	Irene Nansubuga
COUNTRY	UGANDA
TITLE OF THE DOCUMENT	OPTIMAL RECOVERY PROPOSED FOR A WASTEWATER MANAGEMENT SCHEME FOR A SMALL AGRICULTURAL COMMUNITY, COMBINING HIGH RATE ACTIVATED SLUDGE, ANAEROBIC DIGESTION AND BIOCHAR PRODUCTION

Whilst there is significant improvement in access to sanitation globally, access to proper sanitation is still a great challenge in the developing world, especially the Sub Sahara Africa where 25% of the population still practiced open deification by 2012. The current sanitation systems have loop-holes and can barely help the situation. Wastewater is rich in a number of resources, which include water, energy and nutrients. These when rightly explored through recovery, present an opportunity to subsidise sanitation costs hence making it more affordable and consequently accessible for all. A paradigm shift from the ordinary centralised and onsite systems to a cluster decentralised systems which encourage resource recovery is pertinent to achieve more cost effective and manageable wastewater treatment system.

This work done in two parts sought to explore interventions for

resource recovery for wastewater that are appropriate for application in the developing world. Water is a major recoverable product from wastewater, this can be re-use for agricultural purposes. The first part of the study considers a combination of two treatment systems production of water fit for reuse in Agriculture. It combined a high rate activated sludge (HRAS) system and alternating charcoal filters (ACF). The systems were in parallel with the ACF line after the HRAS. The HRAS effectively removed up to 65% of total suspended solids (TSS) and 59% of chemical oxygen demand (COD), while ACF removed up to 70% TSS and 58% COD. The combined treatment system of HRAS and ACF effectively decreased TSS and COD on average by 89% and 83% respectively. Total ammonium nitrogen (TAN) and total phosphates (TP) were largely retained in the effluent with removal percentages of on average 19.5% and 27.5% respectively, encouraging reuse for plant growth.

Energy can also be recovered from wastewater, the second part of the study explored biogas recovery as well as nutrient through biochar formation, from the HRAS digestate. HRAS was first anaerobically digested under mesophilic conditions at a sludge retention time of 20 days. The results showed that HRAS digested well producing on average 0.5 ± 0.15 CH4 L -1L -1d. Biochar was then formed from the dried high rate activated sludge (HRAS) digestate and was characterised with respect to its use as a fertilizer and energy. The produced biochar showed optimal properties as a fertilizer when produced at a temperature of 600°C.

Based on these findings, it can be concluded that HRAS plus ACF together with anaerobic digestion of HRAS and its subsequent biochar formation at HHT of 600°C presents a sustainable management option for wastewater management in tropical settings like in Uganda.

1National Water and Sewerage corporation, Plot 39, Jinja Road, P.O. Box 7053, Kampala, Uganda
2Laboratory of Microbial Ecology and Technology (LabMET), Ghent University, Coupure Links 653, 9000 Ghent, Belgium.
3Department of Agricultural and Bio-Systems Engineering, Makerere University, P.O. 7062, Kampala, Uganda
4Department of Biosystems Engineering, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Ghent, Belgium.

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Recycling for the Recovery of Energy and Nutrients
AUTHOR	GNANGA Rosath Hénock Student / Inter Faculty Research Center on the Environment and Sustainable Development (CIFRED) / University of d'Abomey-Calavi.
COUNTRY	BENIN
TITLE OF THE DOCUMENT	RECOVERY OF WASTES IN BENIN: PRODUCTION OF BIOGAS FROM ORGANIC WASTES IN COTONOU

Faced with the upsurge of wastes from the consumption of various goods, the State of Benin, through its Constitution adopted in 1990, decided to address the challenge of sanitation. It thus organized the public waste collection. But it became clear over the years that it had to make room for the private sector that has taken control. As early as 2010, the private sector became aware that managing the variety of wastes required different forms of recycling before their final transportation to the final disposal place. From then on, the state encouraged more recycling of wastes in producer communities but the efficient management of sludge and biodegradable household wastes remained difficult. In the same year, the country experienced one of its worse energy crises (gas and electricity) because of its population growth and increased demand for energy. Much of the forest trees were felled and savannas were left in their place to provide the urban and peri-urban areas with charcoal and firewood. The possibility to explore new opportunities for energy independence in the field of renewable energy was launched.

With its population of 10,333,319 inhabitants and a 3.5% growth per year (INSAE.2014), this is a potential of 459,776 tons/day of sludge (an average of 0.4 kg/ind./day) and 3,404 tons/day of biodegradable wastes (an average of 0.5kg/ind./day) that are available. Let us not forget that these data do not take into account several other sources of wastes. Therefore in one year, more than 150 million tons of wastes that can be turned into energy are dumped into the environment with consequences that are well known. In this situation, we have undertaken research on the recovery of wastes in Benin through the production of biogas from organic wastes in Cotonou. The objectives were to (i) Identify the type of organic household wastes that must

be collected to produce biogas; (Ii) Study the profitability of biogas and electricity from organic wastes compared to the natural resources currently consumed; (Iii) Analyze the capacity of the city of Cotonou in the recovery process of organic wastes. The results of our sampling enabled us to discover that with the organic wastes that end up in the dustbins of our households, we can produce biogas, and combined with sewage sludge, we can increase the production capacity tenfold.

The results available to date have also pushed us to develop a bio-digester called OMD2012 that enables households to outsource the production of biogas to generate energy (cooking + light) from their own biodegradable wastes and achieve energy independence. The innovation was to design this type of bio-digester and integrate it into the household sludge collection networks while also enabling the households to recycle their biodegradable wastes from their kitchens. In addition, this bio-digester produces an organic fertilizer that some households have sold to farmers who have developed organic farming to the detriment of the use of chemical fertilizers.

We therefore have to know that the possibility to recover biodegradable wastes from the households can enable us to benefit a lot by outsourcing the production of cooking and lighting energy to the delight of the people but also to solve a big sanitation problem in the production units of these biodegradable wastes. Downstream our work, we have developed the possibility to create sources of income for the poorest households and have once again created the conditions that help public and private players reduce the energy deficit and support the agricultural sector of the country.

Keywords: ***Sludge; biodegradable household waste; bio-digester; biogas; energy; sanitation.***

• 14h30 - 16h00

- Room Aberdare : SOLUTIONS FOR SUSTAINABLE ACCESS TO WATER FOR UNDERPRIVILEGED PEOPLE

Presentators

SUB THEME	INNOVATIONS FOR INCREASED AVAILABILITY AND IMPROVED ACCESS TO WATER SUPPLY INNOVATIONS
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Brahim RAMDANE, DG/CDE
COUNTRY	CAMEROON
TITLE OF THE DOCUMENT	SOCIAL CONNECTION PROGRAMS TO IMPROVE ACCESS TO DRINKING WATER

With 22.2 million inhabitants, Cameroon is a middle income country. The poverty rate is stagnating around a national average of 40%, with endemic poverty that affects about 26% of the population. Cameroon will not achieve most of the Millennium Development Goals (MDGs) in 2015 despite the improvements made in terms of universal education and access to water.

In 2005, the Cameroonian government initiated a reform of the water sector, on the contracting out model. A public asset company responsible for the bulk of the investments, CAMWATER, was created along with a concessionary company, the CAMEROUNAISE DES EAUX (CDE), around a strategic partner selected through international competitive bidding (Moroccan consortium led by the Office National de l'Electricité et de l'Eau Potable (National Electricity and Water Office), ONEE). The activities and assets of the former Société Nationale des Eaux du Cameroun (National Cameroon Water Utility) (SNEC) were taken over by CAMWATER and CDE respectively on May 2, 2008.

The water supply situation in Cameroon deteriorated considerably for a long time because of the lack of investments in the sector for 20 years. Today, the rate of access to drinking water by individual or shared connections remains low, around 40% in urban areas.

Beside the low density of the distribution networks, the main weak link remains the inability of households, most of them poor, to support the average connection costs.

Also, in line with its mandate and missions and with the support of institutional partners and donors, CDE has put in place, since the start of its activities, a social connection programs for low income households.

A. The Program for the extension of the drinking water coverage of Cameroonian households in urban areas

The State of Cameroon in 2009 had received a grant of US $ 5.25 million (2.2 billion CFA francs) to finance the program under the Global Partnership on Output-Based Aid (GPOBA). The GPOBA is a multi-donor Fund established in 2003 jointly by the UK Department for International Development (DFID) and the World Bank. The program was designed to promote access to basic infrastructure and social services for poor people in developing countries by providing results-based aid.

The Grant Agreement involved the World Bank, the asset company, Camwater, (Beneficiary of the grant), and CDE (Operator under the lease contract). It was intended to facilitate the connection of about 50,000 households in the area contracted out over a period of four years. The program was part of the efforts to achieve the Millennium Development Goals, enabling households to access the urban drinking water network as part of a promotional connection campaign whose costs were subsidized at up to 44,000 CFAF per connection, VAT included. The households' contribution was 10% of the estimated total cost of the connection, which averaged 130,000 CFAF. 250,000 persons were to benefit indirectly from this operation.

B. 25,000 social connections funded by IDA, a subsidiary of the World Bank and ADB

In June 2014, CDE signed with CAMWATER, the asset company, two contracts for the completion of 25,000 connections at promotional rates. This program is a sequence of the GPOBA project launched in 2009. It is funded by (1) the International Development Agency (IDA), an affiliate of the World Bank (WB), for an amount of one billion CFA francs, and (2) the African Development Bank (ADB) to the tune of

one billion and half CFA francs.

The IDA funds have financed 10,000 connections in the whole country over a 12 month period. The ADB is financing, over a period of 15 months, 15,000 connections in 18 urban and peri-urban centers different from those that have received the IDA funding. At the same time, drinking water supply and extension network work is conducted in several localities with the support of these donors to facilitate the social connections project. The program focuses on the new connections. The customer pays 10% of the total amount, excluding tax, of the connection quotation and the whole subscription cost. In this new program, household eligibility criteria have been made more flexible, compared to the GPOBA program, to match connections known as classical connections.

Keywords:
Cameroon, CDE, access to drinking water, subsidized connections, social connections, GPOBA, DFID, World Bank, IDA, ADB

Presentators

SUB THEME	INNOVATIONS FOR IMPROVING ACCESS TO THE CONTINUING WATER SERVICE
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Jimmy Juma Thuo – ICT Infrastructure Coordinator, NCWSC and Gideon Nganga Nguu – R&D Coordinator, NCWSC
COUNTRY	KENYA
TITLE OF THE DOCUMENT	A MULTI-PRONGED APPROACH TO THE PROVISION OF AFFORDABLE WATER FOR THE PERI-URBAN POOR

Whilst there is significant improvement in access to sanitation globally, access to proper sanitation is still a great challenge in the developing world, especially the Sub Sahara Africa where 25% of the population still practiced open deification by 2012. The current sanitation systems have loop-holes and can barely help the situation. Wastewater is rich in a number of resources, which include water, energy and nutrients. These when rightly explored through recovery, present an opportunity to subsidise sanitation costs hence making it more affordable and consequently accessible for all. A paradigm shift from the ordinary centralised and onsite systems to a cluster decentralised systems

which encourage resource recovery is pertinent to achieve more cost effective and manageable wastewater treatment system.

This work done in two parts sought to explore interventions for resource recovery for wastewater that are appropriate for application in the developing world. Water is a major recoverable product from wastewater, this can be re-use for agricultural purposes. The first part of the study considers a combination of two treatment systems production of water fit for reuse in Agriculture. It combined a high rate activated sludge (HRAS) system and alternating charcoal filters (ACF). The systems were in parallel with the ACF line after the HRAS. The HRAS effectively removed up to 65% of total suspended solids (TSS) and 59% of chemical oxygen demand (COD), while ACF removed up to 70% TSS and 58% COD. The combined treatment system of HRAS and ACF effectively decreased TSS and COD on average by 89% and 83% respectively. Total ammonium nitrogen (TAN) and total phosphates (TP) were largely retained in the effluent with removal percentages of on average 19.5% and 27.5% respectively, encouraging reuse for plant growth.
Energy can also be recovered from wastewater, the second part of the study explored biogas recovery as well as nutrient through biochar formation, from the HRAS digestate. HRAS was first anaerobically digested under mesophilic conditions at a sludge retention time of 20 days. The results showed that HRAS digested well producing on average 0.5 ± 0.15 CH4 L -1L -1d. Biochar was then formed from the dried high rate activated sludge (HRAS) digestate and was characterised with respect to its use as a fertilizer and energy. The produced biochar showed optimal properties as a fertilizer when produced at a temperature of 600°C.
Based on these findings, it can be concluded that HRAS plus ACF together with anaerobic digestion of HRAS and its subsequent biochar formation at HHT of 600°C presents a sustainable management option for wastewater management in tropical settings like in Uganda.

1. National Water and Sewerage corporation, Plot 39, Jinja Road, P.O. Box 7053, Kampala, Uganda
2. Laboratory of Microbial Ecology and Technology (LabMET), Ghent University, Coupure Links 653, 9000 Ghent, Belgium.
3. Department of Agricultural and Bio-Systems Engineering, Makerere University, P.O. 7062, Kampala, Uganda
4. Department of Biosystems Engineering, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Ghent, Belgium.

Presentators

SUB THEME	INNOVATIONS FOR IMPROVING ACCESS TO THE CONTINUING WATER SERVICE
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Honorat GBONDJINON
COUNTRY	BENIN
TITLE OF THE DOCUMENT	PROMOTION OF ACCESS TO DRINKING WATER IN URBAN AND PERI-URBAN AREAS IN BENIN (SONEB)

The Republic of Benin has selected the access to drinking water as one of the priorities of the strategy for poverty reduction and has adhered to the Millennium Development Goals (MDGs). As a consequence, in 2015, it must provide drinking water to 75% of the urban population, that is, about three million people.

In this context, SONEB, the state-owned company, in charge of water supply (WS) in urban and peri-urban areas, must address the following key challenges:

- Improve the connection rate of urban and peri-urban populations to the drinking water systems;
- Strengthen the production capacity of the water supply systems;
- Ensure the continuity and sustainability of the drinking water services in urban and secondary centers;
- Guarantee access to drinking water to low income people.

To address these challenges and promote access to safe drinking water for the people, especially those living in peri-urban areas (therefore lower income people), SONEB has developed a policy based on the implementation of the following:

- Strengthening the production capacity of the drinking water supply systems: increase the water production by 50% between 2005 and 2014.
- Extending and densifying the network in peri-urban areas: more than 1,500 km of network built between 2006 and 2014.
- Creating promotional connections subsidized by the state budget and SONEB to promote access for low-income populations. The beneficiary pays only 50,000 CFA francs, that is, half the cost of the connection, with the payment divided into three (03) instalments to facilitate it.
- Development of collective access water points: implementation of standpipes mainly in peri-urban areas, reactivation of non-functional standpipes, connection of the villages near SONEB distribution networks

- Establishment of a fee schedule to ensure access for poor households to drinking water: VAT exempted social portion and preferential rates for collective access.

All these actions and measures have had a very positive impact on the coverage rate (48% in 2005 and 72% in 2014). The projected service rate in 2015 will exceed 75% of the urban and peri-urban population (set MDG target).

Keywords: ***WS, MDGs, peri-urban areas, potable water, supply rate, collective access***

Presentators

SUB THEME	INNOVATIONS FOR IMPROVING ACCESS TO THE CONTINUING WATER SERVICE
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	C. W. Muturi
COUNTRY	BENIN
TITLE OF THE DOCUMENT	INCREASING WATER SERVICE DELIVERY TO THE UNDERPRIVILEGED IN KENYA

- Room Lenana : INSTITUTIONAL DEVELOPMENT AND CAPACITY BUILDING FOR WATER AND SANITATION

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Richard Holden
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	REVIEW OF SOUTH AFRICAN LEGISLATION TO ENABLE A SUSTAINABLE WATER SECTOR

In 1994 with the advent of a full participatory democracy, the newly elected government sought to introduce legislation that redressed the inequalities in access to water and made it a basic human right to an environment that is not harmful to their health or well-being. This legislation has often been held up as an exemplary example to the rest of the world. In South Africa, however, the situation is not quite as presented.

South Africa is the 30th driest country in the world, receiving an average of 450 mm per year against a global average of 870 mm. It is rapidly running out of allocable water and it is predicted that by 2025 there will be no further water to allocate.

Already many of the catchments are water stressed as development, particularly that associated with the extraction of minerals, has not occurred in the same location of the water resources. This has resulted in major inter-basin transfer schemes, which has fundamentally altered the flow regime in many of the country's rivers.

Also the dilution capacity of the natural river system has diminished as abstraction has increased and this has started to present problems in achieving the water quality objectives and the ecological reserve. This has been exacerbated by the legacy of coal and gold mining.

This has resulted in a significant Acid Mine Drainage problem, which if left untreated will have a major impact on water security, if the water quality objectives are to be achieved.

Traditionally management of the resource has been kept separate from bulk potable water supply and retail distribution; with a focus on the urban areas to the neglect of the rural areas (a consequence of the apartheid policies). When the two major pieces of legislation, the Water Services Act (Act 108 0f 1997) and the National Water Act (Act 36 of 1998), were passed it maintained this divide and introduced and additional layer of administration (Catchment Management Agencies). The document will argue that this approach is no longer relevant (and often practice on the ground is very different) as the country seeks to manage the resource and supply water and sanitation services in the most efficient manner possible.

Furthermore as the legislation developed, treaties were signed with surrounding countries (who had refused to sign such agreements during apartheid), a number of anomalies crept in and this has resulted in endless arguments over the powers and responsibilities of the different spheres and entities of government.

These arguments are also coupled with an equally pressing issue, that of how to raise sufficient revenue to operate and maintain the water and sanitation systems, this issue is becoming particularly pressing as in the supply of water 95% of the population have access to water supply infrastructure but only 64% have access to a reliable supply.

In South Africa the Government has a Constitutional responsibility to manage the water resource and to provide people with access to a safe and reliable water supply.
This is a responsibility that Government cannot pass onto another party and therefore the liability, always remains with government. Therefore any funding raised to provide water infrastructure will always be reflected in Government borrowings

In the Minister of Finance's, Medium Term Policy Statement on 25 October 2011, Minister Gordhan stated
"We need to appreciate that debt has to be repaid, either through the tariffs and charges that are dedicated to these services, or through higher taxes. It is important to find the right balance between cost

recovery from users of services, and general tax-funding."

Paraphrasing Minister Gordhan, if money is going to be borrowed, to pay it back it will either, as a consumer, come out of your left pocket through tariffs or your right pocket as taxes. There is no miraculous third way.

However PPPs are often presented as a miraculous way of raising the finance to enable government to bridge the gap between what is available from the national revenue fund and the current capital expenditure requirement, but fundamentally whether

1) it is the Government borrowing from the private sector through bonds and building the infrastructure itself
2) Borrowing from the private sector through a government agency (TCTA, water boards) and they building the infrastructure
3) Or the private sector borrowing the money and building the infrastructure on behalf of government

There is very little difference the lenders point of view of where the ultimate liability to pay back the debt lies (National Government and the consumer or taxpayer).

A review of the current legislation has been undertaken and this document seeks to show that by simply applying the order of precedence in legislation and the indivisible nature of water supply systems (i.e. they cater for all customers in the area of supply and the water in the system does not distinguish between consumers) it is possible to resolve most of the issues without fundamental legislative change.

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Eric de La GUERONNIERE – Director Water & Waste learning SUEZ
COUNTRY	FRANCE
TITLE OF THE DOCUMENT	REPORT ON THE EXPERIENCE OF SUEZ ENVIRONMENT ON THE MANAGERIAL KNOW-HOW TRANSFER PROCESS IMPLEMENTED IN ALGIERS

Suez Environnement is committed in Algeria in a management contract for SEAAL, a state-owned company. One of the major challenges of this contract is the successful increase and technical and managerial competencies and independence of SEAAL in order to sustain the provision of a public water and sanitation service at an international standard level.
The solution proposed by Suez Environnement to turn that management capacity into independence is to develop the human resources of the company, their technical and managerial skills.
Suez Environnement is betting that the development of the employees is the key to their personal commitment and the quality of the work they do in the general interest.

The purpose of this presentation is to present the OPT human resource management implemented to support the development of managerial skills, based on the individual talents development principle and to detail the results.

The OPT, «Optimizing Personal Talents», methodology has been implemented for 3 years in Algiers. It is based on many types of expertise:

1. Psycho Sociological Expertise. A survey of psycho-social factors was conducted to identify the key managerial needs and potentials of the 300 TOP managers of the company. SEAAL also uses the inter projective methodology to identify potential individual managers.
2. Managerial Expertise. In order to structure the approach, have an objective measurement and evaluation tool and support evenly the evolution of the managerial body, a repository of managerial skills has been designed. It is characterized by its pragmatism, its cultural appropriateness, and ambition.
3. Career Management Expertise. Each manager receives individual coaching by the HR team to build an individual «progress contract» that contains the elements on the potentials, the development goals, and the coaching program.
4. Pedagogical Expertise. The OPT approach provides managers with many tools for the acquisition of new skills: training, e-learning, mentoring, coaching. The most rigorous and innovative pedagogical practices are used to build the content.
5. Communication Expertise. To succeed in changing the way management is practiced and facilitate the adoption of new management practices, intensive communication is implemented:

conferences, newsletters, meetings.

6. IT Expertise. To control the whole mechanism (objectives, assessment, support programs), an ad hoc piece of software was designed and deployed.

The presentation will detail the operating mode of this business-managing approach and the key success factors.

3 years after the start of OPT, the first positive results can be noted and measured.

- Rooting of a set of basic management practices: annual interviews, participatory development of Medium-Term Plans, management by processes, conduct of business meetings, internal communication, negotiations with social partners, anticipation, etc.;
- Openness to innovative managerial practices: Constitution of external networks, partnerships with training institutions/suppliers, dissemination of a culture of compassionate listening;
- Strong increase in satisfaction and fulfillment at work.

These initial observations confirm the perceived managerial maturity, which will ensure the sustainability of the organization, its functioning, its dynamics, the commitment of its employees, and hence the quality of the public service provided.

Beyond these observations, the OPT approach organizes the way these skills evolve. Every year, during the annual interview, each manager is evaluated individually by his/her line manager based on the 4 management development targets set for the year. This evaluation is based on a set of indices and indicators explained in the Charter of the Manager. These indices and indicators guarantee the objectivity of the evaluation. Individual progression is thus measured, tracked, monitored. Additional individual support activities are carried out in order to give employees every opportunity to make progress.

OPT meets the objective of developing managerial skills to ensure the sustainability of the service quality, which is the target set by the Algerian authorities to the operator Suez Environnement.

Suez Environnement has therefore to meet the demand for visibility from customers on the progress of the know-how transfer. This tool for measuring individual progress and, by aggregation, collective progress

enables the operator to introduce, in a transparent manner, the results of the know-how transfer.

Key words: ***Skills Development - Sustainable Management – Optimization of talents - Management Transformation - HR Innovations.***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Kent Alwaka Mukoya Planning , Monitoring and Evaluation Officer Nairobi City and Sewerage Company Ltd.a
COUNTRY	KENYA
TITLE OF THE DOCUMENT	CORPORATE SOCIAL RESPONSIBILITY AS A TRAJECTORY TO ACTUALIZATION OF CORPORATE GOVERNANCE STRATEGY : CASE STUDY OF NAIROBI CITY WATER AND SEWERAGE COMPANY

Introduction

Corporate Social Responsibility is increasingly being identified as part of the overall businesses corporate strategy. Incorporating various stakeholders in the business ecosystem to ensure success and attainment of strategic objectives forms a fundamental part for ensuring amble environment for the business thriving and sustainability. David Vogel 2005 argues that “when corporations make a serious commitment and infuse substantial funding in a socially responsible strategy, then along with the increased risk, comes a bigger potential for payoff”. The World Business Council for Sustainable Development in its publication “Making Good Business Sense” By Lord Holme and Richard Watts (2002), defines Corporate Social Responsibility as the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large. Internationally, incorporation of CSR concepts has wittiness the re-engineering of business identities. 1994 report of the Toronto Stock Exchange Committee on Corporate Governance in Canada, defines Corporate Governance as the process and structure used to direct and manage the business and affairs of the corporation with the objective of enhancing shareholders value. On the other hand,

Bakker (2003) defines corporate governance as a process by which stakeholders articulate their interests, their input is absorbed, decisions are taken and implemented, and decision-makers are held accountable. It can therefore be argued that, from the stakeholder's point of view, Corporate Social Responsibility play a critical role to the actualization of Corporate Governance Strategy.

Responsible business practices can in many ways contribute to sustainable development. Within the concept of CSR, companies consider the interest of society by taking responsibility for their impact of their activities. In 2007, GIZ finalized an impact assessment of the status of CSR in sub-Saharan Africa; in particular the study revealed that, the concept of CSR is still at its infancy although quickly gaining roots. The study recommended that, the governments should play a central role in promotion of the CRS by way of effectively utilizing policy dialogue with other players such as the civil society organizations and the private sector.

Background and Context of Nairobi City Water and Sewerage Company Corporate Social Responsibility

In 2002 the Water Sector Reforms momentum in Kenya culminated in the enactment of the Water Act 2002. Among the key principles underlying water reforms is the stakeholders' involvement and participation in ensuring accountable management of water services by water service providers. Indeed, Clause 43 (1) (d) of the Kenya Constitution under Economic and social right, promulgates that 'Every person has the right to clean and safe water in adequate quantities." This by implication emphasis that, the concept of CRS in water sector in Kenya is broadly a constitutional requirement. Moreover, international human rights treaties and conventions consider access to water and sanitation as a human right. This means that, water service providers can no longer over look and undermine the participation of the stakeholders in their functions in order to achieve this objective. Nairobi City Water and Sewerage Company (NCWSC) is a private company which is owned 100% by the County government of Nairobi the capital city of the Republic of Kenya one of the countries within sub-Saharan Africa. Nairobi city has an estimated population of 4 million people. According to the government of Kenya Economic blue print "Vison 2030" the government envisages to provide water and sanitation services to all by the year 2030. The NCWSC Strategic Plan 2014/15 – 2018/19 identifies eight strategic themes that form the basis for setting of the planning objectives during the set

period. Accordingly, strategic theme No. 8 “brand equity and institutional strengthening”. This theme among other issues focuses on improving the level of brand equity from 35% to 100% by 2018/19 through enhanced public image.

Rationale

According to the United Nations Kenya is classified as a water scarce country. The growing demographic pressure means that involvement of the stakeholders by water service providers in water management should be given consideration. As several strategies are employed in water resource management, engagement of the stakeholders is key in determining efficient and improvement of water and sanitation service delivery, conservation and management of the catchment, and proper and efficient use of portable water and prompt settlement of water billed.

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Rémi BOURGAREL, Managing Director of the Société d’Exploitation des Eaux du Niger (SEEN)
COUNTRY	NIGER
TITLE OF THE DOCUMENT	FORWARD-LOOKING SKILLS DEVELOPMENT : CASE OF THE SOCIÉTÉ D’EXPLOITATION DES EAUX DU NIGER (SEEN)

The purpose of this paper is to present the «Forward-looking Skills Development» method dedicated to improving the performance of water utilities in the water sector by building human resources’ capacities. This is achieved by targeting the skills development of the target population directly impacted by the changes or major events related to the context in which these utilities work. This context is strongly influenced by the requirements of the accelerated development of the access to water.

«Forward-looking Skills Development» is a method that enables a company to align the human resources skills development plan on its strategy. It is based on an analysis of changes, the predictable and desired changes, the impacted populations and the skills to develop for

the next 3 to 5 years. Given the constraints faced mostly by water utilities on the African continent, this method helps achieve rapid efficiency by precisely targeting the skills and human resources to develop.

At a time when utilities in the water sector are under pressure for a strong development and subject to many constraints, both endogenous and exogenous, working methodically to target the skills and the target populations to develop is necessary to gain in efficiency.

VEOLIA is deploying this method in its various companies, particularly in the Société d'Exploitation des Eaux du Niger (Niger Water Utility). In that company, the program is in progress, and already significant improvements are felt.

After presenting this particular context and the actual method, a practical illustration is given with the implementation of the method at the Société d'Exploitation des Eaux du Niger, which is in charge of the operation of the water service in urban and semi-urban areas of Niger.

Keywords: ***Development, Skills, Training, Strategy***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Rémi BOURGAREL, Managing Director of the Société d'Exploitation des Eaux du Niger (SEEN)
COUNTRY	NIGER
TITLE OF THE DOCUMENT	FORWARD-LOOKING SKILLS DEVELOPMENT : CASE OF THE SOCIÉTÉ D'EXPLOITATION DES EAUX DU NIGER (SEEN)

- Salle Expo 1 : - REMOTE CONTROLLED GEOGRAPHIC INFORMATION SYSTEMS AND HYDRAULIC MODELING - SMART LEAK DETECTION SOLUTIONS (LDS/SDF)

Presentators

SUB THEME	REMOTE CONTROLLED GEOGRAPHIC INFORMATION SYSTEMS AND HYDRAULIC MODELING SMART LEAK DETECTION SOLUTIONS (LDS/SDF)
SUGGESTED TOPIC	Remote controlled Geographic Information Systems and hydraulic modeling
AUTHOR	DR. MUSTAPHA HAJJI AND PR. OUAZARDRISS
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	WATERSHED COMPLEXITY MANAGEMENT USING SYSTEM DYNAMICS AND GEOGRAPHIC INFORMATION SYSTEM TO ENSURE SUSTAINABLE DRINKING WATER FOR THE ATLANTIC COAST OF MOROCCO THE CASE OF BOUREGREG BASIN

Bouregreg basin is one of the most critical watershed system that constitute a vital source of drinking water for more than 10 million inhabitants and for the most industrialized area of the country. High pressure on its water resources in conjunction with the climate changes, requires intelligent and sophisticated ways to better manage the sole resources of the area.

In this research we used system dynamics SD as a decision support tool to help achieve sustainable water management in this basin and capture the complexity of the Bouregregwatershed system from rainfall to water end use. We have developed a system dynamics model called BWater that can capture and analyze any event that may impact the water supply in the area. We used it to carry out simulations for extreme events ex. impact of successive dry seasons or excessive rain, risk analysis related to waterworks disruption, capacity planning…etc. The SD models is also linked a geographic information system that provides the model with information relative to soil erosion, land use and other parameters…etc. The results are of paramount for the decision making.

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart solutions for water leakage detection (LDS/SDF)
AUTHOR	BOUBACAR IDRISSA MAIGA
UTILITY	SOMAGEP.SA
TITLE OF THE DOCUMENT	PILOT PROJECT FOR REDUCING UNACCOUNTED FOR WATER IN THE HYDRAULIC SECTOR OF LA CITÉ DU NIGER

SOMAGEP.SA and ITRON ran together a pilot project in December 2014 for water sector management of la Cité du Niger based on innovative solutions using smart meters. The criteria behind the selection of the Water Sector of la Cité du Niger are predominantly its good and steady water supply coupled with an acceptable pressure and watertightness vis-à-vis the rest of the distribution system.

SOMAGEP SA's aim is to have a sound understanding of the smart meter-based innovative solution and to appraise their performance in terms of i) technical management of the sector (monitoring of night time flows), ii) reading and billing of consumers, iii) improvement of consumer relations.
A better understanding of losses through the pilot project would allow SOMAGEP SA to subsequently craft a suitable loss reduction strategy along the Bamako network as part of targeted UFW (unaccounted for water) reduction programs.

The methodology consisted in:
1. Auditing all meters in the area (input meter and billing meters);
2. Establishing preliminary water balance;
3. Implementing and monitoring the project;
4. Analyzing the results so obtained and matching them with the baseline to appraise the solution's added value (project effectiveness and efficiency) in terms of specifying the area's consumption patterns and reduction of actual and known losses;
5. Fully involving operational and billing staff for an extended pilot project should the results be conclusive.

The results are promising and prompt to pursue the experiment with the aim of reducing UFW and enhancing SOMAGEP SA's technical and financial indicators.

Key words: ***Database Analysis; Water sector, Meters Smart Solution; Efficiency; Project Efficiency; Actual Losses, Known Losses, Consumption Patterns; Meter Reading; Revenue water, Unaccounted for Water; Water Balance;***

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart solutions for water leakage detection (LDS/SDF)
AUTHOR	MME ADAMA SEYE NDIAYE
UTILITY	SENEGAL
TITLE OF THE DOCUMENT	SMART TECHNOLOGY FOR LEAK DETECTION: A MEANS FOR NRW REDUCTION

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart solutions for water leakage detection (LDS/SDF)
AUTHOR	M. I. KAREITHI
COUNTRY	KENYA
TITLE OF THE DOCUMENT	INTERGRATING OF GIS AND HYDRAULIC MODELING

MERCREDI 23 FEVRIER 2016

• 10H00 - 11H30

- Room Aberdare : PARTNERSHIPS BETWEEN WATER AND SANITATION OPERATORS

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Partnerships between water and sanitation operators
AUTHOR	MOHAMED JALAL MAKROUM DEPUTY MANAGING DIRECTOR AMENSOUSS
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	PROJECT FOR THE HYDRO AGRICULTURAL EQUIPMENT OF THE EL GUERDANE AREA: FROM THE CLASSICAL APPROACH TO THE PUBLIC PRIVATE PARTNERSHIP

Structural constraints: Scarcity of groundwater resources
Irrigation of the El Guerdane perimeter has historically and exclusively been provided by the ground water resources of the region. This situation has led to the overexploitation of the aquifer which has seen its level decrease by 2.5 to 3 meters per year on average. This continuous decline of the ground water leads each year to the abandonment of many farms because of the drying up of wells or increasingly prohibitive pumping costs. This decline has led to a water deficit estimated to be about 250 million m3.

To overcome this shortage of irrigation water, the Master Plan for the Integrated Water Resources Development (PDAIRE) of the Souss-Massa watershed allocated to the El Guerdane area an annual volume of 45 million cubic meters of water from the hydraulic dam complex of Mokhtar Soussi-Aoulouz.

The mobilization of this surface resource is the only alternative to preserve a portion of land for citrus. Citrus, it must be noted, represents

the central economic and agricultural activity in the area and requires, however, the construction of an impressive hydro agricultural asset that involves significant financial resources

Public Private Partnership: innovative institutional and financial arrangements in the sector

Historically, various options for institutional and financial arrangements for the implementation of the hydro agricultural equipment project for the El Guerdane citrus area were considered, from classic financing by the state budget to the participation of farmers organized in an association to finally the concept of Public Private Partnership.

An analysis and a comparison of the key figures of the various institutional and financial investment arrangements considered for the implementation of the project are presented in the table below:

Montage institutionnel	Réalisation par l'état (code des investissements agricoles)	Partenariat entre l'état et les usagers (association al mostakbal)	Partenariat Public Privé (PPP)
Apport de l'état (%)	67%	53%	24%
Apport des usagers (Dhs/Ha)	34.000,00	49.000,00	8.000,00
Tarif du service de l'eau (Dhs/m3)	1,63	1,85	1,48
Commentaires	- Coût du projet élevé -les finances de l'état ne peuvent supporter de tels investissements.	-Conditions inaccessibles aux usagers, surtout les petits agriculteurs. -impossibilité de financement des usagers en raison de défaut de garanties exigées par les banques.	- Conditions plus accessibles aux agriculteurs - Tarif du service de l'eau le moins onéreux possible.

The conclusion is that the adoption of the Public Private Partnership solution (PPP) is the best way to ensure a level of water service consistent with the expectations of users and in the best financial and technical conditions for all the partners.

The success of any partnership is essentially based on some balances. As the case may be, we will highlight the main axes of this balance,

namely:
- The risk of the water demand;
- The risk of the availability of the water resources;
- The corporate recovery risk.

Infrastructures and modern management tools
The infrastructures that are the object of the project consist of three main parts:

- A water intake from the Aoulouz dam, helping to feed the supply asset with water;
- A water supply system of 90 kilometers to bring that surface water to the project area,
- A distribution network of approximately 270 km serving 600 citrus farmers in the citrus farming area.

The exploitation of such an asset required the development of many modern management tools including:

- A remote management system of the assets: it allows the remote and real-time management of all the key stations of the asset;
- A Geographic Information system: it allows the geographic rewriting of all the alphanumeric data of the project (technical, commercial, administrative…);
- A remote meter-reading system: it allows the reading of the volumes consumed by the farmer remotely and on demand;
- Other tools for the commercial and administrative management of the project.

Economic, social and environmental impacts

The implementation off such a structuring project for the region has invariably positive impacts at the social and environmental level.

These impacts can be summarized as follows:

• Energy saving: reduced pumping water costs by over 50%;;
• Inhibition of the farm abandonment phenomenon and safeguard of the wealth of the region;
• Preservation of approximately 11,000 jobs in the region;
• Creation of 40 direct permanent jobs in the region, and between

300 and 400 jobs during the construction work (2 years);
• Preservation of the Souss ground water: 65 million m^3

- Water savings on the pumping of ground water through the mobilization of an alternative resource: 45 million m^3 from the Aoulouz Mokhtar Soussi dam complex

- Irrigation water saving: by establishing commonly called Drop by Drop irrigation systems on farms enjoying the water service

Keywords: ***Public Private Partnership (PPP) - Scarcity of water resources - surface water resources mobilization - Innovative Project - Infrastructure and modern management tools - Balanced Risk Management - Job Preservation - Preservation of groundwater resources - Energy saving - Improved water service quality.***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Partnerships between water and sanitation operators
AUTHOR	JOHN K. OTIENO EWATER PROJECT MANAGER & WOP COORDINATOR NAIROBI CITY AND SEWERAGE COMPANY LTD.
COUNTRY	KENYA
TITLE OF THE DOCUMENT	WATER OPERATOR PARTNERSHIP TOWARDS SUSTAINABLE ACCESS TO WATER SERVICES A CASE OF NAIROBI CITY AND SEWERAGE COMPANY

Urban water utilities in Africa differ greatly in terms of size, organisational culture and operating environments. But they all share one major challenge, which is, expanding access to water, at appropriate levels of services to their growing urban populations. This challenge can be seen clearly in the context of the MDGs where Africa lags far behind other regions. It is now widely acknowledged that the inefficiencies of African water utilities are a major cause of poor access to water services. In many systems, as much as a third of production is lost through physical and commercial losses and revenues are insufficient to cover operating costs let alone expand service coverage. Thus, it is becoming clear that the real potential in the African water sector lies in increasing efficiency in the existing systems - for example by reducing wastage, improving service quality and securing cash flows.

Water operator's partnerships (WOPs) have been proposed by utilities and their partners as a promising approach for improving the efficiency of water utilities and accelerating progress towards the MDG targets for water and sanitation. At the heart of these partnerships is a strategy of intense and systematic knowledge-sharing (including peer-support) between water operators as a way of bridging the capacity gaps that exist in many countries. However, limited availability of reliable performance information across the region presents a significant challenge to performance improvement through partnerships as it is difficult to tell which operators are doing well and should be emulated and which ones need support from peers. (WOP-Africa Utility Assessment Report 2009)
Under the WOP platform, Nairobi City Water and Sewerage Company (NCWSC) is involved in three programmes, one as a mentee to National Water and Sewerage Corporation (NWSC) of Uganda and two as mentor to Enugu State Water Corporation (ESWC) and Port Harcourt Water Corporation (PHWC) both in Nigeria.

These peer-to-peer learning and benchmarking partnerships have accorded NCWSC valuable learning lessons and successes which this presentation intends to highlight. Firstly the tag of mentor and mentee in the WOP programme can be misleading as each partner has valuable lessons to learn from each other.

Secondly ownership of the programme among staff within the Utility is a major contributing factor to the success of the programmes. It is through this ownership that the programme is driven from the confines of the boardroom to the trenches of the utility.

Thirdly sustenance of the programme relies on how closely the programme relates to the Utility's day to day activities. This progressively builds and leads to new ways of doing things within the Utility.
Within NCWSC, the WOP programme has contributed to the achievements of;

- Reduction of NRW from a baseline of 39% to an average of 38% at the end of the PIP
- Increase in water sales from an average of 10 million m3/month to 10.3 million m3/month representing an improvement of 3%.
- A steady improvement in NCWSC's Meter Reading Efficiency
- Improvement in Customer Perception Level
- Formulation of an Asset Management Policy
- Knowledge sharing on a Peer to Peer basis and capacity building through trainings and bench marking.

Presentators

SUB THEME	GOVERNANCE AND TOOLS FOR IMPROVING PERFORMANCE OF UTILITIES
SUGGESTED TOPIC	Water and sanitation operators' partnerships
AUTHOR	Simeon Kenfack[1], Peter Akari[2] et Sylvain Usher[1] 1) African Water Association (AfWA) 2) Independant consultant (ex- AfDB staff)
COUNTRY	CÔTE D'IVOIRE
TITLE OF THE DOCUMENT	WATER OPERATORS' PARTNERSHIPS PROGRAMME IN AFRICA: WHY MAKING A PARADIGM SHIFT FROM LEARNING TO MORE INVESTMENTS TO IMPROVE PERFORMANCE IN WATER AND SANITATION SERVICE PROVIDERS IN AFRICA

Access to safe water remains a major challenge for most African countries. The quality and coverage of services by water operators are inadequate mostly because of poor performance and this situation is worsened by a rapid population growth and sprawling and uncontrolled urbanization. The AfWA-WSP's report on the performance of urban water utilities in Africa for the period 2006-2009 highlighted sectorial gaps which included: low coverage of water and sanitation supply services, high rate of non-revenue water, low cost recovery rate, low coverage ratio and low service continuity. In 2006, United Nations Secretary-General's Advisory Board on Water and sanitation recognized the huge challenges facing urban water supply and sanitation services and consequently recommended the WOP approach (Water Operators' Partnerships) - which fosters capacity building and knowledge sharing through partnerships of water and sanitation operators - as an effective means of improving the performance of the operators and fast-track progress in achieving the MDGs for water and sanitation services.

In 2008, the WOP Africa programme was launched with the aim at (i) fostering the development and improving the performance of water operators in terms of sustainable access to drinking water and sanitation services in Africa, (ii) overseeing data collection, analysis and comparison of the water operator's performance through selected performance indicators. In 2009, the pilot phase (2009-2014) of the programme was launched under the auspices of the African Water Association (AfWA) with joint funding from the African Water Facility and USAID. At the evaluation in March 2015, the pilot phase succeeded to (i) establish a programme coordination secretariat at the

AfWA's headquater in Abidjan, Cote d'Ivoire, (ii) establish and implement 17 partnerships between water and sanitation operators and (iii) collect data on the performance of water and sanitation operators in Africa for the 2011-2013 period. At the same time, some major trends of the sector was confirmed such as the need to (i) reduce wastage, (ii) improve the quality of services, and (iii) secure operators' cash flows in order to improve their performance. Inadequate communication about WOP's good practices and low level of ownership of lessons learned were also noted.
Although the pilot phase projects established partnerships between mentor and mentee utilities resulting in the preparation of performance improvement plans to address the shortcomings cited above, due to poor financial situation of these utilities, the implementation of most plans have unfortunately stalled. Hence, the need of reviewing the overall operational strategic of the programme has become necessary. This challenge could be addressed during the implementation of its new strategic business plan 2015-2019, considering that, with the huge number of WS operators existing in Africa, if the sole approach of peering utilities was to be followed, the Africa continent will again failed to achieved the sustainable development goals!

Some notable changes in approach are so far to be considered such as:

- To build long-term partnerships extending over at least 18 months instead of 10-12 months as in the past
- To promote strong partnerships to address the sanitation challenges, particularly in fecal sludge management
- To elaborate bankable projects for each partnership to enable the recipient company to implement its performance improvement plan
- To organize every year a round table of donors around the bankable projects elaborated in the course of the programme
- To collaborate with the African Water Academy for organizing high-level training (master classes) on the key themes identified within the WOPs while including companies other than those directly involved in WOPs
- To Promote the culture of capitalization of best practices through the production of factsheets and documentary films on WOPs success stories

Keywords: ***WOP, bankable project, master classes, performance improvement plan, strategic business plan, non-revenue water, capacity building, fecal sludge management, sanitation, water supply ; sustainable development goal ; Africa continent.***

- Room Lenana : GENDER AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	GENDER AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION
AUTHOR	SORO Doba
COUNTRY	CÔTE D'IVOIRE
TITLE OF THE DOCUMENT	FEMINIZATION OF THE MANAGEMENT OF WATER POINTS AND SUSTAINABILITY OFTHE ACHIEVEMENTS IN RURAL COMMUNITIES IN COTE D'IVOIRE

Drinking potable water remains a major challenge in the world, especially in rural communities. «Water is the master of life and death,» they say; but it must be recognized that people living in Sub-Saharan Africa do not have enough to drink to satisfy their thirst.
Côte d'Ivoire has not been spared by this situation which prevails in Sub-Saharan Africa. Indeed, a large segment of the population, especially in rural areas, have no access to drinking water. The proportion of households with access to drinking water was 46% in 1998. In 2009, in terms of level of drinking water service, nearly 13.6 million people in the country, including 8.2 million in urban areas and 5.4 million in rural areas, experienced severe disruptions, and even interruptions sometimes, in the supply of drinking water.
Such a situation leads to dramatic consequences at the health, social and educational levels.

The access to drinking water has become an important issue for all of humanity to the extent that international authorities have included it in the Millennium Development Goals (MDGs), which consists in halving by 2015, that is, this year, the proportion of people without sustainable access to safe drinking water. In 2015, many challenges remain.

Côte d'Ivoire understood very early that requirement and has

developed, since the early years of independence, a drinking water supply strategy that has performed satisfactorily over the years. This policy, marked by innovative reforms, has enabled, depending on the context, the structuring of the needs into three (3) sub-sectors: urban water (HU), rural water (HV) and improved rural water (HVA).
However, endogenous and exogenous factors in the sector, particularly the debt burden of the State vis-à-vis the leaser (Water Utility of Côte d'Ivoire (SODECI)), the investment deficit for more than two decades and the socio-political crisis in the country, caused important challenges over the last decade.

Right after the post-election crisis in 2011, the Ivorian government realized the magnitude of the situation and launched an extensive pump repair operation between 2012 and 2013 for the populations in rural areas. This campaign helped to repair more than a thousand pumps for about three million people living in rural areas (M.I.E.: 2013). At the same time, the National Office for the Coordination of Village Committees for the Management of Water Points (CNC-WMC) had been created by ministerial order (No.012/MIE/CAB dated October 24, 2011). There were two main reasons behind the establishment of this Office: first, address the issue of the communities' accountability in the management of water points by setting up committees (WMC) in order to make village water assets (WMC) sustainable; secondly, empower women, the first people responsible for the chore of fetching water for the family's needs.

How does the feminization of water points management committees contribute to the sustainable access to water in rural communities?

What is the current state, in terms of sustainable management, of water points in Côte d'Ivoire?

What lessons can be learnt for an effective integration model of its kind in the sustainable access to drinking water?

This presentation will strive to answer these questions to make a contribution to the governance of water.

Keywords: ***Feminization, rural communities, water points management committees, sustainable access to water, water governance***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	GENDER AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION
AUTHOR	OTEKPO L. ARMEL Environmentalist Geographer (Young Water Parliament Member)
COUNTRY	BENIN
TITLE OF THE DOCUMENT	GENDER AND INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)

The purpose of this paper is to outline the fundamental relationships between gender and Integrated Water Resources Management (IWRM).
More specifically, the paper focuses on the need for gender in IWRM for development in the water sector and the role of the youth in this sector.

Indeed, sustainable access to water and sanitation in Africa from the perspective of gender is a long process that calls for focus on all the components of society, in this instance, the young generation, to build a better society. Thus, the relationship between old and young, women and men must be based on trust, mutual understanding for a better and joint management of water resources.

The constantly growing population has caused an increased demand for water and uncontrolled management of this resource, which have led to the degradation of water resources (surface and ground water), hence the issues of water availability. Thus, it is important to note that our bad behavior consisting of water wastage, the failure to comply with rules of hygiene and sanitation, water pollution, may significantly restrict our development by 2025, which already seems to explain why Africa has not been able to achieve the MDGs in the sanitation sector. It then becomes important to think about an integrated management of our ponds, lakes, aquifers. The IWRM approach is, according to the Global Water Partnership «A process that facilitates the coordinated development and management of water, land and related resources with a view to optimizing the resulting economic and human well-being, in an equitable way and without compromising the sustainability

of vital ecosystems». The alternative that follows this definition is to find the right balance to manage the «available resources» and «the needs of the people.»
The concept of gender is linked to the role of each player in order to see the relationship and the needs of women and men in a dynamic way according to their various fields of activities and their social context. One of the IWRM principles highlights this: management based on participation. This involves taking on board the various functions and uses of water now and in the future, a management that respects the real costs of the water service and good and fair governance. The role of women in water management, supply and preservation ... This dynamism is supported by various factors in our African context. Physical and mental ability, age, sex, religion, social class and ethnicity are the variables. Thus, the gender approach in IWRM advocates equality between women and men and the opportunities to access resources, goods with a social value, and to control them. It provides an opportunity to create change in the management of water resources in a fair manner to maintain the multifunctionality of water. The strategy is to ensure that the problems and experiences of the various social strata (men/ women; girls/boys, old/young, physically disabled/able-bodied ...) are taken into account in the design, implementation, supervision and evaluation of policies and programs in all political, economic and social bodies so that all benefit in an equal manner and inequality is eradicated; that is, an institutional framework that seeks collaboration between all stakeholders and water users.

Finally, our role, we, young people in this sector, is to be aware of the water, water users, grassroots communities and women for a better implementation of the best practices, to be informed on issues related to water and sanitation, to adopt good behavior and the rational management and water protection and to invest in the awareness-raising of our peers.

Keywords: ***IWRM: Integrated Water Resources Management; rational management, water multifunctionality***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	GENDER AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION
AUTHOR	GUEYE Awa Doctorat student, Laboratoire LEIDI UGB (Senegal), Hydroscience Montpellier (France), Member of the Scientific and Technical Committee of AJPEAS DIATTA Mohamed Cherif Bassirou Cissé Ph D, Hydrology and Water Social Management, UCAD (Senegal), Research Fellow at Laboratoire Société Environnement Territoire UMR 5603 CNRS/UPPA (France), President of the Scientific and Technical Committee of AJPEAS
COUNTRY	SENEGAL
TITLE OF THE DOCUMENT	THE GENDER DIMENSION IN WATER SECURITY AND SANITATION: SHARED EXPERIENCES BETWEEN RURAL AREAS SENEGAL AND BURKINA

In countries of the South, it is generally recognized that women and men contribute differently, and often unequally to the management of water and sanitation. Social organization gives women and girls the role of the main providers and managers of water in the households but also the responsibility of the hygienic conditions in the homes. They are therefore most affected when water is not available, and they are forced to go far to access the resource. But the lack of sanitation facilities frequently puts them in danger when they are have to wait for the night in order to go and relieve themselves in remote places out of sight. Standardized offer, the failure to taking into account the specific needs in accordance with the sex and local realities prevent the sustainable management of water resources and sanitation. The gender dimension is very often perceived when the project does not work. The purpose of this paper is to highlight the specificities of the roles and consequences when the gender approach is not included in rural water security and access to sanitation for all. The results are from the parallel experiences of two geographical areas: Senegal and Burkina Faso. They offer an interesting reading grid on the use of this approach, will help managers and project planners to identify, through a gender analysis, the important differences between the roles and responsibilities of women and men and the consequences which affect them differently. These results help to get information to make development programs and projects in sustainable water and sanitation management more effective.

Keywords: ***Gender, water, sanitation, Senegal, Burkina Faso***

- Salle Expo 1 :- SMART METEOROLOGY SYSTEMS
- INNOVATIVE AND SUSTAINABLE PAYMENT SOLUTIONS

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart Metrology Systems
AUTHOR	David N. Mburu Business Application Manager Nairobi City and Sewerage Company Ltd (NCWSC)
COUNTRY	KENYA
TITLE OF THE DOCUMENT	LEVERAGING ON TECHNOLOGY FOR BUSINESS GROWTH_ WIRELESS-WEB ENABLED METER MANAGEMENT SYSTEM.- MOBILE FIELD ASSISTANT(MFA)-CASE FOR NCWSC

The Kenyan water sector has been undergoing extensive reforms anchored on the Water Act No. 8 of 2002 which saw a transformation of water service provision from direct government administration and management towards commercialized “water service providers”. In practice, the newly incorporated water companies generally adopted assets and staff from the prior local government entities, inheriting non-commercial processes, poor monitoring systems and challenges in business data management such as asset registries, metering and billing that have negatively impacted business efficiency and productivity.

In its latest annual IMPACT report, the Kenyan water sector regulator (Water Services Regulatory Board (WASREB) rated both urban and rural water service providers’ overall metering ratio, non-revenue water and water coverage as “not acceptable” (IMPACT 2014 Report, Table 2.1). Limited financial resources and human capacity have prevented water utilities from adopting mechanisms in their endeavors to enhance business process to curb losses and inefficiencies.

Nairobi City Water and Sewerage Services Ltd (NCWSC) embarked on tackling the seemingly hefty challenge of a) reduction of commercial non-revenue water and b) accurate data collection and analysis in meter reading and revenue enforcement. The distinctive approach leveraged on affordable, agile technology that could be easily installed within the existing organizational and infrastructural setting.

NCWSC commissioned a local Kenyan vendor (Wonderkid Multimedia Ltd) to supply, install and maintain a mobile to web solution dubbed the "Mobile Field Assistant" (MFA). The MFA enables near real time transmission of meter reading data/revenue enforcement from the field to NCWSC's regional/HQ offices for processing and analysis. Field staffs are equipped with locally sourced smart phones to collect information on meter readings, geo-referenced location of households and photos of meters. It supports extended work process functions, for example an automatic routing system is incorporated as part of the software and meter readers are presented with a route plan.

The result of the automation of the collection and processing of data created ripple effect in several areas. Management is empowered having access to accurately monitor the layout and state of the meter network. Furthermore, team leaders are able to monitor the performance of their field teams. Prescribed task management procedures embedded in the system enable the resolution of anomalies, securing the continuous billing of our customers.

From a technical stand point of view, the MFA is a business critical application that cannot afford incidences of network downtime. NCWSC has invested heavily in infrastructural hardware to cater for the multiple applications that are hosted in our data center. However, for utilities with limited financial resources the advent of web-based applications such as the MFA provides utilities with varied options such as cloud based services inevitably reducing investments in hardware (data centers).

The ICT directorate has been at the forefront of guiding the implementation of the MFA, through the formation of a dedicated project team with representation from all relevant departments. The project team is accountable for the implementation and reporting on the project. In addition to the project team, existing internal support structures within the company provide easy to access support to users. Designed to be a decentralized format, the ICT support staff are located at regional offices of the company. These key human capital elements have lead to the success of the project.

KEYWORDS: ***Non-Revenue Water, Meter Reading, Revenue, Enforcement, Productivity, Mobile, ICT, Data, Technology***

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart Metrology Systems
AUTHOR	Eddie Sendikwanawa, Department of IT,
COUNTRY	UGANDA
TITLE OF THE DOCUMENT	OPTIMIZATION OF WATER SMART METERING SYSTEMS POTENTIAL WITH CELLULAR M2M COMMUNICATIONS. A CASE OF NATIONAL WATER AND SEWERAGE CORPORATION, KAMPALA, UGANDA

Water Smart meters are electronic devices which have advanced metering infrastructure (AMI) which support the real time measuring of water consumption. Smart Meters help modernize the water distribution network by providing the ability to remotely monitor and transfer consumption and water quality information more frequently and reliably. This allows utilities to work both behind the scenes and with their customers to manage the distribution network more efficiently.

As modern water utility functions and procedures become more automated, more organizations are turning to wireless machine-to-machine (M2M) communications. M2M technology allows private and public organizations to monitor and control telemetry systems, sensors, meters, industrial equipment, and virtually any other system remotely and cost-effectively. As a result, utilities can more efficiently manage water consumption, water thefts, billing data and dozens of other remote systems and applications, even in the most hard-to-reach locations. Cellular M2M solutions reliably connect sensors and monitoring devices for a broad range of applications. In the past, while many utilities relied on cellular technologies to connect concentrators and industrial sites, they used other communication networks to connect the meters themselves. Now, as cellular technologies have advanced and carriers have introduced more attractive rate plans, more and more suppliers are deploying wireless WAN solutions all the way to the meter. Cellular WAN solutions offer a number of advantages for Smart Metering deployments including lower communications infrastructure costs and significantly reduced installation costs and implementation times for smart metering projects.

In the past, while many utilities relied on the automatic meter reading (AMR), the straightforward capture of readings from meters at customers' premises,

to advanced metering infrastructure (AMI), which gathers information with greater frequency and variety, the concept of smart metering has not been fully realized. Water utilities today are increasingly seeking to automate processes and monitor equipment remotely. For a broad range of companies, the ability to collect data and control systems in real time can unlock significant benefits, increasing efficiency and productivity, lowering costs, and improving safety and security. Now that cellular technologies have advanced and carriers have introduced more attractive rate plans, integration of cellular M2M connectivity into the operations of smart metering can play a central role in achieving these benefits.
The main objective of this study is to improve the performance of water Smart metering systems by integrating cellular M2M communications which results into real time response and improved service delivery by utilities.

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Smart Metrology Systems
AUTHOR	Innovative and sustainable payment solutions
POSITION / ORGANIZATION /COUNTRY	MARKETING AND CUSTOMER MANAGER / SODECI / COTE D'IVOIRE
TITLE OF THE DOCUMENT	CHANGES IN THE WATER BILL PAYMENT FROM CASH TO ELECTRONIC PAYMENT :THE EXPERIENCE OF SODECI

Established in 1960, the Société de Distribution d'Eau de Côte d'Ivoire (Water Utility of Côte d'Ivoire) (SODECI) has experienced more than 50 years of changing behavior from its customers regarding the payment of their water bills.

- For a long period, the cash payment at the counter was the general rule whatever the customer's category. Checks were however used as early as 1960 by a few large traders and industrial companies in Abidjan;
- Gradually, payment by checks developed, but for about 30 years, this payment method was only for high invoice amounts (business customers);
- In the 1990s, advances in computer applications and densification of communication networks provided the opportunity to introduce the so-called ''moving'' receipts (possibility to pay one's bill at counters located

elsewhere than in one's place of residence);

- From 1992, the opportunity was given to pay by check irrespective of the invoice amount and the share of this payment method increased significantly;
- Since 2011, new technological advances and lower communication costs have enabled the emergence of a third generation of payment tools; now the customer can pay his bill:

o At bank counters,
o At partners' points of sale,
o By phone (fixed or mobile)
o By Internet,
o Via partner networks.

These payment methods are available 7 days a week and 24 hours a day whatever the geographical location across the country.

These new methods of payment which ''dematerialize the supplier-customer contact'' appear altogether as a break with the provisions adopted so far, but mostly this will require SODECI to build a new type of relationship with its customers.

I. PROBLEM

In countries with low bank account penetration rates like Côte d'Ivoire (14% Source: Treasury Directorate General in 2014), the context is strongly influenced by the culture of the species. Furthermore, in general, the public water and electricity utilities are often the last to be paid by their customers. Thus, at SODECI, 98% of the payments are in cash and 80% are on the deadline, that is, at times of large crowds at SODECI counters. There is therefore a congestion that causes a huge inconvenience to customers.
How to eliminate the long lines at the counters when bill payment time comes?
And how to improve the quality of service to customers and the efficiency of the recovery of bills 24 hours a day, 7 days a week, regardless of the geographic location?

II. OPPORTUNITIES FOR A DRINKING WATER PUBLIC SERVICE

Two facts can be referred to to attest to this opportunity:

- The explosion of mobile phone use in Côte d'Ivoire and its various

specific uses,
- The development of the banking network.

From its customer satisfaction surveys, SODECI very early identified an increasingly higher demand from customers, which imposed to the utility an approach that is innovative, flexible, and capable of responding effectively to customer expectations.
Had it not been for the socio-political crisis that shook COTE D'IVOIRE for a decade, SODECI would have launched this process well before 2011, but the context forced it to wait. It has therefore been four years since the utility started investing to offer its customers new services consistent with the realities of a changing society.

III. IMPLEMENTATION OF CHANGE

In Côte d'Ivoire, the advent of Information and Communication Technology (ICT) has led to a transformation of the public space, notably through the explosion of the use of mobile telephony.
To make the most of this situation to the benefit of SODECI, technical and organizational changes are necessary in order to adapt the services to the needs of the people on the one hand, and secondly, to change the behavior of customers in order to switch from traditional methods to new ways of paying the bills (NMPF), which are modern and safe for customers.
But in a context strongly influenced by the culture of the species, how did we go from the physical to the virtual payment or even to the electronic payment? Who are customers who use these new ways of paying bills (NMPF)? Why do all the clients not choose these new services?

IV. EXPERIENCE FEEBACK

After the first experimental phase that lasted thirty months (six months pilot and twenty-four months of contractual exclusivity with two partners), which gave satisfactory results and ended on April 30, 2014, and given the interest elicited among customers by these new payment methods, SODECI opened the NMPFs to four (4) other service providers (always from the ICT and banking sectors) that can provide the service in accordance with the specifications.
Thus at the end of April 2014, the utilization rate was 26.26% during busy periods. It must be noted that some Regional Directorates such as Yopougon (42.24%), Daloa (39.03%), Abidjan South (37.72%), Gagnoa (35.80%) and Yamoussoukro (32.95%) exceeded the initial target of 30%.

Nevertheless, one must note some reluctance on the part of some customers, especially because of the persistence of cybercrimes or their lack of knowledge about ICTs.
Consequently, in order to achieve the new general target of 50% and make NMPFs a sustainable solution, it is important to strengthen communication and implement a marketing action plan with the partners.

V. PROSPECTS

This type of process must certainly be built on a more or less long period before a critical mass of users is reached, but it opens up new prospects for customer relations/public water service for improved customer relations.
The ownership and sustainability of the use of these new methods of payment call for the building of a close relationship made of reciprocal and mutual trust between providers and users.
Finally, the need to adapt to these new payment methods involves a new mindset among the staff, a new mode of management and staff trained to deal with them.
Beyond the applications related to the settlement of invoices by electronic means, the speed of technological changes with the advent of connected devices (Smart Grid), opens up a new world in general to public drinking water services particularly .... It up to us to adapt to it!

- Room Expo 2: POLICIES AND INSTITUTIONAL FRAMEWORKS FOR SUSTAINABLE SANITATION IN AFRICA - APPROPRIATE TECHNOLOGIES FOR PRIVATE SEWAGE DISPOSAL

Presentators

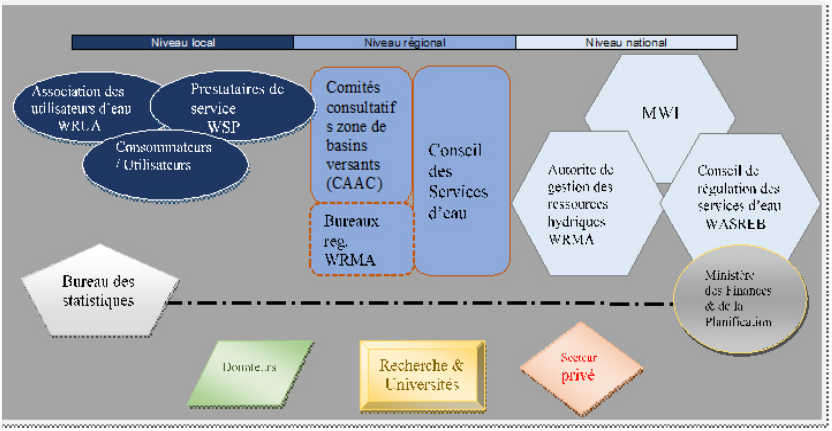
SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Institutional Development and Capacity Building for Water and Sanitation
AUTHOR	Eng. Wangai Ndirangu and Eng. Sabine Sibler
COUNTRY	KENYA
TITLE OF THE DOCUMENT	KNOWLEDGE MANAGEMENT IN THE WATER SECTOR – HOW TO CLOSE THE GAPS?

Every successful company bases its decision on actual facts or as Bahram Meihami states, that knowledge and technological innovation are the basis of competition and the most important factor for a company's survival. While it is relatively easy to collect data for one single company, it is much more complex to collect, review and analyze data for an entire sector with a variety of stakeholders, all of them with individual and sometimes different goals. Knowledge management must be planned, structured and provided with sufficient resources so that it can be integrated throughout the organisation cycle. While knowledge and capacity development takes time and can easily be overlooked but when it is applied it brings great returns. To effectively share knowledge a secure learning environment with space for questioning and reflection is required. This makes knowledge management a multidimensional and multidisciplinary concept.

This paper takes a look at the case of Kenya's water sector focusing on the importance of obtaining and disseminating high-quality water-related data as a central theme, while analysing the complex system of stakeholders and their different approaches taken to water security, provision and waste water treatment. A successful KM must, on the one hand, capture and share experiences in order to incorporate existing trade-offs between social groups as well as different uses of natural security resources, it needs to reflect on technological innovations and a strong completion between sectors (e.g. Water-Food-Energy), and on the other side must also focus on the

contextualisation and adaptation of those findings. Through careful analysis it is possible to identify and determine what knowledge and capacity is related to the development of those goals.

The graph below gives an overview of all the stakeholders involved within the water sector in Kenya on local, regional and national levels. All of which have individual data managements, but managing water resources often requires data that resides outside water sector institutions (e.g. economic, environmental and/or social data). For example, it is important for water utilities to be aware of the population growth rate or the industry establishing in their region. This influences the abstraction rate, the implementation of new household connections, an increase in wastewater and therefore a potentially bigger wastewater treatment plant needs to be built, and the financial planning and budget must reflect these developments. Information and data to plan efficiently and accurately must then come from authorities and/or institutions, such as: e.g. National Environmental Agency (NEMA),



Bureau of Statistics, Ministry of Finance and planning, etc.
This paper is designed to introduce a KM approach and how to close gaps that need to be addressed in order to allow for an efficient knowledge transfer. It provides ideas how to implement management instruments (e.g. assessment, information, allocation of instruments), how to create an enabling environment (e.g. legislation, regulation), and how to set up an efficient communication network between public and private stakeholders as well as between national and local stakeholders.

The data is based on KM workshop held in Nairobi at the Kenya Water Institute (KEWI) in March 2015 that analysed knowledge processes, choice

of appropriate IT skills for Knowledge Management, Implementation and maintenance of knowledge networking and development of orientation and attitude building skills for knowledge management. Finally the workshop introduced Knowledge Value Chain and evaluated its key processes and managerial variables.

KM-Scan for all participants (N=25), exemplified where knowledge comes from, different types of knowledge networks, what the drivers are behind collaboration, what knowledge networks exist in the water sector, how knowledge networks 'work', and what the relevance and benefits are of engaging at individual and organisational levels

Total overview ALL (n=25)

		Determination of necessary knowledge	Cataloguing available knowledge	Development of (new) knowledge	Sharing of knowledge	Application of knowledge	Evaluation of knowledge
Average	44	3.71	4.01	3.15	3.35	3.35	2.58
Culture	3.06	45	49	39	41	41	32
KM-Strategy	3.47	51	56	44	47	47	36
Management style	3.72	55	60	47	50	50	38
Personnel	3.47	51	56	44	47	47	36
Systems	2.98	44	48	37	40	40	31
Structure	3.08	46	49	39	41	41	32
		Upto	22				
		Upto	44				
		Upto	66				

Some improvements arising practical exercises, group work and discussions suggested for improvement in Knowledge Management amongst water policy makers and regulators include:

a. Have a clear inventory of personnel, their profiles and qualifications/ skills.

b. Use the inventory above to plan and send staff for training with clear relation to their duties and job improvement plan.

c. Encourage senior staff to willingly share knowledge with junior staff.

d. Apply newly acquired knowledge locally or internationally in day to day activities.

e. Train top management in change management.

f. Have a systematic review and evaluation of knowledge.

The paper presents analysis and areas of potential improvement for the different water sector groups including water utilities, Community Service Organisations, regulators, education and research.

The strategic and systematic long term goal for Knowledge Management in

the water sector is the acquisition, application and dissemination of existing and created knowledge. It is envisaged to:

- ensure an organisation's productivity, adaptation and competence
- center on a collaborative working environment and the means of sharing both explicit and tacit knowledge assets
- use appropriate information and communication technologies ICT)
- foster individual and organisational learning.

So far, Knowledge Management has captured the nature of knowledge (tacit/explicit); the importance of knowledge and innovation and; the rationale for knowledge management.
The next steps for Knowledge Management would be:

- Focus is on the 'Knowledge Value Chain' that needs to be managed
- Cutting through complexity & suitability for the water sector.{M. Weggeman (2000)}
- Knowledge Management Landscape: range of approaches and theories
- To apply Knowledge Management to: individual level, group level (department, research group, etc.), organisational level and national levels. {Source:UNESCO-IHE}.

keywords : ***Knowledge Management, Knowledge Managament Cycle, Water Sector***

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Policies and institutional frameworks for sustainable sanitation in Africa
AUTHOR	Mame Penda THIAM SEYE, Environmentalist, Project Manager at the National Sanitation Office of Senegal
COUNTRY	SENEGAL (DAKAR)
TITLE OF THE DOCUMENT	ENVIRONMENTAL ASSESSMENT OF SANIATION PROJECTS: CONSTRAINT OR SUPPORT IN THE EXECUTION OF LARGE SCALE PROJECTS (CASE OF THE HANN BAY CLEANING UP PROJECT)

The environmental assessment of projects/programs meets the requirements of the Senegalese legislation. The Environmental Code of Senegal, in Article L48, states that «any development project or activity likely to affect the environment, as well as policies, plans, programs, regional and sectoral

studies shall be subject to an environmental assessment.» In addition, Decree No2001-282 dated April 12, 2001 on the implementation of the Environmental Code provides for, in Title II, «the requirement for any investment program to conduct an environmental impact study». The objective is to take into account all the environmental concerns in the decision-making of the authorities and in the implementation of the projects. The ESIA leads in fact to an ESMP that includes all the measures to mitigate negative impacts, compensation measures for residual impacts and optimization measures for the positive impacts identified during the different phases of the project. The ESMP also defines the responsibilities, modalities and implementation costs of each proposed measure. A supervision and environmental monitoring plan for all these measures is also established.

Key elements of the ESIA include the participation of the public, which materializes the participatory approach. This takes place throughout the implementation phase of the ESIA and the Consultant must demonstrate understanding for the rights, interests, values and concerns of stakeholders, recognize and respect them in the planning of the proposed measures and activities. However, this «perfect» theory has some weaknesses in practice and its approach is often biased. We will focus on a case study of the Hann Bay cleaning up project as an illustration.

The ultimate objective of the PDBH is to succeed in collecting all wastewater discharge both domestic and industrial, via an interceptor before being treated at a wastewater treatment plant and discharged into the sea through a 3km long drain. This project aims to restore the quality of the bay and consequently restore the sanitary, environmental, socioeconomic state of old. Since the project has an environmental aspect, it underwent a thorough impact assessment as required by the Senegalese regulations.

Only this ESIA appears today as a major constraint in the implementation of the project. Indeed, the detrimental tendency to use it as a catch-all takes away all its strategic importance. The greed of the actors consulted as part of public consultation raises a problem as each player feels he must find his benefit in the project and therefore his institutional or community order and sometimes even personal concerns must be met. ONAS, the project owner and state-owned industrial company, is responsible for the quality of its wastewater discharges treated. Yet, it cannot financially assume control of the quality of the receiving environment that is the Bay, especially since this component is an integral part of the mission of other state institutions. Moreover, it would be foolish, even unfair, to want to charge the project with a possible degradation of the infauna, to name just that. It is clear that the elimination of direct discharges of sewage into the bay, the project's purpose, does not exclude the fact that there is rampant pollution because of solid wastes and because of civic irresponsibility.

It thus appears that the participatory approach as advocated in environmental approaches often tends to empty the ESIA of its purpose. Personal or sectoral concerns far outweigh those of public interest, to the extent that sometimes people want to challenge or want to block the implementation of the project. The highlighted high costs of the implementation and monitoring of the ESMP leads to too high budgets, often with an overestimation of the figures.

The budgets allocated to the operation of ONAS's asset is very insufficient to cover them. The costs of implementing the environmental measures in the operational phase cannot be borne by such budgets. Engineers specializing in project management thus see the ESIA as a major and unavoidable constraint in the implementation of sanitation projects and programs.

Thus, since the institutions responsible for the implementation of such projects are State bodies, the situation often lies in providing the means to carry out the environmental assessments leading to a well-defined ESMP adopted by all stakeholders to obtain an environmental compliance certificate authorizing the start of the work. However, the recommended environmental management measures are never applied except those proposed in the construction phase and whose implementation is borne by the companies. This scourge is aggravated by the severe shortage of logistics means of the bodies in charge of the environment. Thus, these bodies cannot carry out their mission, which is to supervise and monitor the environmental management measures, to the extent that the threat of lawsuit against public bodies is almost zero.

This largely calls for a reconsideration of the process to avoid the inapplicability of the regulations on environmental assessments. Thus, it is not pretentious to turn to innovations, but in a smart manner, with a rationalization of the measures and implementation costs of the ESMP.

The prerogatives of the approved consultants should then be reviewed for an ingenious analysis and a fair retention of the concerns of the actors involved in the participatory approach. Also, the DEEC should ensure that the ESMP does not takes into account exclusively the impacts related to the implementation and operation of the assets to be built under the project. Thus, the residual impacts will be offset as much as possible and, in consultation with the asset owner, by mitigating measures for local residents.

So the point will no longer be to encourage the desire to resolve all the environmental ills of a community through a project which then may exacerbate them if they are not taken into account. State bodies must, above all, attend to the respect for the environment, an essential aspect for the success of projects.

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Policies and institutional frameworks for sustainable sanitation in Africa
AUTHOR	Saad AZZAOUI – Assets Director – Lydec – SUEZ environnement
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	CHALLENGES RELATED TO THE SANITATION OF GREATER CASABLANCA

Casablanca is experiencing a rapid urban development of about 350 ha/year. Subdivision projects flourish and nibble newly opened urbanization areas. This urban expansion has resulted in increased wastewater discharges and in strong soil sealing. This urban development should be supported by wastewater and storm water infrastructures.

The sanitation activity of Lydec has several objectives, including:
- Preserving the environment and the health conditions of Greater Casablanca residents,
- Preventing and fighting against floods.

In order to provide continued service to Casablanca dwellers, Lydec is managing and developing more than 5,000 km of collectors, made up of unitary and separate sewer systems for wastewater and storm water for the sanitation of Greater Casablanca.

The company must ensure wastewater treatment in compliance with the contractual criteria for treatment and connection rates, and sanitation for rainwater in accordance with the contractual criteria for the resilience against precipitation (decennial return of rain).

The 2009 SDAU introduced a new urban development strategy for 2030. Eventually, the urbanized area of Grand Casablanca will double.

The Greater Casablanca is divided into two major watersheds, West and East, and four peripheral watersheds: Mansouria, Ville verte de Bouskoura, Médiouna and Nouaceur.
In 2030, the water consumption of Greater Casablanca will increase from 193 million m3 in 2009 to 288 million m3/year, that is, an increase of 57%.

The increase in consumption, and therefore discharges of wastewater on the land of Greater Casablanca increase the volumes of wastewater that must be routed to the only natural outlets that are the wadis and the ocean. The necessary increase in collection and treatment capacity requires then, in the extension areas, additional infrastructure. For the existing network, this implies a strengthening of the already installed infrastructure.
The opening of new urbanization areas leads to the growing sealing of the soil of Greater Casablanca and thus increases the volume of rainwater that must be channeled to natural outlets (wadis and ocean). The necessary increase of the collection and discharge capacity of the rainwater then requires, in the extension areas, additional infrastructure by limiting inputs to the existing one.

- Lead rain water to the ocean for coastal zone extension (1,020 km of linear extension)
- Build storms basins for extension areas remote from the coast (5.4 million m3, 192 ha of land)
- Remove overflow areas by building large sanitation galleries (31 km linear extension)

Currently, the rate of connection to wastewater collection networks and rainwater is 87%. The objective is to generalize the connection to the collective networks to reach 100%. To this end, Lydec is working closely with the authorities on an action plan to connect all unserved subdivisions: it provides for the contribution of beneficiaries, which represents only a symbolic contribution of the real cost of that connection.

Lydec is meeting the wastewater challenges through several major assets:

- Anti-Pollution System of the West Coast – 2 million equivalent people;
- Médiouna wastewater treatment plant - 40,000 equivalent people;
- Anti-Pollution System of the East Coast - 2.5 million equivalent people.

Today, the coastline of Casablanca enjoys a pollution cleaning rate of 100%, thanks to Lydec's structuring and additional projects: indeed, the protection device for transferring sewage from the west coast of Casablanca to the El Hank pretreatment station, supplemented by the Anti-Pollution System that drains wastewater from the eastern part of the coast to the pre-treatment station of Sidi Bernoussi, offers ultimately a total clean up.

Keywords: ***Sanitation, wastewater, storm water collectors, pollution control, assets, urban planning***

Presentators

SUB THEME	SANITATION AND ENVIRONMENT
SUGGESTED TOPIC	Appropriate technologies for private sewage disposal systems
AUTHOR	Simeon Kenfack[1], Hector Kpangon[2] et Jean Malomon[3] 1) African Water Association (AfWA) 2) Water and Sanitation for Africa (WSA) 3) Independent Consultant (former WSA Country Representative to Benin)
COUNTRY	CÔTE D'IVOIRE
TITLE OF THE DOCUMENT	PRIVATE SEWAGE DISPOSAL TECHNOLOGY OPTIONS ADAPTED TO HYDROGEOLOGICALLY DIFFICULT AREAS OF BENIN: CASE LACUSTRINE AREAS, BASEMENT AREAS AND HYDROMORPHIC SOIL AREAS

Water and sanitation are essential to the preservation of public health and to environmental protection. According to studies conducted by Estrey et al, 1991, and Fewtrell et all, 2005, improved access to sanitation would reduce over 30% cases of diarrheal diseases, which are responsible for the death of over 2 million children under 5 years per year according to the WHO. In the race to achieve the Millennium Goals in sanitation, the most promoted technological approach in the world in general, and Africa in particular, has been the construction of latrines and, for the most part, Turkish pit latrines. However, it turned out during the implementation in some countries that this type of latrines is not necessarily suitable for all hydrogeological and/ or sociological contexts. Thus, as part of its multi-annual support program for the Water and Sanitation Sector (PPEA) in Benin, the Royal Embassy of the Netherlands developed, and took into account the research component of, appropriate technologies in areas with difficult hydrogeological conditions such as lacustrine areas, hydromorphic soil areas and basement areas, with the Government of Benin, for the 2010-2014 period,. Following an action-research project entrusted to CREPA Benin, supervised by CREPA headquarters and conducted in three regions of Benin, technological options tailored to each of these areas were proposed and tested.
Indeed, the overall objective of this research was to determine the appropriate sanitation technology options for the poorest communities living in areas with difficult hydrogeological conditions.

Specifically, the research consisted of:
- Identifying and proposing technological options that meet private sewage disposal needs in hydrogeologically and sociologically difficult areas,
- Gathering information about these technology options and testing their implementation to increase knowledge of their functioning;
- Addressing the weaknesses (ability to protect the groundwater and

the environment, to facilitate draining, compatibility with socio-cultural values, costs, compliance with technical standards, etc.) related to these options in cooperation with the people;

- Recording the populations' proposals to improve these technologies;

After a year of research work in the municipalities of (i) Sô-ava, Aguégués and Ganvie in the lacustrine areas of Benin near Cotonou, (ii) Lalo, Ouinhi Pobè in the center of the country and (iii) Natitingou, Dassa-Zoumé and Bembéréké in the north, 3 technological models of household latrines were developed and offered to users. These include:

1. Floating barge for lacustrine areas,
2. ECOSAN-Bare (above ground) for areas with hydromorphic soil,
3. And ECOSAN latrine for basement areas

Keywords: ***private sewage disposal, hydrogeologically difficult area, lacustrine area, hydromorphic area, basement area, household latrine, environment, diarrheal disease.***

• 11h45 - 13h15

- Room Aberdare : COMMUNICATION AND MARKETING TOOLS TO IMPROVE THE SERVICE PERFORMANCE

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Communication and marketing tools to improve service performance
AUTHOR	Souleymane Ouattara
COUNTRY	CÔTE D'IVOIRE
TITLE OF THE DOCUMENT	KNOWLEDGE MANAGEMENT AND SHARING AS A PERFORMANCE TOOL FOR AFRICAN WATER AND SANITATION UTILITIES

The African Water Association, with the support of USAID WA-WASH program, has established a platform for managing and sharing of knowledge it makes available to the community with a view to promoting good practices and improving African water and sanitation utilities' performance. This is a set of processes and technologies that makes it possible to collect, organize, distribute, share and make knowledge live.

The initiative aims at making useful information available without it been asked for, at responding to users' requests, at making knowledge grow and capitalizing it, and finally at enabling the participation of stakeholders in a «collective performance».

This paper is part of promotion and popularization actions implemented by AfWA, which comprise a series of workshops, the publication of information media widely disseminated within the community, or papers presented or presentations made during important events. All this aims at leading the various players to take ownership of this tool and at giving it a meaning.

The paper will therefore contribute to the understanding of a concept which is becoming increasingly important in the life or organizations.

How to define knowledge? How to collect professional expertise? How to disseminate it? These are so many questions that justify the discussion around this project that will identify the different stages of the creation of a device for sharing by revisiting the issues at stake.

The paper will present the organizational framework put in place by AfWA for managing and sharing knowledge. Then, it will clarify the various planned and modeled processes for the efficient operation of this tool, namely:

- The contribution process or how the interested entities can submit their knowledge;
- The validation process and how the quality of knowledge is guaranteed;
- The storage process or how to ensure the sustainability of the recorded knowledge;
- The sharing process or how to disseminate newly acquired knowledge and make it reusable.

Such a tool, however valuable it may be, is primarily based on the principle of interaction and cannot function without the commitment of the various players. And our goal is to make it clear that the management and knowledge sharing tool will benefit everyone, in that it makes the user community more productive and more efficient.

Keywords: ***Innovation, creativity, knowledge sharing, skills, dissemination of knowledge, development, training, exchange, collaboration***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Communication and marketing tools to improve service performance
AUTHOR	Zainabu Hassan Charity Supeyo
COUNTRY	KENYA
TITLE OF THE DOCUMENT	COMMUNICATION AND MARKETING TOOLS USED TO IMPROVE SERVICE PERFORMANCE-A CASE OF NCWSC

In today's hostile business environment, there is more need than ever for companies to explain why they are here, the rationale and the context. Globalization, democratization of information, the rise of social media and the global financial crisis have forced corporate leaders to reassess the strategic path for their brands and organizations. They do so at a time when the central objectives of communication, reputation and trust, have shifted shape, perhaps irrevocably. Companies in today's business environment: the need for transparency, managing successful organizational change and reputation recovery after a crisis.

The digital age has foreshown generational shift in the way that the communications and marketing and advertising operate. It is increasingly evident that the future lies in full integration of all the communication disciplines.

Objective

The purpose of this paper is to demonstrate how Nairobi City Water & Sewerage Company Ltd (NCWSC) has advanced in incorporating the modern communication and marketing trends to improve its performance and governance within Nairobi County.

The project will also show the importance of fully adopting and implementing the different means of digital communication and marketing tools and its impact to achieving the vision and mission of the Company.

Methodology and scope of work

Communication messages are derived with the target audience in mind to ensure the key message is received and acted upon with the desired results. The communication platforms at NCWSC have evolved over time in terms of disseminating of information and marketing of new products to the customers. The Company has been using traditional means in communication and marketing tools, as well as adopting modern tools to complement each other. It is more notable that real time information is desirable to the more tech savvy customer and the not so tech savvy that relies on updated information as need arises.

In this study, we will focus on the main channels of communication and marketing tools used in NCWSC to improve on the service delivery of the Company:

Communication tools both internal and external stakeholders: Letter heads, Internal memos, Press release, News watch , Emails, Website, Electronic , Print, Social media.

Marketing tools: Shows and exhibitions; Annual Stakeholders meetings, road shows, clinics, Participation in Conferences and Exhibition.

The more conventional means adopted at NCWSC include and not limited to FM Radio adverts & presenter mentions, Printing of corporate t- shirts with the messages, Use of display promotional materials, Use of Push messages to

customers mobile phones and the website.

A SWOT analysis will be carried out to show the strengths, weakness, opportunities and threats of the Company's both internal and external communication and marketing needs that will help identify the factors that will affect the company's future performance.

The study will be carried out by the use of open Questionnaire and online survey.

The use of Digital Media, Broadcast and Print Media

Through growing trends and a more dynamic City consumer of water, digital media was no exception to reach the trendy customer. The need to accommodate the customer who is always online, to answer the need of a mobile customer who needs constant information and to encompass the behaviour of the dynamic customer the company adopted the need of social media to address issues.

Due to the vast spread of information, the Company has used online platforms to market and enlighten it's customers of the new products and services. This has also encouraged customer input for product and/or service improvement as well as building a relationship with the Company.

The response on the use of digital media from customers and commendations is proof that we are providing a service that the customers require as well as detecting the needs they require.

In crossing the currents the water sector can adopt use of digital media to market its product, interact and engage its customers in a more participatory and real time basis as the trend and need of dynamic customers' is instant response to nagging issues.

Water is a vital need and any query on its availability, reliability or supply should be communicated to the customer in a timely manner and electronic media provides the answer. It also helps with the interaction of customers who feel the personal attention in view of a public platform provides assurance.

The case for NCWSC is a success story where we continue to embark on advertising the use of digital media to grow the customer interaction where it can also be used as a tool for customer perception where the application provides a tracking mode for topics discussed and those who have reacted.

The Company has also been able to use the digital media to complement its more conventional communication platforms such as use of broadcast and print media to pass messages.

We have used these platforms to alert customers on supply fail, paying their water bill, checking their water bill online, reading meters, lodging and checking status of their complain online, advertising our new/ or advanced products and services, publicizing our Corporate Social Responsibility and

the response has been very positive from most customers.
In conclusion, the case study of NCWSC and the use of digital media, broadcast and print media will show a means of communication and marketing tools reaching both formal and informal customers of the Company. Kibera is the largest informal settlement in East and Central Africa and the goal is to ensure communication across all residents who are our customers. The ability for both rich and poor to access information through these modes of media.

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Communication and marketing tools to improve service performance
AUTHOR	James Karanja Charity Supeyo Maureen Karugu
COUNTRY	KENYA
TITLE OF THE DOCUMENT	USE OF SOCIAL MEDIA AS A COMMUNICATION TOOL USED TO IMPROVE SERVICE PERFORMANCE-A CASE OF NCWSC

Introduction

The world has moved from the old one way mass communication to large audiences to social networked media communications. As Communicators, journalists & PR practitioners continue to communicate with mass audiences, the strength and character of their message depends in part on the organizations' or individual's social networks and branding. As a consequence of this rapid change in communication technologies, social media has become part of the contemporary classroom, publicity campaigns, crisis communication, political campaigns, advertising & Public Relations.
Just like TV and Radio brought with it opportunities and challenges, so does social media. Social media discussed here in include Twitter, Facebook & YouTube.
With the explosion in online media in the past few years, PR is more important than ever and companies are hiring agencies or staff to manage internet relationships. Intelligent and responsive community management for a brand will often help or exacerbate a PR crisis as it unfolds in real time. When a news story breaks now, it typically happens on Twitter. Broadcast news channels often refer to tweets

as part of their newscast, media live-tweet events as they occur and TV stations put shows on the air with content exclusively based on social media. Social media has hence gone beyond simply sharing, to building reputation and bringing in career opportunities and monetary income for organizations and individuals.

Objective

The purpose of this paper is to demonstrate how Nairobi City Water & Sewerage Company Ltd (NCWSC) is using social media to engage with its customers, and potential customers — on their terms. Social channels are key because stakeholders use these platforms to give feedback on their experiences with our service and products. Social listening tools allow us to pick up on the feedback, and engage with customers without them even directly asking for help. Social media allows us to serve multiple customers at a time and be responsive to all parties unlike the call center where only one customer can be served at a time.

The project will also show the importance of fully adopting, implementing and appreciating the use of social media platforms as a communication tool and its impact to achieving the vision and mission of the Company.

Methodology and scope of work

Communication messages are derived with the target audience in mind to ensure the key message is received and acted upon with the desired results. The communication platforms at NCWSC have evolved over time to incorporate social media to compliment the print and electronic options. It is more notable that real time information is desirable to the more tech savvy customer and the not so tech savvy who relies on updated information as need arises.

The more conventional means adopted at NCWSC include and not limited to FM Radio adverts & presenter mentions, Printing of corporate t- shirts with the messages, Use of display promotional materials, Use of Push messages to customers mobile phones and the website.

A SWOT analysis will be carried out to show the strengths, weakness, opportunities and threats of the Company's both internal and external communication needs that will help identify the factors that will affect the company's future performance.

The study will be carried out by the use of open Questionnaire, face to face interviews, mail/self-completion and online survey.

Use of Social Media in Communication for the better

Through growing trends and a more dynamic City consumer of water, the need to accommodate the customer who is always online, who needs

constant information and to encompass the behaviour of the dynamic customer the company adopted social media to address issues.
The response on the social media from customers and commendations is proof that we are providing a service that the customers require as well as detecting the needs they require. NCWSC has taken up the role to sensitize other water service providers in Kenya to join the social media and activate the customers' appetite in delivering services and more so information.

Water is a vital need and any query on its availability, reliability or supply should be communicated to the customer in a timely manner and social media provides the answer. It also helps with the interaction of customers who feel the personal attention in view of a public platform provides assurance.

The Company has also been able to use the social media to compliment its more conventional communication platforms such as use of FM radio stations to pass messages. Social media will provide a written message that customers can be informed as events happen.
We have used social media to alert customers on supply fail and the response has been very positive. The Social media platform is now adopted to answer to the customers right to complain on service delivery and thus acceptable as an official communication tool.
In conclusion, NCWSC has shown through the Facebook and Twitter handle, the Company is able to gain reach of its customers who are tech savvy and require prompt information, provide real time information to the target customer within a particular time, get real time feedback from the customer, as a platform to publicize notices and supply interruptions real time, to inform and remind customers on products and services offered in the Company and also used to build the image of the Company as a modern and customer focused service provider. It will also show social media as a means of communication reaching both formal and informal customers of the Company since it is now a lifestyle grown from a trend.

- Room Lenana : PERFORMANCE-BASED CONTRACTS FOR IMPROVED ACCESS TO WATER AND SANITATION

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Performance-Based Contracts for Improved Access to Water and Sanitation
AUTHOR	David Schaub-Jones
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	PERFORMANCE BASED CONTRACTS FOR REDUCING NON-REVENUE WATER:SELECTED LESSONS FROM INTERNATIONAL EXPERIENCE

South Africa, as a semi-arid country, is required to invest heavily in primary and secondary water resources infrastructure to ensure that adequate water is available to satisfy its domestic, commercial and agricultural demand. It is estimated that, of this total demand, the municipal water services sector represents 27%.

As the Minister for Water and the Environment made clear in 2013 when launching a study into 'non-revenue water', the sector continues to experience high water losses and leaks attributed to, amongst others, aging water infrastructure, inconsistent metering and billing systems, lack of awareness amongst customers and poor operation and maintenance of water supply systems. She went on to point out that reducing water losses in municipal supply systems is a strategic priority for South Africa's water sector. Not only will it help municipalities meet growing demands, but a reduction in water losses will help to improve municipal finances and also reduce the impacts on the environment.

As has been recognised in many countries, the savings made in addressing non-revenue water can cover the cost of the needed interventions within a few years. Yet the challenge can be quite technical and the skills to take this on do not always reside within public municipalities. For instance, an Asian Development Bank report looking specifically at NRW reduction in 2010 suggested that the

"design of NRW reduction contracts is not simple, and very few specialists currently have enough experience to properly design such contracts" (Frauendorfer&Liemberger, 2010). For these and other reasons, there is growing worldwide interest in performance-based contracts (PBCs) with specialised contractors. PBCs can be used to ensure that targeted results – and value for money - are achieved and that critical skills and knowledge can be sourced from outside the municipality itself.
A recognised obstacle to this approach is the complexity of establishing such performance-based contracts. As such, GIZ, the German development aid implementing agent, with funding from the German, British and Australian governments supported South Africa's Strategic Water Partners Network (SWPN) to develop a standard contract to facilitate the routine implementation of water loss reduction activities. This 'contract template' was launched at World Water Day 2015.
One of the activities undertaken was to review international experience on this issue and this paper contextualises these findings for an AfWA audience.

Keywords ***:Performance-Based Contracts, NRW, South Africa, Municipalities, Water Loss, Public Private Partnership***

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Performance-Based Contracts for Improved Access to Water and Sanitation
AUTHOR	John M Ruhiu Non Revenue Water Manager Nairobi City and Sewerage Company Ltd.
COUNTRY	KENYA
TITLE OF THE DOCUMENT	PERFORMANCE-BASED CONTRACTS FOR NON REVENUE WATER REDUCTION

The realization that water is not a finite resource must drive the need to have it utilized in a most efficient and effective way. In that case Non Revenue water reduction becomes a matter of priority and all efforts must be directed towards the same. One of the biggest challenges for many water utilities in Kenya is the high level of Non-Revenue Water both technical and commercial in nature. With access in Nairobi City being at 77% and water resources being far and depleting fast, there is need to address water loss with the objective of saving for wider

access. Besides, the resources used to supply customers with the much needed commodity must be recouped to support the operations on a full cost recovery basis. NRW reduction is a costly affair and there is need to avail adequate resources to support NRW projects. The manner in which a water utility manages its assets affects the success of a NRW reduction strategy. While various initiatives have been employed to bring down the level of non-revenue[2] water, there exists the potential for projects that could use the performance-based contracting model. Performance based contracting focuses on the goals of the contract rather than how the work is to be performed. The model seeks to improve performance and lower costs through the use of performance based contracts that: (1) describe the requirements in terms of results required rather than specifying how the work is to be accomplished; (2) set measurable performance standards; (3) describe how the contractor's performance will be evaluated in a quality assurance plan; (4) identify and use positive and negative incentives, when appropriate.

To design a credible Performance Based Contract (PBC) addressing the above characteristics, a pilot project has been initiated in Kahawa West to collect data to help in the design of PBCs for NRW reduction projects in Nairobi City Water and Sewerage Company. The study will derive performance indicators (PI) that will inform the design of the PBCs.

1.1 The project area

The area represents a low to medium consumption class. The study pilot area referred to as District Metering Area (DMA) is located in the Northern part of the Nairobi City County. It is geographically located within the jurisdiction of the Northern region, one of the six regions the company is demarcated into. The DMA is served by DN 200 distribution water main tapped directly from a transmission line.
The DMA has 1,000 metered connections.

1.2 Methodology and Scope of the Study

The study area was identified based on the criteria described earlier and a Preliminary study undertaken to identify supply network – GPS mapping and altimetry Surveys. Two suitable locations were identified on the ground where boundary Valves and bulk water meters were installed. Pressure Sensors were installed at selected points to assess the average network pressure while zero pressure tests were conducted to ensure water was supplied from the only two identified points.

Customer surveys and census were conducted to establish who

our customers are in the study area, who are connected to the water reticulation legally or otherwise, who is metered or not, amongst other anomalies. Precision Domestic Water Meters were randomly installed for reading together with the customer meters with readings being used to assess the accuracy level of the customer meters. Water Demand for the Pilot Area was assessed for different consumer categories at the same time determination was made of Minimum Night Flows for leakage assessment.

Presentators

SUB THEME	GOVERNANCE AND PERFORMANCE IMPROVEMENT TOOLS
SUGGESTED TOPIC	Performance-Based Contracts for Improved Access to Water and Sanitation
AUTHOR	Bedel Anicet N'KOSSI Deputy Development Manager of SNDE
COUNTRY	CONGO-BRAZZAVILLE
TITLE OF THE DOCUMENT	PUBLIC-PRIVATE PARTNERSHIP IN THE WATER SECTOR: LESSONS FROM THE CONGOLESE EXPERIENCE

Since its inception in 1967 following the nationalization of the African Public Services Company (CASP), the National Water Utility (SNDE) has been the public operator of drinking water services in the Republic of Congo. It is now present in 21 localities in the Congo.

Despite huge investments by the government in the water sector, access to water remains very low. With its substandard performance in all its business segments (production, distribution, marketing, human resources, finance and compatibility), SNDE has seen the quality of the service provided to subscribers deteriorate over the past decade. To turn SNDE around and allow it to guarantee a quality public service to users, the government, with the support of the World Bank, decided to reform the water sector by developing a participatory strategy with the private sector in the water sector in the shape of a public-private partnership (PPP).

Thus, between 2009 and 2010, SNDE was audited by ICEA-SOGREAH with a view to assessing the state of the water production, storage, distribution, and marketing infrastructures as well as the human resources and finance.

That audit revealed important weaknesses in the sector, including:

- A low coverage rate in the twenty centers managed;
- A discontinuous service;
- The lack of reliable of customer files, with a third of «inactive» subscribers and many undeclared connections;
- Rates that have remained unchanged for 15 years and were the lowest in the region;
- Ignorance of the volumes produced and sold due to lack of metering;
- A situation of bankruptcy with a debt burden corresponding to 10 years of turnover;
- Low staff productivity, 8 agents per 1,000 subscribers, and staff costs absorbing over 50% of the revenues;
- Leaks on the network causing losses accounting for more than 50% of the water produced;
- Uneven recovery for water sales to public administrations, accounting for about 16% of the turnover.

Following this study, the government and the World Bank, through the PEEDU, recruited a private operator, the French group Veolia, following a call for tenders, to support SNDE in its recovery.
To enable the recovery of SNDE, the operator chosen by the PEEDU, Veolia, signed a service contract on January 26, 2013. It was followed by the signing of a performance contract between the State and SNDE on May 7, 2013.
These two contracts are monitored by an interdepartmental monitoring committee assisted by an independent technical auditor.

The service contract:
By this contract, the contractor made available to SNDE four permanent staff and several executives for a support mission to enable knowledge of the water infrastructures and increase the skills of SNDE agents.

Veolia made the commitment to deliver seven (7) products that are as follows:
Product 1: Assistance for the creation of the Development Directorate;
Product 2: Diagnosis and action plan for improving SNDE;
Product 3: A Computerized Maintenance Management System (CMMS)
Product 4: Hydraulic modeling;
Product 5: A Geographic Information System (GIS);
Product 6: Renewal and strengthening program for the pipes and connections;
Product 7: Study of the connections and meters.

Apart from product No. 1, which enabled the new Development Management to become operational, the other products have not been delivered. The reasons were as follows: the lack of funding, the failure to adopt the new organizational chart proposed in product No. 2, chronic delays in the procedures of the World Bank in charge of the trust management of the FRR, the delay in the implementation of the training plan with funding amounting to 2,225,000 dollars. Added to this was the lack of communication about the contract, which put several agents on the sidelines of the change process.

The performance contract:

The aims of the performance contract are:
- Improve the quality of the service provided to users;
- Increase access to safe drinking water for the population;
- Improve the management of SNDE;

The performance contract is based on the commitments made by the State and SNDE.
Under that contract, the State is committed to:

- Granting management autonomy to SNDE;
- Helping SNDE regain its financial balance by applying a new pricing grid;
- Paying regularly the water consumed by the administrations;
- Delegating the project ownership of the water sector projects to SNDE;
- Providing infrastructures;
- Clearing the debts of SNDE.

Only the commitment on the clearance of the debt was met.
As for SNDE, apart from its traditional missions to produce, distribute and market the water, it is committed to:

- Improving its financial and human resources management;
- Improving the quality of the service provided to subscribers;
- Designing a strategic development plan;
- Implementing a 5-year investment plan;
- Implementing a new organization;
- Producing monthly operating reports;
- Establishing contracts with the Regional Directorates;

- Preparing the annual report on the implementation of the investment program.

Difficulties experienced in the implementation of the contracts
To date, the State has not met all its commitments and it is difficult for SNDE to meet the commitments it has made.
The financial difficulties of SNDE do not allow it to finance the implementation of all the measures it has considered to allow its recovery.

Conclusion:

Halfway through the public-private partnership, the lack of financial means and the failure of the State to meet its commitments are the main causes of the probable future failure of that endeavor aimed to putting SNDE back on its feet.

Presentators

SUB THEME	INNOVATIONS FOR INCREASED AVAILABILITY AND IMPROVED ACCESS TO WATER SUPPLY INNOVATIONS
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Brahim RAMDANE, DG/CDE
COUNTRY	CAMEROON
TITLE OF THE DOCUMENT	SOCIAL CONNECTION PROGRAMS TO IMPROVE ACCESS TO DRINKING WATER

With 22.2 million inhabitants, Cameroon is a middle income country. The poverty rate is stagnating around a national average of 40%, with endemic poverty that affects about 26% of the population. Cameroon will not achieve most of the Millennium Development Goals (MDGs) in 2015 despite the improvements made in terms of universal education and access to water.

In 2005, the Cameroonian government initiated a reform of the water sector, on the contracting out model. A public asset company responsible for the bulk of the investments, CAMWATER, was created along with a concessionary company, the CAMEROUNAISE DES EAUX (CDE), around a strategic partner selected through international

competitive bidding (Moroccan consortium led by the Office National de l'Electricité et de l'Eau Potable (National Electricity and Water Office), ONEE). The activities and assets of the former Société Nationale des Eaux du Cameroun (National Cameroon Water Utility) (SNEC) were taken over by CAMWATER and CDE respectively on May 2, 2008.

The water supply situation in Cameroon deteriorated considerably for a long time because of the lack of investments in the sector for 20 years. Today, the rate of access to drinking water by individual or shared connections remains low, around 40% in urban areas. Beside the low density of the distribution networks, the main weak link remains the inability of households, most of them poor, to support the average connection costs.

Also, in line with its mandate and missions and with the support of institutional partners and donors, CDE has put in place, since the start of its activities, a social connection programs for low income households.

A. The Program for the extension of the drinking water coverage of Cameroonian households in urban areas

The State of Cameroon in 2009 had received a grant of US $ 5.25 million (2.2 billion CFA francs) to finance the program under the Global Partnership on Output-Based Aid (GPOBA). The GPOBA is a multi-donor Fund established in 2003 jointly by the UK Department for International Development (DFID) and the World Bank. The program was designed to promote access to basic infrastructure and social services for poor people in developing countries by providing results-based aid.

The Grant Agreement involved the World Bank, the asset company, Camwater, (Beneficiary of the grant), and CDE (Operator under the lease contract). It was intended to facilitate the connection of about 50,000 households in the area contracted out over a period of four years. The program was part of the efforts to achieve the Millennium Development Goals, enabling households to access the urban drinking water network as part of a promotional connection campaign whose costs were subsidized at up to 44,000 CFAF per connection, VAT included. The households' contribution was 10% of the estimated total cost of the connection, which averaged 130,000 CFAF. 250,000 persons were to benefit indirectly from this operation.

B. 25,000 social connections funded by IDA, a subsidiary of the World Bank and ADB

In June 2014, CDE signed with CAMWATER, the asset company, two contracts for the completion of 25,000 connections at promotional rates. This program is a sequence of the GPOBA project launched in 2009. It is funded by (1) the International Development Agency (IDA), an affiliate of the World Bank (WB), for an amount of one billion CFA francs, and (2) the African Development Bank (ADB) to the tune of one billion and half CFA francs.

The IDA funds have financed 10,000 connections in the whole country over a 12 month period. The ADB is financing, over a period of 15 months, 15,000 connections in 18 urban and peri-urban centers different from those that have received the IDA funding. At the same time, drinking water supply and extension network work is conducted in several localities with the support of these donors to facilitate the social connections project. The program focuses on the new connections. The customer pays 10% of the total amount, excluding tax, of the connection quotation and the whole subscription cost. In this new program, household eligibility criteria have been made more flexible, compared to the GPOBA program, to match connections known as classical connections.

Keywords:
Cameroon, CDE, access to drinking water, subsidized connections, social connections, GPOBA, DFID, World Bank, IDA, ADB

Presentators

SUB THEME	INNOVATIONS FOR INCREASED AVAILABILITY AND IMPROVED ACCESS TO WATER SUPPLY INNOVATIONS
SUGGESTED TOPIC	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Vicky (WORLD BANK)
COUNTRY	WORLD BANK
TITLE OF THE DOCUMENT	HEREWITH ATTACHED AND THE SECOND ON PERFORMANCE BASED CONTACT

- Room Expo 1 : SIMPLE AND ECONOMICAL SOLUTIONS FOR WATER DEMAND MANAGEMENT INNOVATIONS IN PRODUCTION, TREATMENT CONTROL PROCESSES

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Simple and economical solutions for managing water demand
AUTHOR	SERGE LESCOUET
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	IMPROVING THE DRINKING WATER SUPPLY SYSTEM IN GREATER CASABLANCA FEEDBACK ON A 15-YEAR EXPERIENCE

Every day, about 530,000 m3 are distributed to 4 million Casablanca dwellers. The city is growing larger at over 1 hectare per day; this rate is expected to triple in the coming years according to the latest SDAU (land-use plan), thus challenging water resources supply in the Greater Casablanca. As an operator of a fragile network and contractually capped in terms of its renewal capabilities, LYDEC has been-since the start of a delegated management- pursuing a proactive policy to reduce Non-Revenue Water -“NRW”- and is striving to enhance it every year to meet the contractual target set at 80%performance.

Since the inception of a delegated management contract, the loss reduction policy was instrumental in gaining 12 point performance at the end of 2014. This policy is based on an action plan focusing on three areas: the fight against physical losses, metering losses and business losses.

Since 1998, actions taken under annual plans for reducing non-revenue water (or Non-Revenue Water- NRW Plans -) helped to gradually improve the water network performance. The goal set by the Community at 80% in 2015 is a far-reaching target vis-à-vis a moderate renewal program and a fragile network.

In 2014, network performance reached 76.6%, i.e. a rise of 0.5 points

compared to 2013, or savings of about 2.8 million m3 of drinking water. LYDEC continues its action plan targeting 80% of network performance, based on a Smart Water approach.

- To ensure improved targeting of leakage after completing the permanent DMA establishment (100 km mesh) across the network of Casablanca (5 400 km), extending periodically the establishment of DMAs (40 km and 10 km meshes) onto new areas at an increased DMAs establishment pace: four to eight measurements of DMA/week (targeting 120 km network per week).
- Testing the advanced DMA establishment onto an 85M pilot pressure stage (City center): a concept of innovative DMA establishment based on motorized valves whose automatic opening and closing ensure daily monitoring of losses along the 40 km network's meshes.
- To reduce the existing leakage rate, Lydec regulates the pressure on over 2,500 km of network, delivering optimum pressure (between 2 and 6 bar) across the whole territory of Casablanca. This approach thus helps reduce the leakage flow and the frequency of breakage: i.e. a flow gain ranging from 5 to 10%,
- Implementation of the advanced pressure control technology (control valves locked to a pressure measurement point on the network): Additional flow-rate gain by 3-5% compared to a conventional modulation pressure; savings on teams' travels for fine-tuning instructions,
- Installation of 450 fixed leakage pre-locators with GSM transmission on deteriorated networks thereby enhancing the leakage location capacity and better responsiveness to degradation.
- Installation of over 400 pressure measurement points on the network, which will further optimize the pressure at any point within the network and detect network structural alterations.
- Deployment of new SI monitoring tools -"Aquadvanced" and "NRW Geo"-; these two tools provide rapid cross-analysis of several types of data (flow-rate, volume, pressure, asset, pre-locators' noise, customers' claims, hydraulic model data, ..) and improved targeting through decision support statistical modules.

These tools are part of the "Smart" network strategy developed by the Suez Environnement Group and termed as "Advanced Solutions for Water Networks".

In 2014, Lydec "gave a listening ear" to nearly 3,500 km of networks during night inspection operations. Over 850 water pipe leaks were

detected and repaired, as well as nearly 18,600 leaks on connections and metering stations.
With better knowledge of existing assets (GIS, geo-localization of leaks, measurement of division in sectors, pipe corrosion and Ciclope® test diagnostic laboratory in relation to connections), Lydec improves every year on its targets in terms of pipes and connections renewal. In 2014, 30 km of pipes and 7,650 connections were renewed with a gain confirmed by measurements greater than 1.5 l/s/km.
New rules laid down for connections renewal have also helped reduce the number of leaks in 5 years by over 50% (from 13,000 in 2009 to less 6,000 leaks in 2014).

Another area for improvement in 2014 involved various actions taken to ensure the quality of newly-built networks, especially for building plots: laying of meters at network end, mainstreaming the component of DMA establishment right from the design stage, strengthening technical requirements for developers, setting up a Quality, Safety and Environmental Stewardship work Unit; acceptance of work and performance monitoring in relation to commissioning (performance follow-up), rapid integration of new networks into the GIS and standardization (selection of materials, continued “polyethylene” approach, inspection of enforcement of installation standards...).
A new NRW action plan coupled with a business component was implemented with the aim of gaining 1 million m3 annually: enhanced fraud and metering anomalies detection processes, specific action aimed at industrial clients and continued metering policies, with control by the accredited ISO 17025 Technical Metrological Centre.
Additionally, to ensure better monitoring of key accounts, a remote reading system project for 800 large meters via Suez-Environment technology, was launched in 201 ....

Key words: ***Non-Revenue Water (NRW), System Performance, DMA establishment, leaks, asset, remote reading of large meters.***

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Innovations in production, control and treatment processes
AUTHOR	MOHAMMED MACHKOR
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	PREDICTING THE COAGULANT RATE IN A WATER TREATMENT PLANT THROUGH THE EXPERIMENTAL DESIGN METHODOLOGY.

Coagulation is one of the most important steps in water treatment. The main difficulty is to ascertain the optimum dose of coagulant to be injected depending on the features of raw water. Poor control of this process can result in a huge rise in operating costs and non-compliance with the quality objectives of water exiting the treatment plant. Aluminum sulfate (Al2(SO4)3.18H2O) is the most commonly used coagulating agent. The determination of the dose of coagulant is done by a laboratory test called “Jar Test”. The disadvantage of this approach is a relatively long delay time. The approach therefore does not allow an automatic control of the coagulation process.
The objective of our study is to predict the rate of aluminum sulfate based on running parameters, such as colloidal turbidity, temperature and CAT.

The writer, following a bibliographical summary of coagulation and a screening study of all parameters that may impact the phenomenon considered, epitomizes a final mathematical model connecting the optimum dose of coagulant -aluminum sulfate- with the abovementioned parameters.

The variation of the optimum rate of coagulant depending on the raw water turbidity shows that the (nonlinear) correlation is significant, it is not sufficient enough to describe the phenomenon. The study of these waters has also pointed to the existence of interaction between parameters (that between CAT and temperature, for instance).

A two-degree comprehensive polynomial model was therefore opted for, i.e. also including the so-called quadratic effects β11, β22 and β33. This model is thus explicitly given in the form below:

$$Y=b0+\sum_{i=1}^{k} biXi+\sum_{i=1}^{k} biiXi^{2}+\sum_{i=1\,,j=2et\ i\neq j}^{k} bijXiXj$$

Y: model's response
bi: model's factors
Xi: model's variables

With a coefficient of determination (R2) of around 0.998, the model so found elaborates on the phenomenon under study. The results of this modeling are of paramount importance for the management of the station since for each sample tested, the calculated rate is very close to the experimental rate.

Key words: ***Modelling, aluminium sulfate, colloidal turbidity, temperature, complete alkalinity titration***

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Innovations in production, control and treatment processes
AUTHOR	LAHCEN HASNAOUI, ABDELHAK ENNOUARI, LAHCEN AITHSSAIN, ABDELKRIM ZAGHRIOUI ; MOHAMED ELOTMANI, ABDELHAMID MOURAD
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	RECYCLING FILTER BACKWASH WASTEWATER AND TREATING SETTLING TANK SLUDGE

The Bouregreg water treatment plant processes water from the SMBA retaining reservoir in terms of 9m3 processed water rate/s and supplies water to the cities of Rabat and Casablanca, as well as all cities and towns between the two aforesaid cities, i.e. a population about 10 million inhabitants.

The applied treatment is based on prechlorination at the raw water intake located near the dam. The water intake is in the shape of a multi-level intake tower, the selection of which depends on the water quality. The water entering the treatment plant undergoes aluminate sulphate coagulation, decantation, sand filtration and final disinfection prior to distribution.

The filter backwash wastewater and the settling tank sludge are discharged directly into the environment. This damages the environment and causes water loss.

To preserve the environment and save filter backwash wastewater, a filter backwash wastewater treatment and recycling unit with a processing capacity of 200 l/s was built. The filter backwash wastewater so treated with a quality equivalent to settled water in terms of turbidity is recycled at the start of the treatment.

Settling tank sludge purges, drainage of other treatment facilities and settling tank purges clarifying filter backwash wastewater are dumped into a sludge distribution tank for thickeners.

Thickened sludge in scraped settling tanks is centrifuged and thickened and the resulting sludge will be sent to a public landfill.

This article aims to describe the operation and monitoring of the performance of the sludge treatment unit and the recycling of filter backwash wastewater and its impact on the station's hydraulic performance and on environmental protection.

Key words: ***Settling tank, thickener, recycling, centrifugation.***

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Innovations in production, control and treatment processes
AUTHOR	DERRAZ MUSTAPHA FARHAOUI MOHAMED
COUNTRY	MOROCCO
TITLE OF THE DOCUMENT	OPTIMIZING THE TREATMENT PROCESS OF POTABLE WATER.

Problem

For a sustainable access to safe drinking water, optimization of the process of clarification in the treatment plants is of great importance since the cost per m3 of water produced is optimized. This optimization involves the reduction of not only the consumption of reagents, namely aluminum sulphate (the most commonly used coagulant in the treatment chain in Morocco and in other countries) but also the cost of managing the sludge produced by the station.

Approach: In this study, the effectiveness of the use of sludge as a coagulant aid is evaluated for different levels of turbidity of the raw water of the treatment plant Meknes, Morocco (low: 10 NTU, medium: 20 NTU and high: 40 NTU) with lower doses of aluminum sulphate. The influence of the settling time was also studied.

Results:

the results of this study demonstrated that the use of sludge produced by the station can improve the quality of the water produced and help reduce the doses of aluminum sulphate used from 40 to 50% depending on the level of turbidity.

Conclusions/Recommendations:

The cost price per m3 produced by the station can be optimized while improving the quality of the water produced. Significant drawdown was observed using both the mud and the aluminum sulphate as a coagulant. The percentage of lowering of the turbidity was 97.56%, 98.96% and 99.47% for low, medium and high turbidity of the water respectively.

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Innovations in production, control and treatment processes
AUTHOR	S. M. SIBIYA
COUNTRY	SOUTH AFRICA
TITLE OF THE DOCUMENT	THE APPLICATION OF THE ONLINE ANALYZER FOR MONITORING AND CONTROL OF THE WATER CHLORINATION PROCESS

Presentators

SUB THEME	SMART AND INNOVATIVE SOLUTIONS
SUGGESTED TOPIC	Innovations in production, control and treatment processes
AUTHOR	M. JÉRÉMIE MACHEMY
COUNTRY	FRANCE
TITLE OF THE DOCUMENT	ON-SITE CHLORINE PRODUCTION THANKS TO SALT ELECTROLYSIS

- Room Expo 2 : PRICING AND RECOVERY FOR THE SUSTAINABILITY OF THE SECTOR

Presentators

SUB THEME	Innovative financing mechanisms
SUGGESTED TOPIC	Pricing and recovery for the sustainability of the sector
AUTHOR	Jean Birane GNINGA[a,b]; Dr. Cheikh DIOP[b], , Pr. Kuassi DONGO[c], d, Dr Doulaye KONE[e,] [a] Université Cheikh Antadiop de Dakar [b] Agence intergouvenementale pan africaine Eau et Assainissement pour l'Afrique [c] Université Félix Houphouët Boigny , Abidjan [d] Centre Suisse de Recherches Scientifiques en Côte d'Ivoire [e] Bill & Melinda Gates Foundation
COUNTRY	MAROC
TITLE OF THE DOCUMENT	COST OF SANITATION SERVICES: Toward a pricing method for urban private sewage disposal adapted to the socioeconomic context of Sub-Saharan Africa; Case studies in Accra, Dakar, and Ouagadougou.

More than 80% wastewater and excreta management in the urban areas of sub-Saharan Africa is dominated by private sewage disposal. The enormous quantities of sludge produced must be collected, stored, disposed of, treated and sometimes reused. All these activities constitute a value chain in sanitation that involves a number of unexpected economic actors. However, unlike collective sanitation, actors operating along the private sewage disposal value chain do not have a pricing methodology adapted to the context of Sub-Saharan Africa and the informal sector still dominates the market.

This investigation is carried out within the framework of the partnership

between the Institute of Environmental Sciences, the Department of Water and Sanitation in Developing Countries (Sandec) from the Swiss Federal Institute of Water Science and Technology (Eawag) and the NCCR-NS program. Based on a diagnosis that asks fundamental questions to sanitation actors, our study aims to develop an innovative approach to the pricing of urban private sewage disposal services, particularly in the cities of Accra, Dakar and Ouagadougou.

Apart from the literature review, various data collection tools were used and the most critical ones are the household survey on the willingness to pay and the financial evaluation of the socio-economic activities of the private sewage disposal value chain.

For households, the first variable that determines the price of the sludge collection, transportation and dumping is the frequency and the draining method. Yet, the choice of that method depends on three main factors:

First, there is the availability of the service, which is expressed by 37% of household heads in Accra and Dakar and 23% in Ouagadougou,

Then, the service quality is the second factor which explains 12% of the choices of the emptying method in Accra and 39% in Dakar and Ouagadougou. The heads of even the poorest household attach greater importance to these two variables. In Ouagadougou, the service quality determines the choice of the 43% richest household heads (IR1), the rich (IR2) and the averagely rich (IR3) and about 35% of the poor (IR4 and IR5). Regarding the frequency of emptying, it is so high that 60% and 88% of household heads say they empty at least once a year in Accra and Dakar respectively, whereas the rate is 35% in Ouagadougou.

The current price for emptying is 18,000 CFAF in Ouagadougou, 20,000 CFAF in Accra and 25,000 CFAF in Dakar. This price is considered as inaccessible by more than half of the household heads. Thus, the maximum price that household heads are willing to pay is lower than the equilibrium price of the emptying companies in the cities of Accra and Dakar. Only in Ouagadougou does the willingness to pay exceed the equilibrium price and only for medium and large companies.

The average size of the emptying companies' vacuum trucks is 10 m3 and prices are based on the access, distance, volume and type of service. These four determinants are correlated with four other variables of the operating account. The first is fuel consumption that absorbs 30% of the companies' revenues in Accra, 36% in Dakar and 44% in Ouagadougou. Depreciation expenses, tax on dumping and payroll come after in that order. All these four variables represent 81% of the companies' turnover in Accra, 72% in Dakar and 75% in Ouagadougou. The equilibrium price for the emptying companies decreases with the size of the company. Thus, under the effect of economies of scale, large companies can withstand a

drop of over 23% in the current emptying prices against 15% for medium size enterprises and 5-8% for small businesses.

The investigation revealed three management models: a private model; a public model and a mixed model. Then, around these models, there is a deterrent pricing method of the binominal type with two parts. This model comprises a variable component, payable after each emptying and a fixed part that must be paid on a regular basis. This method of charging for every portion perfectly matches the request of the household heads, particularly low income ones, who do not have the financial capacity commensurate with the prices currently charged by the market for mechanical emptying.

Keywords: ***pricing, sewerage, private sewage disposal, urban, sludge, emptying, waste water, sanitation value chain***

Presentators

SUB THEME	Innovative financing mechanisms
SUGGESTED TOPIC	Pricing and recovery for the sustainability of the sector
AUTHOR	DENNIS MWANZA
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Commercial financing of water utility investments

Introduction and objectives

USAID through its six year regional program the Sustainable Water and Sanitation in Africa (SUWASA) supported an initiative to shift from a purely donor-based investment strategy by water utilities to one that integrates commercially financed investments that adhere to the core business principles of market responsiveness, service delivery and return on investment. It assisted in institutionalizing this commercial approach among utilities, commercial banks, and the Kenyan government and building their capacity to continue the program after the end of SUWASA. The program aligns the financial incentives, bank and consumer to drive a financially sustainable model that increases access to water, reduces the cost of water to the end

user, and increases profitability of the utilities and the banks.

Methodology approach

Identify the key issues relating to why utility not getting needed investment, provided capacity building to banks on legal framework for lending to state owned utilities, Undertake a market assessment to determine ability and willingness to pay. Development of a business plan taking into account the commercial loan, Support the utility in developing an application letter for a loan to a bank submit the application for the bank.

Analysis, results, conclusions and recommendation

The USAID/SUWASA program supports a shift from a purely donor-based investment strategy by water utilities to one that integrates commercially financed investments that adhere to the core business principles of market responsiveness, service delivery and return on investment. SUWASA Kenya is institutionalizing this commercial approach among utilities, commercial banks, and the Kenyan government, building their capacity to continue the program after the end of the SUWASA progam. Ultimately, the program aligns the financial incentives of the utility, bank and consumer to drive a financially sustainable model that increases first time and improved access to water, reduces the cost of water to the end user, and increases profitability of the utilities and the banks. The program does this by:

1. Supporting utilities in identifying commercially viable investments and developing bankable financing proposals.
2. Advising commercial banks in developing new water financing products and appropriate lending methodologies for utilities.
3. Assessing market demand and affordability for water and sanitation services among the poor, and supporting community outreach and education programs related to utility investments.

SUWASA Kenya has had a transformational impact on the country's water sector by successfully unlocking commercial financing and allowing utilities to tap into a host of government, international, and multilateral funding resources. The program's technical assistance to bank partners and utilities is an ideal complement to the successful USAID Development Credit Authority (DCA) guarantee program, which has USD 9 million in water financing guarantees with three Kenyan banks, Kenya Commercial Bank (KCB), Housing Finance and K-Rep Bank. SUWASA

Kenya is also partnering with the Government of Kenya (GoK) Water Services Trust Fund, complementing and supporting their management of Output Based Aid (OBA) and Aid on Delivery (AOD) subsidies to incentivize commercially financed projects. SUWASA helped nine WSPs develop investment proposals for projects valued at approximately $4.6 million. SUWASA technical assistance to utilities and commercial banks resulted in bank loans of approximately $3.5 million for projects, such as water supply network rehabilitation, pipeline extensions, household connections and the upgrade of a water treatment plant.

Keywords : ***Commercial financing, Commercial banks, urban water***

Presentators

SUB THEME	Innovative financing mechanisms
SUGGESTED TOPIC	Pricing and recovery for the sustainability of the sector
AUTHOR	KAJIBALE NGULUMINGI ANDRE
UTILITY	REGIE DE DISTRIBUTION D'EAU OF THE DEM. REP. OF CONGO (REGIDESO)
TITLE OF THE DOCUMENT	EXPLORATION OF ALTERNATIVE PRATICES FOR THE SUSTAINABILITY OFTHE SECTOR BASED ON THE EXISTING MANAGEMENT POTENTIEL: CASE OF THE REGIE DE DISTRIBUTION D'EAU OF D.R. CONGO (REGIDESO)

Context for the sustainability of the sector

Access to water, especially for underprivileged groups, has made water not only a major focus but has put it on the international agenda. It is also a global responsibility supported by a partnership of institutions financial, governments, the United Nations, Water utilities, unions and the civil society.

International solidarity gathered around partners and multi-donor institutions, supported DRC, not only with service expansion projects and improved management efficiency, but it (international solidarity) also financed new modern water production infrastructures.

Given the reluctance of African governments to borrow from multilateral institutions, considering the limitations of traditional patterns of official development assistance, convinced of the reluctance of the private sector to invest in a sector that is unprofitable in the short term, all

this set against the «poor access to water - low investment in water-poverty funding – financing deficit – poor access to water» looped vicious circle background: the discerning international analysts already expected the Millennium Development Goals not to be achieved at a 100%. Nevertheless, beyond 2015, some conclusions can be made:

- The significant improved access to water for the poor,
- The reduction of poverty due to water deprivation, without completely eradicating global poverty would remain as long as the same causes and challenges that affect the sector.

The issue of water is a local problem that therefore falls under public responsibility. The State, which has the burden of sustaining the sector through public policy, is invited to take over the efforts of the global partnership by increasing its responsibility by making water a top priority in the government's actions. Through REGIDESO, the national water operator, it must also get the cash flow from a performing management to reinvest in water with the aim of reducing the financial dependence on promoters or international donors after this long period of funding and support from multi-donor financing which is expiring in 2015.

Alternative practice approach based on the potential of existing management for the sustainability of the sector

Water is life, they say. This clearly shows beyond doubt that water as a natural resource is priceless but as a selling service, it has a price and recurring costs to be recovered from users: this is the very purpose of the existence of pricing and service cost recovery.

The price and the recovery of water service costs, controversial topics, have always seemed like real challenges facing all water operators given a series of multiple and often conflicting objectives, that is, environmental, social, economic and financial objectives, which, as the case may be, aim at ensuring the service continuity, protect the resource, the people without purchasing power etc.

In the fully-fledged paper, we will demonstrate the elements of the existing potential that generates financial savings through courageous initiatives taken by the operational managers of REGIDESO. These initiatives were made necessary by the tough business environment characterized by the immutability (ceiling) of the administered price grid.

These successful initiatives, comforted by the findings of several studies that «the demand for water is inelastic for the simple reason that water has no substitute,» have raised the level of recoverable sales, which in turn, have helped to cover a proportion of the operating costs while respecting the principle of reduced inequality.
The cost recovery and use of unusual techniques for insolvent customers have helped raise revenue as never before, thereby improving the cash flow of the company.
The strict policy of sending reminders to customers would not have succeeded without a prior increase in the customer's willingness to pay.

The results of the customer satisfaction survey allowed REGIDESO to discover customer perception of the service, which led to the establishment of a customer listening body and the resolution of its grievances.

Water utilities have an independent funding source hitherto neglected: the reduction of the overall inefficient management and the use of the existing potential from the operational efficiency of performing service that help make substantial financial savings to move towards recovery programs and pave the way for society to enjoy the financial and physical sustainability of the sector.

The challenges in access to water for the poor have imposed to the water operator new paths, in addition to the benefits of reducing inefficient management, the use of solutions based on low cost technology like paying standpipes. Such solutions remain provisional in view of a planning network development in response to the unmet demand for water from vulnerable and difficult to reach groups and people.

Conclusion
The Millennium Development Goals, through the results achieved, managed to raise a national consciousness for the public to take ownership of international development standards for the purpose of sustainability.
Challenges create paths: REGIDESO used its existing potential for results that can be shared without skimping on low-cost solutions.

Keywords:
- ***Sustainability of the sector***
- ***Selling service***
- ***Administered price***
- ***Alternative practices***
- ***Existing potential***

Presentators

SUB THEME	Innovative financing mechanisms
SUGGESTED TOPIC	Pricing and recovery for the sustainability of the sector
AUTHOR	Msafiri Philip Wambua
COUNTRY	KENYA
TITLE OF THE DOCUMENT	Application of polluter pays principle as an innovative financing mechanism for the management of industrial wastewater: - the case of NCWSC

Presentators

SOUS THEME	Innovative financing mechanisms
SUGGESTED TOPIC	Pricing and recovery for the sustainability of the sector
AUTHOR	M. Blokland
COUNTRY	NETHERLANDS
TITLE OF THE DOCUMENT	Water Financing Facility: startup of activities to in Kenya

• 14h30 - 16h00

- Room Aberdare : ADAPTATION TO CLIMATE CHANGE

Presentators

SUB THEME	Innovations for Improving Access to the Continuing Water Service
SUGGESTED TOPIC	Adaptation to Climate Change
AUTHOR	Margaryan Varduhi
COUNTRY	ARMENIA, YREVAN
TITLE OF THE DOCUMENT	The change dynamics and evaluation of ice phenomena of the rivers of Kura basin (in the territory of the Republic of Armenia) in the context of global climate change

Climate change is a serious problem for humanity. Influences of climate change are sensed in around the world today. The Republic of Armenia as a country with dry climatic conditions is vulnerable in the

whole territory of country to climate change. By the estimation of World Bank in the region of Europe and Central Asia Armenia is most sensible country to climate change.

So, the main goal in the work was to study, clarify and analysis number of ice events and of ice cover and the duration of freezing periods in the rivers of the Kure Basin (in the territory of the Republic of Armenia) in the context of global climate change.

All Armenian rivers are, divide on three groups based on ice regime: freezing, with unstable ice cover, and not freezing. When the water temperature of a river decreases below 0ºC, ice cover appears and this is defined as the beginning of the winter regime.

In this study, data on ice regime from the period 1936-2010 from hydrometric points of the Kure River Basin (within the territory of Armenia) were analyzed. It has to note, that in Armenia ice regime studies in the rivers started from 1936. The ice regime of the rivers of Armenia has studied a few.

The study revealed that different ice events with different sizes and duration takes place during the year: shore ice, slush ice, freeze-up. They can take place simultaneously, sometimes in different parts of the same river changing themselves during episodes of thawing and freezing. Generally, ice runoff is absent in the rivers during spring and autumn. The slush ice is the most common, and this often disturbs hydro – technical works.

Stable of ice cover only forms at Kurtan hydrometric point of Gargar River, at Fioletovo hydrometric point of Aghshtev River and at Tsaghkavan hydrometric point Hakhum River. The other rivers in the basin are unstable freezing and not freezing rivers. In the lower part of Debet River, ice events have occurred very seldom (only once or twice during the monitoring period of more than 70 years). So, the Kure Basin is a basin with unstable freezing conditions, with its own ice regime.

The basin has ice events with light development. In the basin all kind of ice events takes place from the second decade of November to the first decade of January. The number of days with ice cover in the rivers of the Kure Basin fluctuates from 0 to 80, the maximum number being 10-115. The number of days with of ice events in the rivers of the Kure Basin fluctuates from 0 to 100, the maximum number 50-160. Maximum duration of ice cover was at Fioletovo hydrometric point of Aghstev river in 1992-93, 1994-95, it was 115 days. Here was observed maximum duration of ice events also, 162 days (1977-78, 1993-94).

The rivers become free from ice in the first and second decades of March. In the Kure River Basin the average number of days with slush ice fluctuates from 10 (Debet River – hydrometric point Akhtala) to 55

(Pambak River – hydrometric point Shirakamut), with maximums from 20 (Tashir River – hydrometric point Mikhaylovka) to 84 (Debet River – hydrometric point Shirakamut).
The research show that since 1995 to 2010 the number of ice events and the duration of freezing periods have decreased in the basin due to global change of climate.
So, taking account above-mentioned, in the work have been suggested the methods of softening and adaptation of consequences of effects of climate change in studying area, for its realization are necessary large capital investments.
It is very important the circumstance to work out the mechanisms of acquisition of financial mean, also immediate participation of society in arrangements to softening of consequences of climate change.

Presentators

SUB THEME	Innovations for increased availability and improved access to water supply
SUGGESTED TOPICS	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Alphonse G. AFFO, Geologist Engineer/Hydraulician Grâce Flora HADEOU, Civil Engineering Engineer
COUNTRY	BENIN
TITLE OF DOCUMENT	Controlling water in the face of climate change in Sub-Saharan Africa: Possible strategies for adaptation and/or mitigation

Water plays an important role in the lives of people and their production activities. In the context of global changes and, especially climate change, people experience various problems related to the lack of control on water. For this reason, sustainable water management is a priority in projects aimed at adapting to climate change.

Sub-Saharan Africa is one of the most vulnerable regions in the world in terms of climate change impacts on all sectors in general and on water resources in particular. Forecasts (2010-2050) for the cost of strategies to adapt to extreme weather events for this region amounted to 6.4 Billion US Dollars (World Bank, 2010 in “Adaptation Gap Report”, UNEP, 2014), which shows the scope of that vulnerability.

In West Africa, adapting to hazards and risk management are sometimes considered. This consideration is based both on technical

choices and a social organization, which are proving increasingly inadequate or inappropriate today.

Indeed, global climate change is reflected locally by several developments. These are: i) shifts in climate calendars, ii) changes in the annual rainfall levels, along with, in many regions, more pronounced and/or more frequent droughts; iii) the increased frequency of paroxysmal phenomena and abnormal events (hurricanes, unusually high temperatures); iv) finally, and everywhere, a very high temporal and spatial variability at local level (Marie-Josephe Dugué and al, May 2012).

The impact of climate change on water resources is multiple. This weighs on access to clean water at all levels: i) water for domestic use, ii) water for agriculture (disadvantaged position for access to water resources and iii) water for industry. In sub-Saharan Africa, we can see an irregularity in the hydrological regime (making the control of water difficult), the degradation of water resources (water infrastructure and natural streams), the potential increase in evapotranspiration, the change in the biophysical quality of water, etc. These impacts, especially in rural areas, weigh on people, on the capital of the farms and their results (less productive livestock systems and crops), but also on the collective dynamics. All this contributes to increasing the vulnerability of the poorest. In arid areas, water resources (over 99% are ground water) are becoming increasingly difficult to access because of the water levels due to drought. Water points built in arid zones draw the resource in quantities which do not foster, for lack of sufficient energy, sustainable agricultural development and therefore development. This raises the problem of dewatering technology and appropriate energy at this level.

Given these challenges met by the water sector in this sub-region, “possible adaptations and/or mitigation strategies” are essential:

1. Efficient water management. In fact maximizing the saving of water when using it is all the more important that it reduces the amount of energy required to produce and transport water, which, in turn, contributes to the reduction of greenhouse gas emissions;

2. The efficient management of energy. It is also important to think about water and energy as two closely related sectors. Efficient energy management reduces the amount of gas emitted and subsequently that of water essential to fossil energy extraction and to the production of all forms of electricity. The water thus saved may be used for other needs;

The development of smart systems for water mobilization and management should be encouraged (hydraulic dams locally adapted, locally adapted water infrastructures, wastewater reuse, economical irrigation systems);

3. Smart flood management. Improved flood management should be incorporated as a multi beneficial tool for crisis management and also as a means of supplying drinking water;

4. The photovoltaic pumping as an adaptation and mitigation tool. In West Africa and especially in arid areas, it is advisable to stay in the dynamics that seeks to take advantage of solar energy to provide endogenous responses to local water control problems. Smallholders' strategies (autonomous pumping for drilling, irrigation) must therefore focus on dewatering technologies using solar energy.

5. Priority should be given to beneficial actions. Taking into account climate change in drinking water supply projects is therefore essential. Preliminary environmental impact studies should be undertaken for any development project with a view to subsequently preserving the water quality and the ecosystem.

Although most of the countries in West Africa have not attained the MDGs in the water sector, significant efforts have been made. It is now urgent that the issue of climate change be addressed in this sector in a context of sustainable development. Actions should be conducted taking into account regional integration, the characteristics of the local context, be it the natural environment or the socio-economic environment of each country. The reproducibility of the relevant actions on adaptation and/or mitigation must be a priority for all actors at all levels.

Keywords: ***water, climate change, energy, adaptation, mitigation, sustainable development***

Presentators

SUB THEME	Innovations for increased availability and improved access to water supply
SUGGESTED TOPICS	Solutions for sustainable access to water for underprivileged populations
AUTHOR	Alphonse G. AFFO, Geologist Engineer/Hydraulician Grâce Flora HADEOU, Civil Engineering Engineer
COUNTRY	BENIN
TITLE OF DOCUMENT	Controlling water in the face of climate change in Sub-Saharan Africa: Possible strategies for adaptation and/or mitigation

- Room Lenana : POLICIES AND STAKEHOLDER COMMITMENT TO IMPROVING THE SECTOR'S PERFORMANCE

Presentators

SUB THEME	Policies and performance improvement tools
SUGGESTED TOPICS	Policies and stakeholder commitment to improve sector performance
AUTHOR	Rafatou Fofana
COUNTRY	BENIN
TITLE OF DOCUMENT	Contribution to Integrated Water Resources Management in a contexte of climate change: case of the Nanon watershed for the Kpassa dam on the Okpara river in the north Benin

Water resource shortage is paradoxical in a context of increasing water need, under the combined effects of demographic growth and the impacts of climate change inducing water resources degradation. So there was an awakening of conscience about water resources management which presents a capital stake for all water actors around the Kpassa dam on the Okpara. The major concern in this study area still remains the lack of knowledge which requires the availability of data in quantity and quality for all water related sciences.

First, the model based on the Least Actions Principle was used to generate the data on the flows entering the dam from precipitations

recorded in the watershed. That makes it possible to a sufficient series to assess the resource and its seasonal fluctuations it is subject to. The results show that overall, the model simulates in a satisfactory way the hydrograph.The flow peaks calculated are well located in time, even if they are sometimes underestimated or over-estimated. On the one hand, the low levels of water are perfectly reconstituted with a good superposition of the initial hydrograph and the graph of the flows calculated over the period from 1950 to 1969. The findings of our analysis is that from 1990 to 2010, precipitations were reduced in frequency and intensity: The number of rainy days with rain above 5 mm and 10 mm was reduced by 11% and respectively 43%. And, the annual average was reduced by 15% compared to the wet period from 1950 to 1969.

But while the annual maximum flowrate decreased by 23%, the annual minimum flowrate increased by 10%. On the other hand, by referring to the period from 1950 to 1969, the minimum flowrate dropped by 17% over the last four decades. As for the floods, the maximum flows decreased by 22% from 1950 to 1969 and 18% from 1970 to 1989. On the whole, the average flow dropped by 19% over the last four decades. For a better monitoring of the resource, three rivers sections were selected or gauging purposes. They are accessible by road at Binassi, Darnon and Douroube.

Secondly, the eco-toxicological approach was used as a decision-making tool. The Atomic Absorption Spectrometry method was used to analyze and toxic metals Pb, Hg, As and Cd) and organochlorine pesticides in the fish and crude water of the dam. The results show that most of the organoclorine parameters show critical concentration levels. As for metals, they all have concentrations lower than the standard in force.

Keywords: ***Ungauged basin, Least Actions Principle (ModHyPMA), IWRM, Nanon, Kpassa Okpara, climate change, pesticides, toxic metals.***

Presentators

SUB THEME	Governance and Performance Improvement Tool
SUGGESTED TOPICS	Policies and stakeholder commitment to improve sector performance
AUTHOR	David Kipngeno Kemei Planning , Monitoring and Evaluation Coordinator Nairobi City and Sewerage Company Ltd.
COUNTRY	KENYA
TITLE OF DOCUMENT	Sustaining water utility performance through performance contracting: Case study of Nairobi City Water and Sewerage Company

Nairobi City Water and Sewerage Company (NCWSC) was incorporated in December 2003 under the Companies Act cap 486. It is a wholly owned subsidiary of Nairobi City County.
It has its headquarters in Kenya, Nairobi City, Kampala Road in Industrial Area and has its area of jurisdiction divided into six administrative regions, namely, Northern, Eastern, and North Eastern, Central, Southern and Western regions which are further devolved into 25 zones.

The mandate of the Company is to provide affordable, clean water and sewerage services to the residents of Nairobi County, in a financially sustainable manner and within the Government regulations. The 2002 Water Act brought about reforms in the Water Sector that were aimed at facilitating access to clean water and sewerage services to all Kenyans. The reforms saw the creation of regional Water Boards which were tasked with the responsibility of overseeing the operations of water and sewerage/sanitation utilities in their respective areas of jurisdiction, besides major asset development. To enhance the Nairobi City Water and Sewerage Company's efficiency, the senior management team of the Company has been recruited competitively from the job market. The Company is run on commercial principles; staff and management are integrated into a competitive and productive environment that is customer-focused and results-oriented. This is realised through performance contracting where all the staff of NCWSC are expected to sign Performance contract with their respective supervisors. Since the promulgation of the new constitution in the year 2010 water function was devolved to the counties and such NCWSC was devolved to the Nairobi City county (NCC).To this, end NCWSC reports to the County Government of Nairobi

Performance Contracting (PC) was introduced in Kenya in 2003 under the broad public sector reforms. The Kenyan Performance Contracting was adopted from the best practices in US, Britain, South Korea, china and Singapore. PC was adapted to improve on efficiency and effectiveness in the delivery of services. To achieve this, indicators of performance which are objectively identified and negotiated were put in place. Subsequently, at the end of a certain period, performance evaluation and ranking is carried out for every individual to be accountable for the results and thus improve on public service delivery. This also meant that officers are subjected to operational autonomy.

NCWSC started signing performance contract with AWSB in 2008/09 and has since been signing annually and reporting quarterly. The performance contracts together with the annual work-plans implement the company's medium-term strategic plan. PC is also in tandem with the company's annual budget. For instance, the 2014/15 theme for both budget and PC was "Accelerating growth for transitional takeoff" Once the contract is signed by the Company's managing director, it is then cascaded to functional directors, managers, coordinators, officers, supervisors and downwards to the rest of the staff. Indeed, one of the non-financial items that was introduced in 2012/13 is commitment of the company to cascade the PC targets to all staffs. This was aimed at holding all the staff to account for their respective performances.

Under the new constitutional dispensation, the company has signed Performance Contract with Nairobi City County Government. Under this contract the NCWSC will still be contracting annually and reporting quarterly.

To this end, the company has achieved its strategic objectives since the inception of performance contracting like it has provided a framework of setting objective indicators and tracking their performances over time. The PC targets have helped the company to achieve the following,

- Performance improvement and accountability have been cascaded to all staff levels: every member of staff is now fully aware of their obligations in the company
- Negotiations between the contracting parties and presentations of reports accord the company an opportunity to improve on its areas of focus and weaknesses.
- PC has sparked healthy competition within the company and other WSPs
- On impact assessment, the company as a WSP is now in a position

to be rated by other agencies or stakeholders.
- Reduction of corruption tendencies as there is so much emphasis on corruption eradication.
- Enhanced compliance of statutory requirements.

With the Nairobi City Water and Sewerage Company performance contracting will boost quality of treated effluent and portable water, improve customer satisfaction, sustain a well-oiled and competent workforce and optimize day-to-day company operations.

Lastly, performance contracting will improve infrastructure stability, boost stakeholder confidence and ensure stakeholder understanding and cooperation and most importantly ensure water resource sustainability and replenishment.

As part of the performance management cycle, the water utility company will need to encourage and nurture effective leadership, strategically plan future utility goals and operations that underly vision and mission, as well as implement a variety of organizational approaches aimed at building performance momentum. Moreover, the company must focus on measurement within the monitoring and evaluation framework, and perpetuate a “Plan, Do, Check, Act” management framework.

Presentators

SUB THEME	Governance and Performance Improvement Tool
SUGGESTED TOPICS	Policies and stakeholder commitment to improve sector performance
AUTHOR	BEN AHMED EL HASSANE
COUNTRY	MOROCCO
TITLE OF DOCUMENT	Is this the end of intermittent distribution?

Introduction:

India is the seventh largest country by area (~ 3.3 million square kilometers). It is the second most populous country in the world (1.24 billion in 2011). India is experiencing a high population growth and a high urban development rate. Currently, over 370 million people live

in urban areas.

Initiatives of comparative analysis show that coverage by the distribution of current water ranges from 55% to 89% in urban areas. The water availability per capita is quite high, between 90 and 135 liters per capita per day, but no city provides a continuous supply system. The water supply is around an average of only four hours a day, with many cities making alternating distribution.
The growing population in New Delhi has put enormous pressure on water supply and on the distribution of drinking water management services. The exercise consisting in setting standards for service delivery and improve drinking water supply to New Delhi was long overdue. The Government of India has launched a pilot project to improve water supply in selected areas of Delhi. The authorities have also recommended water supply H24 as a standard for all cities and villages of India; which is obviously vital for health, sanitation and the well-being of citizens. To meet the increasing demand, a project aimed at improving the level of water service and establish H24 delivery standards for service delivery and improve the water supply was launched in Delhi.

Main achievements in the pilot region:

- The water supply of this area has increased, from only 100 minutes a day with the old pumping facilities to 24 hours a day with the new pumping arrangements.
- With the new system, we have enabled continuous water supply in the region, and it was possible to reduce NRW by 61% to less than 6%,
- With the new pumping facilities, energy consumption has drastically been reduced between the old pumping arrangements and the new pumping facilities,
- Although water supply is at the H24 service level, water put into the network has been kept at the same level.

Keywords: ***NRW reduction, intermittent distribution, H24 distribution***

- Room Expo 2 :- PUBLIC-PRIVATE PARTNERSHIPS FOR FINANCING WATER AND SANITATION INFRASTRUCTURES
- SUSTAINABLE FINANCING OF RURAL WATER

Presentators

SUB THEME	Innovative Financing Mechanisms
SUGGESTED TOPICS	Public-Private Partnerships for Financing Water and Sanitation Infrastructures
AUTHOR	Richard Wenu
COUNTRY	LONDON/ UNITED KINGDOM
TITLE OF DOCUMENT	Revisiting PPP Policy: Aligning PPP Policy Objectives & Strategies, and Optimizing Water Sector Financing

To meet its most pressing infrastructure needs and catch up with developing regions in other parts of the world, Africa needs to expand its infrastructure assets in key areas of power, transport, telecommunications, ICT and water supply and sanitation.

According to the AfDB - PIDA report 2012, infrastructure demand is estimated to USD 360 billion, from 2012 - 2040. And under the Priority Action Plan (PAP) 2012-2020, USD 67 billion would be needed annually to finance this plan.

As part of the response, and due the diminishing fiscal capacity of Governments to finance such public infrastructure financing requirements; Public-Private Partnerships (PPPs) have now become, for most Governments, the preferred policy option for implementing public infrastructure with private investment.

Attracting private investment in public infrastructure such as water supply remains very challenging. As shown by the various data on Private Participation in Investment and by analyzing the types of PPPs that have occurred in the water sector over the last 20 years, financing water supply infrastructure through PPPs appears to be a very daunting task.

In fact, most PPPs which have occurred in the water sector in Sub-Saharan Africa tend to be the types of partnerships in which the very fiscally constrained Governments end up paying the private partners while remaining responsible for capital investment. - An outcome different from the primary objective of why African Governments sought to enter into PPPs -.

If the primary objective of PPP is to attract private investment, the logical choice of PPP should be to choose the PPP models where the private sector provides the investment - CAPEX-PPPs -, but not the partnerships where the private sector operates the existing assets - OPEX-PPPs -, while leaving the responsibility for investment with the very Government which sought the partnership to secure private investment, in the first place.

Clearly, achieving PPPs outcomes contrary to the main PPPs objectives indicate that there exist barriers which do not allow meeting the main objectives.

Over and above the constraints related to the operating environment (political, socio-economic, legal, regulatory and institutional) of public infrastructure, there exist other challenges which make it difficult to implement PPPs involving private sector investment or CAPEX-PPPs.

Based on the various discussions held with senior public infrastructure authorities, there appear to be a number of barriers to implementing CAPEX-PPPs in public/water supply infrastructure. Two of these barriers consist of:

- First, the shadow understanding amongst public infrastructure authorities, of what infrastructures really are, to the eyes of private investors,
- Second, the limited capacity within the host Governments to model the needs of such private investors, in terms of the levels and types of risks they are likely to accept, given the nature, the characteristics and the business model of the given infrastructure sector; and the long term nature of their investment.

The existence of these two barriers, amongst many others, suggests that PPP policy objectives are not aligned with the strategies used to achieve them.

Achieving the alignment of PPP polices with the PPP strategies, would require the removal of these barriers, which would in turn create the space and widen the scope to optimize the financing of water supply infrastructure in view of ultimately implementing such infrastructure using other PPP models than CAPEX-PPPs, which are realistically unachievable, under current circumstances.

It is worth noting that the ultimate aim of PPPs is neither to finance nor to construct public infrastructure, but more about improving the quality and performance of service output of the underlying infrastructure.

Currently, most public infrastructure sectors operate in an environment marred by poor planning, the lack of organisational and institutional capacity; the obsolescence of underlying assets with inadequate funding regimes, both from tariffs, taxes and transfers; all resulting in delivering less than satisfactory levels of services in terms of quantity, quality and frequency.

Starting from such an unsustainable low base, financing water infrastructure remains critical to improving coverage and access. However, financing such requirements with private capital through PPPs proves to be challenging and less realistic, given the various constraints on securing such finance, under current circumstances.

To address this challenge, African PPP policies need to be aligned with PPP strategies. And by doing so, policy makers would be enabled to devise alternative financing mechanisms which would align water infrastructure nature and characteristics with the characteristics of the adequate sources of finance; thus, addressing the constraints that are currently being encountered in the process of financing water infrastructure with private sector capital.

The process of financing public infrastructure with private capital involves the use of the project finance technique, which underpins the BOT contractual variants that are often used in CAPEX-PPPs contractual models, involving the development/construction, rehabilitation & maintenance of public infrastructure, such as water supply infrastructure.

The understanding of this technique would highlight the constraints that exist when attempting to finance water supply capital investment requirements with private capital, using CAPEX-PPPs models.

However to date, it does not seem like African water authorities have come to realise either the existence of these financing constraints or the urgency to address them quickly in order to get back under control, the continuously degrading water supply and sanitation services.
To get back the water supply under control, PPP policy objectives and the strategies used to implement them need to be fully revisited, in view of their alignment.

To achieve this alignment, African Governments need to act on three essential aspects:

(1)To remove the two major barriers to CAPEX-PPP implementation, which are:

- The shadow understanding amongst public infrastructure authorities, of what infrastructures really are, to the eyes of private investors;
- The limited capacity within Governments to model the needs of such private investors;

(2) To widen the understanding of what PPPs are, amongst policy makers

(3) To create awareness amongst PPP policy makers, of the challenges involved in implementing CAPEX- PPPs, including the exposure to contingents liabilities, given the long term nature of PPPs (CAPEX-PPPs) arrangements.

Without addressing the above aspects in view of aligning PPP policy objectives and strategies; PPPs will remain another empty token, specifically for CAPEX-PPPs, which are unrealistic to be achieved under current circumstances, since the characteristics of private investors (international) capital do not match the type of funding required by the water sector, given its nature, characteristics and business model.

Until this alignment is achieved, the hopes that most Governments have placed in PPPs as a policy option of choice, for reducing infrastructure financing gap by leveraging on the private sector capital, will prove to have been misplaced.

It is time for water authorities to fully revisit their PPP policies in order to align their objectives with the strategies used to achieve such objectives. This way, Governments would optimize the financing of water supply

infrastructure by widening the financing scope to include other adequate sources of finance that are more appropriate to meeting the requirements of the water supply sector.

However, the support of the private sector would still remain crucial on the implementation of such infrastructure, since the ultimate aim of PPPs being the improvements in quality, levels and performance of service, but not necessarily the financing or construction of infrastructure, an approach which appears to be unrealistic under current circumstances, as evidenced by existing data.

Keywords
Brownfield Project : Project involving rehabilitation, renewal or expansion of an Infrastructure on an existing site.

Presentators

SUB THEME	Innovative Financing Mechanisms
SUGGESTED TOPICS	Public-Private Partnerships for Financing Water and Sanitation Infrastructures
AUTHOR	Moustapha LO
COUNTRY	SENEGAL
TITLE OF DOCUMENT	The guarantee fund for emptying operator: A facilitated access to financing

Background

Private sewage disposal is the most common system in Senegal for the management of domestic wastewater. In the Departments of Pikine and Guediawaye (Dakar Region, Senegal), nearly all the people use this type of sanitation. This has resulted in a considerable production of faecal sludge (1150 m3/day). This sludge is collected partly by vacuum trucks (another portion was collected manually). On the whole, the Region of Dakar has 150 vacuum trucks. The number of trucks varies depending on the companies: those with a single truck are predominantly the most numerous (68%).

This is due partly first to the weakness of the companies' own resources and secondly to the difficulty for them to have access to bank loans. This explains the difficulty for them to renew their fleet of vacuum trucks, which for the most part, are old and unfit for the activity (the average age is 25 years). Thus, beyond the health and environmental problems posed by these trucks, their operating costs are high. Maintenance and fuel consumption account for 7-12% and 34-41% of the operating costs respectively.

Now, emptying companies have great difficulty accessing bank loans. Bank give out loans on the condition that the borrower has enough income to cover the costs of the loan, or a security equivalent to at least twice the amount of the loan.

These conditions are often inaccessible to the players in the emptying business, who, for the most part, work in the informal sector. Emptying operators often acquire their trucks through equity financing (about 91%) or operations combining the financing of part of the equity and a loan from a third party (close relative, friend, economic operator). The latter is based on trust or on debt commitments signed by both parties.

As part of its policy to develop and modernize the private sewage disposal, the National Sanitation Office of Senegal (ONAS) has established, with a financial support from the Bill & Melinda Gates Foundation, the Faecal Sludge Market Structuring Program (PSMBV). One component of this program aims at modernizing the collection of faecal sludge, and, among other things, supporting the renewal and rehabilitation of the truck fleet.

The objectives of the guarantee fund for emptying operators:

The main objective of the guarantee fund of the PSMBV is to promote the development of emptying companies by facilitating access to loans for the renewal of their vacuum trucks and/or acquisition of spare parts in order to enable them to:

- On the one hand meet future requirements for the setting up of the license for exercising the emptying activity. The license will lead to the certification process of emptying companies; and
- On the other hand, increase their income through lower expenses related to the operation of dilapidated trucks.

In other words, the guarantee fund is intended to offset the potential losses of loans institutions in case of default by the borrower emptier.

The fundamental principles of the guarantee fund
The guarantee fund is based on the following three principles:

- risk sharing between the three parties involved (guarantee fund, credit institution and beneficiary of the guarantee [the emptying operator]), which leads to the fact that:
- The intervention of the guarantee fund for compensation takes place only on faulty operations which have been the subject of all the legal steps required to recover the funds, in accordance with the usual practices of the credit institution; and
- The application by the credit institution of a lower interest rate than is usually applied, taking into account the reduction in the cost of the risk related to the guarantee fund.

The operation of the guarantee fund

To ensure proper operation of the guarantee fund for drainage, ONAS has set up a steering committee of the fund, which meets at least once a month and may call, in the exercise of its mission, on anyone or competent body. Its missions consist in:

- Assessing the financial and economic viability of emptying operators seeking a loan from the selected bank as part of the financing agreement that the latter signed with ONAS,
- Helping emptying operators (most of them illiterate) in putting together their dossiers,
- Evaluating and selecting the financial dossiers;
- Ensuring compliance with the commitments made by emptying operators to the selected bank
- Reporting to the Director General of ONAS of the situation of the guarantee fund

The first results achieved

- The Guarantee Fund Steering Committee received 18 applications for funding from emptying operation at the end of April 2014. These applications were from 18 companies including 3 limited liability companies, 1 economic Interest grouping and 14 individual companies. These dossiers are all for the acquisition of a vacuum truck.
- The analysis of the dossiers led to their validation by the Steering Committee and transmission to the bank selected in mid-May 2014

- All the 18 applications were accepted by the selected bank. This reflects the quality of the applications filed by the emptying operators.
- The first sixteen trucks are currently in Senegal from Europe. The system set up between the bank, the association of emptying operators and the Senegalese vendor worked well

The first lessons learned

The process that led to the establishment of the guarantee fund and the acquisition of the first trucks by emptying operators helped to draw the first lessons:

- The emptying operators involved in the PSMBV have a huge need of funds for their activity, particularly for the renewal of their vacuum trucks.
- Credit institutions have no confidence in the repayment capacity of emptying operators, which blocks their access to credit.
- The establishment of a guarantee fund reassures credit institutions for them to engage in financing the emptying activity.

Keywords: ***Guarantee Fund, Funding, Emptying operators, Banks.***

Presentators

SUB THEME	**Innovative Financing Mechanisms**
SUGGESTED TOPICS	**Sustainable Financing of Rural Water**
AUTHOR	**Kelvin Mwangi Wambui** **Accounts/Finance Supervisor** **Nairobi City and Sewerage Company Ltd.**
COUNTRY	**KENYA**
TITLE OF DOCUMENT	**Sustainable Financing of Rural Water: Case for Githunguri Water and Sanitation Company in Kiambu County, Kenya**

Provision of quality and sustainable water and sanitation services to all citizens have been one of the most difficult challenge faced by many governments. This is due to the fact that it is a fundamental human right. In Kenya, water and sanitation coverage fall short of the required standards as only 53% of the households use water from sources considered safe while sanitation coverage stands at 50% (National Water Services Strategy, June 2009). One of the major contributing

factors is the scarcity of resources that the government is able to allocate to water and sanitation services. This led to development of new coping strategies where the water sector should be run in a socially responsible commercial orientation. This means that the water sector in Kenya should be financially independent and sustainable in the long run. Sustainability of water services in Kenya led to the water sector reforms in 2003/2004 anchored on the Water Act 2002.

Under the Water Act 2002 several institutions were created with an objective of providing water and sanitation services in a commercially oriented manner while at the same time serving all Kenyans including the poor. The institutions created under the Act are;

Ministry of Water and Irrigation – To enact laws and policies for the sector while at the same time mobilize finances for the sector.

Water Services Regulatory Board - To act as the overall regulator of the sector and set standards for provision of water.

Water Services Trust Fund – To act as a basket through which the government and donors can fund water and sanitation services to benefit the poor.

Water Services Boards – Their mandate is to ensure efficient and economical water services through development of water and sewer facilities. In Kenya they are eight in number.

Water Service Providers – To provide water and sanitation services in an economically sustainable manner. They many of the in Kenya but very few are self sustaining even on operational costs.

National Water Conservation and Pipeline Corporation – To construct dams and drill boreholes.

Kenya Water Institute – To carry out training and research on water and sanitation services.

Despite the enactment of this Legislation and creation of these many institutions, provision of clean and reliable water remains a major challenge in Kenya as the sector has not achieved sustainability or the objectives of the water sector reforms.

The public resources are not enough to finance water services and sanitation projects hence the need for public-private sector partnership. Governments can certainly take advantage of its strengths in promoting financial sustainability in the water sector through creation of public awareness of cost recovery principles and a tradition of broad based consultations (Jeremias, 2009).

A number of researchers have provided insights, theoretical as well as empirical, into the sustainability puzzle. However, the issue as to why many water companies are not sustainable is yet to be resolved yet many Kenyan continue to suffer as they cannot access this essential

commodity.

Problem Statement

Regulation is a fairly new concept in the water sector in Kenya. Thus, there is a tendency of water sector players to resist or evade it. Many of the institutions established by water sector reforms are still young. The weak financial situation of Water Service Providers and dilapidated infrastructure threatens the growth of the sector. This tends to pose unique challenges in nurturing the growth of water services provision.

Water reforms were hinged on the premise of better efficiency in service delivery, sustainability of services and affordability of the same. However, a report released by WASREB Impact Report (2007), only 3 WSPs can sustain full cost recovery while only 10 can meet operation &maintenance (GTZ, 2007).

Factors contributing to non-viability of water and sanitation business have occasioned a large volume of research and are still attracting researchers. The great majority of the studies on this subject, however, were based on developed economies, especially those of the USA and Europe, and little concern was given to less developed nations. Some past studies investigated the impact of unaccounted for water (UFW), tariff structure and even the management of the water companies on financial sustainability.

Researchers followed different procedures (theoretical and/or empirical), endeavoring to highlight factors that needs to be considered and addressed to enhance the long term sustainability of these companies. However, most of this empirical work has been focused on developed nations where poverty levels are low and advanced technology is available to monitor the water distribution system. Therefore the conclusions reached may not be applicable in countries with different cultures, political and economic frameworks. There is also need to test whether the findings of previous researchers are still relevant today.

Thus, this study seeks to answer the following research question: what should be done to make provision of water sustainable and affordable?

Objectives of the Study

1. Establishing the reasons why government owned water companies are not financially self-sustaining.
2. Identifying the largest cost elements in provision of water and sanitation services.
3. Establishing the major factors hindering financial sustainability of the water services companies.

Research Questions

1. Why are government owned water companies non-viable in Kenya?
2. What are the largest cost elements in provision of water and sanitation services?
3. What is the major factor(s) hindering viability of water services companies?

Justification of the Study

It was important to carry out this research because the goals of water sector reforms of access to all and self-sustainability of the water and sanitation services have not been achieved. More so, many water companies continue to rely on government subsidies and hence in the event that the government withdraws its funding many residents will not access this essential service.

Significance of the Study

This study is important to the players in the water sector as it will provide an insight on what should be done to ensure financial sustainability, while at the same time, ensuring access of water to all at an affordable cost. This will enable them establish the common approach to overcoming the challenge of provision of water and sanitation services. To the public, the research will enlighten them on their responsibility in actualization of an effective water sector in Kenya.
This study is also important to researchers as they will find this study a useful guide for future research on water sector in Kenya.
Scope of the Study
The study covered water companies licensed and operating within Nairobi and its environs under the jurisdiction of Athi Water Services Board. Data from Githunguri Water services Company Ltd was collected and analyzed for the purpose of this study.

Presentators

SUB THEME	Innovative Financing Mechanisms
SUGGESTED TOPICS	Sustainable Financing of Rural Water
AUTHOR	WORLD BANK
COUNTRY	
TITLE OF DOCUMENT	One on PPP for rural water services sustainability in Benin

- Room Turkana: BENCHMARKING FOR THE IMPROVEMENT OF THE WATER AND SANITATION SECTOR'S PERFORMANCE

Presentators

SUB THEME	Governance and Performance Improvement Tools
SUGGESTED TOPICS	Benchmarking for the Improvement of the Water and Sanitation Sector's Performance
AUTHOR	CHRIS HEYMANS, WORLD BANK GLOBAL WATER PRACTICE
COUNTRY	KENYA
TITLE OF DOCUMENT	THE POSSIBILITIES AND LIMITS OF AFRICAN UTILITIES DELIVERING SUSTAINABLE UNIVERSAL SERVICES

1. Introduction and overview

The paper will be reflect the provisional findings of a new Word Bank WSP study that is due to be completed in early 2016. Focusing mainly on water supply, this study seeks to identify and gain a deeper understanding of the better performing urban water utilities in Sub-Saharan Africa. The paper will show that African utilities are capable of delivering vastly improved services, provided that critical drivers of performance are in place.

It will break new ground in going beyond the mere technical and

financial aspects of utility services and performance, with a notably robust analysis of contextual drivers of or obstacles to performance. Key questions are:

- How have better-performing Africanutilities been able to overcome obstacles to good performance in their specific contexts, and how does better utility performance translate into access to piped water services by poor people in the utility service area?
- How does this compare with other (more burdened) utilities serving large African cities?
- Can this learning be used to identify country and utility contexts where the prospects of improving utility performance and piped water access are higher than average and can this also inform the appropriate strategies to achieve this?

2. Seven dimensions of performance

The study will define good performance from a customer perspective, along seven dimensions:

1. Accessibility: A large and increasing share of the population in the service area have access to a piped water service.
2. Safety: The water supplied is safe to drink.
3. Adequacy: The volume supplied is sufficient to meet basic health needs.
4. Reliability. The water is reliably supplied.
5. Cost-effectiveness. The water is provided cost-effectively in terms of the utility's practices and because the reliance on intermediaries that charge
6. Sustainability. There are sufficient resources to be able to sustain the service over time.
7. Transparency and responsiveness: The customer has access to information on the audited utility finances and performance, and the utility is responsive to customers

3. Network extent, access and affordability

Based on 16 utility case studies, the presentation will demonstrate the relationship between performance, the extent of the water network, and access to water services by poor households and affordability. It will put forward a proposition that "improved urban water supply services" essentially require piped water, as networks provide safer, treated water and eliminate the dependence of poor people on pricey intermediaries. In

this respect, the presentation will ask:

1. What is the state of water supply in African cities?
2. What are the common and divergent patterns between cities? Especially, how do these patterns differ betweencities with well-performing utilities compared to other cities?
3. What are the differences in access for the poor and payment for water between cities with well-performing utilities compared to others?
4. What are the practical implications of the patterns for improving access to urban water services for poor households in African cities?

4. The context and political economy of performance

The paper will shed new light on the contextual, non-technical dynamics that contribute to good performance in well-performing water utilities, and analyze how any obstacles to good performance have been overcome. It will capture:

1. What circumstances and incentives enhance the prospects for improved performance?
2. What are the formal and informal features that contribute to success and how did they arise? Were there political economy obstacles to good performance and how were these overcome?
3. What lessons are there for assessing the prospects and leverage points for successful interventions to improve performance?

5. Way forward

Drawing on the lessons from case studies and comparative analysis, and targeted at utility managers, policy leaders and potential financiers, the paper will provide insight and guidance for action on the critical drivers of utility performance and viability

Presentators

SUB THEME	Governance and Performance Improvement Tool
SUGGESTED TOPICS	Benchmarking for the Improvement of the Water and Sanitation Sector's Performance
AUTHOR	MBUTU MWAURA PLANNING , MONITORING AND EVALUATION MANAGER NAIROBI CITY AND SEWERAGE COMPANY LTD.
COUNTRY	KENYA
TITLE OF DOCUMENT	RELATIVE CONTRIBUTION OF NAIROBI CITY AND SEWERAGE COMPANY IN ACHIEVING KENYA'S VISION 2030'S WATER AND SANITATION GOALS

The current Kenya's economic development blueprint, Vision 2030, covers the period 2008 to 2030. It aims at making Kenya a newly industrialized "middle income country providing high quality life for all its citizens by the year 2030" and is implemented through five-year Medium Term Plans (MTPs). The first MTP covered the period 2008 to 2012 while the second MTP covers the period 2013 to 2017 and is currently being implemented. The vision is based on three pillars namely; the economic, social and the political pillars. The social pillar seeks to build "a just and cohesive society with social equity in a clean and secure environment" by investing in security, infrastructure, public sector reforms, people development and land reform.

The vision for the water and sanitation sub-sector is "to ensure water and improved sanitation availability and access to all by 2030". This sub-sector's aspiration is further embedded in 2010 Kenyan constitution. Specifically, clause 43 (1) (b and d) under Economic and Social Rights of the Kenyan Constitution provides, in part, that 'Every person has the right to accessible to reasonable standards of sanitation and to clean and safe water in adequate quantities." In addition, part 2, 11 (b) of the fourth schedule of the constitution provides that water and sanitation services provision are under the county governments whereas water as a resource is under the national government. However, Kenya is a water scarce country with renewable annual fresh water per capita at 647m3 against the United Nation's recommended minimum of 1,000m3. It is critical to note that this fresh water per capita has been declining and is projected to reach 235m3 by 2025 unless measures to address the challenges are implemented (Kenya's vision 2030).

Nairobi county, which is the most populous city in East Africa has a current estimated night population of 4.5 million (about 10% of country's population) inhabitants projected from the 2009 census, living within

an area of 695 km^2. Further, it is estimated that a sizable portion of this population lives in the unstructured informal settlements posing service delivery challenges.

It is against the foregoing background that water and sewerage services must be provided in an effective and sustainable manner. Nairobi City Water and Sewerage Company (NCWSC) Ltd is a key player towards achievement of Kenya's Water and Sanitation targets.

Nairobi City Water and Sewerage Company (NCWSC) Ltd developed its fourth Strategic Plan (FY 2014/2015 – FY 2018/2019) in tandem with Kenyan Medium Term Plans and Vision 2030. The five-year Strategic Plan is expected to provide the Company with a strategic direction and assist it to accomplish its operational goals more efficiently and productively.

The second Vision 2030's MTP commits to strengthening of Kenya's competitiveness by, among other things, increasing government spending on expansion and modernization of water infrastructure

One of the aspects analyzed in Kenya National Bureau of Statistics (KNBS's) 2009 Kenya Population and Housing Census, Volume II, on population and households' distribution by social economic characteristics, is access to water and sanitation. According to the results, 30% of Kenyan households have piped water (either into dwelling or within compound). For Nairobi county, piped water is the product of NCWSC. According to 2009 KNBS's data, the company provides water to 76% of the total households in its area of service. This is consistent with 75% water coverage reported in the 2012/13 WaSREB's seventh series of impact report that summarizes the sub-sector performance. A comparison made by the former administrative regional units, the provinces, on the number of households who use piped water as their main source of water reveals that Nairobi county has the highest (28%) contribution towards households with piped water into dwellings while North Eastern has the lowest (1%). These can be argued to be the relative regional contribution to Millennium Development Goal (MDG) No. seven (target ten) and Kenyan Vision 2030's target on water.

In addition, the 2009 KNBS's data show that out of the 3.4 million households in urban areas, 53% (1.8 millions) have piped water. In this urban areas category, Nairobi County contributes the highest (42%) coverage of urban households with piped water while North Eastern has the least (1%).

With respect to sewerage services, 8% of Kenyan households access main sewer. Out of the 0.67 million households who access main sewer, 70% (0.47 million) are in Nairobi. Due to the complimentary nature of clean and waste water, region-wise, Nairobi County has the highest

(48%) of households with access to main sewer while North Eastern has the lowest (0.4%). The 48% sewerage coverage is higher than 28% reported in WaSREB's seventh impact series but for the year 2012/13. Comparing with other urban areas per province, Nairobi County has the highest households' percentage with access to sewerage services of 48% and it contributes to 71% of all urban households with access to main sewer. Overall, 20% of Kenyan Urban households have access to main sewer as their human waste disposal method.

Given the leadership role that NCWSC plays in the water and Sewerage sub-sector, its long term vision is to continuously improve on its effective service delivery under the devolution structure so as to increase the 30% and 8% national coverage of clean water and sewerage services respectively. In so doing, the company will also increase its clean water coverage within its area of operation and its contribution to national coverage from 76% and 28% respectively. Similarly, it's is envisaged that sewerage coverage will increase from the 48% and 70% levels for within its area of jurisdiction and contribution to national coverage respectively.

Presentators

SUB THEME	Governance and Performance Improvement Tool
SUGGESTED TOPICS	Benchmarking for the Improvement of the Water and Sanitation Sector's Performance
AUTHOR	PAPA SAMBA DIOP
COUNTRY	KENYA
TITLE OF DOCUMENT	BENCHMARKING FOR PERFORMANCE IMPROVEMENT IN THE WATER-SANITATION SECTOR : MEASUREMENT INSTRUMENTS CONSISTENT WITH WATER AND UTILITIES SPECIFICITIES

This is an observation that is clear to everyone, based on what can be seen every day: the Water and Sanitation sector is advancing at a slower pace than expected. As if it had an anvil around its neck, the pace of the sector has slackened, lagging behind the increase in the demand and the needs expressed by new land planning policies, demography, the improvement of the living environment, among other things. Disparities give our achievements the aspects of a leopard's skin: here the good points provide solid lines; there, the vacuum increases the contrast. The coverage rate is very low in some areas, in proportion

to the weakness of the funds injected into the extension, maintenance and modernization of the various drinking water and sanitation networks. The source of these evils is diverse. Indeed, many determinants are emerging. They range from the increasing scarcity of water resources to often inappropriate techniques and technologies to the failure to capitalize good practices. These technical and managerial failures induce inevitably relatively low performances. This is a field that research should explore in order to feed the reflection on the sector and serve as a beacon to the formulation and implementation of effective and proactive policies to meet the challenges of the future. The living conditions of the new generations are a concern to us because it is now that future battles are prepared and won. In this respect, Water and Sanitation constitute a current subject of which we propose to identify the issues. Knowing that these overall performances involve the consideration of several indicators, this paper, to be useful, has the formulation of solutions as its guideline. These solutions will be efficient only if they meet the requirements of the context in its social, economic, ecological, managerial and policy dimensions. This approach is grounded in this formidable instrument for experience sharing that benchmarking is. Benchmarking is increasingly practiced within the African Water Association (AfWA) and elsewhere in the world.
However, this practice must be framed by ethics, timeliness, credibility, public utility line and the nature of the activity. This warning is important because the type of benchmarking practiced is sometimes distorted by a lack of hierarchy between water and/or sanitation utilities (WSUs). And it is far from being just a detail since the basis of calculation of the performance ratings is not the same. The example of Kenya was a decisive contribution to the construction of a theoretical model regarding the new approach for the calculation of performances. The basic data used, in fact, come from the WASREB whose system should spread like wildfire and inspire other African countries.
Let us be clear: we are not questioning the expertise of that regulatory body. WASREB is authoritative in its field of competence. Let us also be realistic: it is difficult to compare the performances of utilities specializing in the production and operation of drinking water, of utilities that only deal with sanitation and finally, of institutions that are at the same time in sanitation and drinking water. These three business profiles call for differentiation in their categorization in order to have reliable results because they reflect the specificities of their activities.
That is our challenge. Thus, we intend to build mathematical models through linear regression in order to calculate and predict these overall performances.
This method aims at getting rid of this contextualization barrier in

comparing the performances of WSUs. Better, this mathematical perspective may provide some answers on organizations in the sector that ensure the best performances for WSUs.

Presentators

SUB THEME	Governance and Performance Improvement Tool
SUGGESTED TOPICS	Benchmarking for the Improvement of the Water and Sanitation Sector's Performance
AUTHOR	ESAWAS
COUNTRY	
TITLE OF DOCUMENT	BENCHMARKING OF LARGE WATER SUPPLY AND SANITATION UTILITIES

WWW.AFWACONGRES2016.ORG