

ABSTRACT VOLUME

World Water Week
in Stockholm

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Water for Development

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Workshop 6:
Sustainable Cities: a pipe dream or realistic
future?

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Workshop: Sustainable Cities: a pipe dream or realistic future?

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Strengthening institutional and governance arrangements for small city sanitation, Indonesia



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Keywords: Sanitation, Indonesia, decentralisation, cities, governanc

Introduction and objectives

The Government of Indonesia has set an ambitious target for achieving 100% access to adequate sanitation by 2019. A key barrier to success is continued low investment by local governments, who have primary responsibility for sanitation under decentralisation. The research aims to support local governments to plan, budget, finance and deliver sustainable and equitable sanitation infrastructure and services. It explores institutional aspects including: capacity, resources, regulations, budgeting, local governance structures, and central-local government interactions.

The project fills knowledge gaps for small cities, which like large cities experience urbanisation, but are additionally challenged by the constraints of smaller local government.

Methodology approach

This project was implemented by the research team (University of Technology Sydney, Kemitraan Partnership Indonesia, and SNV Indonesia), in partnership with the Government of Indonesia (BAP-PENAS) and local governments; supported by Australian Aid. The research drew on political economy analysis and institutional analysis approaches. In six local government case study locations, stakeholders were engaged through participatory focus group discussions, semi-structured interviews and workshops. Stakeholders from provincial, national and international agencies/organisations were interviewed, and planning and budgeting documents reviewed. Stakeholders from different cities, sectors and levels of government met to share experiences in workshops.

Analysis, results, conclusions and recommendation

Local governments are assisted by a central government program to develop multi-year sanitation strategies (SSK – Strategi Sanitasi Kota/Kabupaten). SSKs are required for local governments to access certain central government and international donor funding. However, processes to ensure the quality and completeness of SSKs are weak. In practice in some locations, SSKs have limited or nil relationship to sanitation budget allocations or implementation.

Central law requires local governments to establish a pokja sanitasi (committee) to conduct sanitation planning and coordinate activities between departments. In practice, several pokja are not operational and in these cases local government provide limited services. In other locations a pokja functions effectively, but faces challenges in arguing the case for adequate sanitation budgets, mainstreamed across various departments.

This project is exploring ways to strengthen governance arrangements to clarify pokja roles and responsibilities to improve the linkages between planning, budgeting and implementation.

Low community demand for sanitation, poor governance, local government reluctance to invest in network-scale infrastructure, and confusion about central government regulatory frameworks are often cited as major barriers to sanitation outcomes.

Our case studies confirm and provide further specific details about these issues, and also reveal some latent opportunities for leveraging networks amongst local stakeholders. Civil society organisations are actively involved in engendering demand, advocating for sanitation provision to the poor and vulnerable and promoting awareness of local government responsibilities. Local government officials with external roles within the community, and community members with networks within local government, are instrumental in motivating both community and local government action.

Constructed Wetland for Decentralized Wastewater Treatment in Tanzania Informal Settlements



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Keywords: Constructed Wetlands, Technology, Informal settlements, financial mechanisms, potential of alternative financial mechanisms

Introduction and objectives

About 60-70% of the urban population in Tanzania currently lives in unplanned informal settlements, relying mostly on pit latrines and septic tank soak away systems for sanitation. Major problems with pit latrines and septic tanks are leakages caused by poor construction, flooding of low lying areas and lack of maintenance. Constructed wetland (CW) can solve these problems in informal settlements. The advantages associated with CW is that they use locally available materials and low costs in terms of operation and maintenance and can be decentralized meaning that they be used even in the space limited areas like informal areas.

Methodology approach

The pilot study of CW was conducted in Tanzania with the main objective of determining the performance treatment of CW with respect to organic compounds (TSS and BOD5) and pathogens (Fecal Coliform-FC). A pilot CW constructed at the University of Dar es Salaam was planted with Phragmite Mauritanus with dimensions of 0.6-m wide, 1.75-m long and 0.6-m deep. The study was also conducted to identify the current financial mechanisms for construction, operation and maintenance of the CW and explore the potential of alternative financial mechanisms in informal areas using structured and semi-structured questionnaires, interviews and field observations tools.

Analysis, results, conclusions and recommendation

CW system achieved TSS load reduction by 89.35% which is 15.97g TSS/m²/day while BOD5 load reduction by 84.47% which is 9.29g BOD5/m²/day was achieved. The FC removal rate of 99.99% was also achieved. By achieving mean effluent TSS of 12.64±4.12mg/l, BOD5 14.12 ± 3.84mg/l and effluent FC concentration of 790 FC/100ml it was concluded that application of CW technology can be considered technically as one of the most appropriate technologies for wastewater treatment in informal settlements of Tanzania.

In terms of the current financial mechanisms, the study has identified national authorities, external support agency and regional and local authority, with the type of funding being subsidies, loans, grants and salary payment (7%), private sector which provides loans and financing (23%), NGOs, CBO with the type of funds being grants, soft loan, donations of material, salary payment (47%) and community/user which provides taxes and tariffs constituting (14%) with others which include household contribution and in kind contribution was 9%.

For informal areas of Tanzania it is seen that the main contribution of financial mechanism is NGOs, CBOs followed by private sector and least from regional and local authorities. Furthermore, a willingness to pay for CW analysis reports that 35% are willing to pay in cash for CW in their area, 40% are willing to contribute through labour charge and 25% are not willing to pay in their area due to the fact that they are aged and don't have enough money.

Financial mechanisms for building CWs that have a potential for future in informal areas of Tanzania include micro credit savings, government subsidy, public financing, and private sector in complimentary nature. The study concludes that there is no single financial mechanism that suits CW but a combination of different financial mechanisms is crucial for sustainability of the financial mechanisms.

The Diamond Business Approach for Sustainable Sanitation in Cities



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Keywords: innovative financing, business approach, diamond approach, government, urbanization

Introduction and objectives

Rapid and uncontrolled urbanisation causes major sanitation and waste problems. Especially marginalised people in slums have little access to private or public toilets. Their open defecation leads to health problems. Traditional approaches (NGOs build subsidised toilets for a community) do not work: these solutions are not sustainable and cannot meet the demands of a growing population. Local governments are often not equipped to address growing needs. The private sector is not yet convinced of sanitation as a viable business. The Diamond Business Approach provides sustainable sanitation in cities and accommodates population growth, with NGOs playing a supportive role.

Methodology approach

Within the domain of sanitation the WASH Alliance is working on the development of an enabling environment: creating a well functioning WASH market and a well functioning WASH public sector aiming to increase access to sanitation facilities. To realise this sector development, WASH Alliance partner WASTE has developed a unique approach called the Diamond Business Approach. It is an institutionalized business approach that is system-oriented and driven by demand and supply mechanisms. This approach requires a new facilitating role of NGO's. The approach specifically applies for cities since, compared to rural areas, it is easier to create a market here.

Analysis, results, conclusions and recommendation

Since the diamond approach is an institutionalized business approach, core stakeholders are the private sector and its clients (households, landlords, municipalities) and organizations that enable the business environment (e.g. financial institutions and local authorities). Other organizations, such as NGOs or consultants have supportive roles in this system. These parties only provide support services to the core stakeholders in the diamond.

During the last years, WASTE (specialists in sanitation) gained experience with this approach in Ethiopia, Zambia and Malawi. Here the approach is being up-scaled from three to twelve citywide interventions. The FINISH programme, initialized by WASTE, in India has been running for 5 years now and FINISH managed to leverage government subsidy by 1:20. Under this programme a new toilet is built every 3 minutes. Micro Finance Institutions are at the heart of the FINISH partnership.

With her approach, WASTE aims to set up sustainable sanitation systems in all countries in which the organisation is active. It is the objective that by the end of 2015 'functioning diamonds' are up and running in which all stakeholders know their roles and responsibilities and act accordingly.

By now, demand for improved toilets among households and landlords is present, toilets are being built,

loans are being provided by local (micro) finance institutions to both households and entrepreneurs and people pay back these loans. Local entrepreneurs are being trained to construct toilets of good quality and to transport, dispose, treat and process the sludge safely.

In the Diamond Business Model everything is geared towards sustained development based on local funding mechanisms and strengthened existing institutes. There is no place for a traditional role of NGOs, using external subsidies to provide infrastructure. Making such a shift from subsidies towards a market driven approach is a challenge for NGO's, governments and end users.

Semi-Decentralized, Modular Wastewater Treatment Concept for Fast Growing Cities



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Keywords: semi-decentralized, urbanization, wastewater treatment, water reuse, biogas

Introduction and objectives

Fast growing cities and towns are facing great challenges and high pressures due to rapid urbanization and insufficient water supply and wastewater treatment utilities, especially in developing countries or regions. With the semi-decentralized water infrastructure concept DEUS 21, a highly efficient and future-oriented approach to water and wastewater management has been developed by Fraunhofer IGB (Fraunhofer Institute for Interfacial Engineering and Biotechnology). While decentralized systems are not feasible in the urban context due to high specific costs and inadequate maintenance, centralized systems need large sewers for the transport of wastewater and are very inflexible due to their size.

Methodology approach

The concept DEUS 21 has been demonstrated in a development area with 100 plots in Knittlingen (southern Germany). In 2014, the concept has been adapted to the situation in China in the project “Integrated Resource Management in Asian cities: the urban Nexus” in cooperation with GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). In the course of the research project in Knittlingen, technical options for the utilization of wastewater as a resource have been demonstrated. In China, a solution for the challenges at the specific site has been developed, on the basis of the technological options demonstrated in Knittlingen.

Analysis, results, conclusions and recommendation

In Knittlingen, a vacuum sewer system has been built for collecting wastewater and kitchen waste. For wastewater treatment, an anaerobic membrane bioreactor (AnMBR) has been demonstrated, producing an effluent free of pathogens but containing all the nutrients, therefore suitable for irrigation and fertilization in agriculture. The recovery of these nutrients with MAP-precipitation and ion exchange has been demonstrated as well. Biogas production was significantly higher than in conventional treatment plants, as the process was purely anaerobic and kitchen waste has been added to the wastewater. Rainwater was collected in separate tanks and purified in the water house. The quality of the treated rainwater allows for flushing toilets, watering gardens, operating washing machines and dish washers and use in sinks and showers.

In the concept adapted for China, black water is collected separately from grey water. Grey water is treated in an aerobic process, disinfected and reused for toilet flushing, cleaning purposes (e.g. staircases, roads), irrigation, or it can be discharged into lakes and creeks. Black water is treated separately in an anaerobic pre-treatment (e.g. UASB- Upflow Anaerobic Sludge Blanket process) and an aerobic polishing step. As most of the nutrients are concentrated in the relatively small black water stream, an elimination of these nutrients is not recommended. They should be used with the disinfected water for fertilization in

urban agriculture, e.g. in greenhouses which can grow crops all over the year. Stormwater is stored and treated before discharge into the surface water or reuse.

With these modular approaches, the semi-decentralized concept could be a blueprint for fast growing cities particularly in the rapid urbanization areas in China, as the infrastructure is installed step by step according to the real demand, and the resource efficiency is higher compared to centralized solutions, as the reuse of water, nutrients, and energy is possible.

Water-use efficiency using spatial and temporal clustering analysis of pipe-failures



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Keywords: Failure Analysis, GIS, Geo-statistical model, AC pipes

Introduction and objectives

Although the spatial and temporal scale of pipe failure impacts are an important concern, analyzing pipe failures interactions is hindered by the quality of available data. This research presents a novel approach that aims to analyze spatial data to evaluate the water network reliability and to analyze the temporal data of failures. This analysis addresses how varying temporal and spatial resolution changes the water pipeline reliability value. A spatial and correlation analysis is used to determine the temporal and spatial scale.

Methodology approach

We employed ArcGIS10 software to analyze the data. Water pipe failure database provided from the Syabas Company (Kuala Lumpur Water Company). Database covers the pipe failures from 2006 and 2010. This proposed approach is described and tested in a data set that consists of about 2500 breaks that occurred over four years in a 2500 km of main water supply network in Kuala Lumpur. Advanced geo-statistical and spatial analysis techniques in ArcGIS 10 have been used to present the failure clustering and relationship between distance and temporal intervals between failures.

Analysis, results, conclusions and recommendation

Prediction maps have been created from pipe failures using the kriging tools in ArcGIS.

The spatio-temporal data set for pipe failure in Kuala Lumpur. These records allow us to examine the spatial structure of pipe failure and to address the role of several parameters. We use advanced application of spatial analysis to evaluate the occurrence of spatial clustering in the cases using different temporal windows. The spatial location of failures was also confronted against the spatial location of water network. Spatial clustering of pipe failures was detected at different temporal and spatial scales. The spatial clustering of failures relative to water network, and its timing, suggests an effective role of several factors in pipe failures such as pipe leaks, existing of district meter zones, rainfall intensity.

The results presented in this research indicate that there is a relation between spatial and temporal interval between failures especially for AC pipes. According to statistical spatial analysis, the pipe failures in Kuala Lumpur expected to be occurred in clusters. Also this research presents the importance of clustering to understand the factors contributing in pipe failures. Furthermore, the research presents the technical implication of our approach results.

The technical department can make the accurate decisions based on clustering of database. It is clear that the main failures are in AC pipes with diameter 100mm. Pressure management using District Meter Zone (DMZ) has no actual effects to reduce the pipe failures due to high deterioration of AC pipes. Water pressure management is temporary solution to reduce pipe failure. According the long-term plan, the sustainable improvement of water network become more effective in the schedule of pipe replacement of AC pipes.

Safe human waste recycling for agriculture in India



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Keywords: Sanitation, Resource recovery, Safe reuse, Water saving, Agriculture

Introduction and objectives

A large amounts of human waste generated and gets dumped irresponsibly. This waste has economic value when safely managed and recycled. This standpoint provides an innovative solution to challenges of clean water availability and over-dependence on chemical fertilizer in Indian agriculture sector. The objective of the pilot is to recover nutrients from human waste generated in the city of Udaipur for agriculture in a manner that is financially sustainable. This way, large amounts of water are saved with non-sewered system and nutrients are recovered. More importantly, the financially sustainable model is replicable and scalable to other regions of India.

Methodology approach

The pilot area is Rajasthan, India. WASTE and FINISH (local partner of WASTE in India) is working together with the Morarka Foundation, an organic group in India to answer the following question: "Can the human waste be converted commercially and in a safe manner into a product that can be marketed?". Compost is the targeted end product. Morarka Foundation is responsible for the pilot operation, local market scanning, and product marketing. WASTE is accountable for quality monitoring and provision of technical inputs.

Analysis, results, conclusions and recommendation

Sludge was collected from pits and tanks (every three days) with collection cost at INR150/tonne. It was then sprayed with natural disinfectants to remove smell at a cost of INR235/litre and got diluted (15 days of processing time). Afterwards it was mixed with 25% cow dung, worms were put into it and covered with leaves to avoid direct sun exposure.

Watering and aeration is provided every one to three days and three days, respectively.

The compost produced was similar to the vermin compost produced by other manufacturers in the market. Morarka Foundation had no difficulty in marketing the product. Ideal sales price is INR3,000/tonne (€1=80 INR), yet actual sales price is much lower (INR1,800/tonne) for affordability and marketing reasons. Organic entrepreneurs are therefore able to use different pricing strategy. Price breakdown of the product: Sales price INR1,800- 3,000/tonne; Material INR 150/tonne; Processing INR300/tonne; Transport INR 300/tonne; Packing INR 400/tonne; Profit INR650-1,850. Regarding water-saving, this non-sewered system uses 1 litre/flush as compared to 10 litre/flush in conventional system. A household of 5 people can save up to 30 m³ of fresh water per year.

Indian government plans to increase organic fertilizer production by 5% next year, as it is more sustainable and affordable. Effective uptake of urea (chemical fertilizer) in agriculture is 11%–13% (max.17% in good soils). If compost is used, uptake goes up significantly. Farmers who prefer sustainable and affordable production of nutrients have demand for the product. Potential market is

thus enormous. Recommendation is to explore opportunities for replication (including scaling up) in other areas. Main focus areas are: Rajasthan, Gujarat, MP, Odisha, Bihar, Jharkand, and UP. Education is needed for more farmers to understand the economic value in compost and training is required for SMEs to maximize nutrient value in compost and therefore maximize its sales price.

Performance Improvement planning(PIP) tool for improved water and sanitation services



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Keywords: Water, Sanitation, Performance Improvement, Too

Introduction and objectives

Traditionally, urban local governments in India are characterized by poor service levels and financial dependency on national-state grants for provision of urban infrastructure. Existing urban infrastructure financing mechanism in India focuses on standalone projects; on outputs and not outcomes. Experiences from cities that have implemented projects suggest that such investments are often unsustainable, as the techno-financial implications of the operation and maintenance of the infrastructure are usually ignored. Therefore, Performance improvement planning tools were developed with an objective of moving from “infrastructure investment plans” to “service improvement plans” with a wide set of actions including policy and process reengineering.

Methodology approach

Performance Improvement Planning (PIP) tool is developed to support decision making process for local governments for water-supply and sanitation services. PIP tool has three main interlinked components of performance assessment, inter-sectoral action planning, and financial planning. Service oriented PIP tool offers detailed guidance on identifying an appropriate set of actions, and assess the impact of these interrelated set of actions on both service performance and finances. For selected actions, it creates different improvement plans with life cycle cost assessment, and enables comparison of different scenarios. The performance improvement plans developed through this approach are multi-year integrated technical and financial plans.

Analysis, results, conclusions and recommendation

The Performance Improvement component of the Performance Assessment System programme has focused on development of tools and approaches to improve delivery of city level water-supply and Sanitation (WSS) services. 25+ local governments, with population ranging from 15 thousands to 500 thousand, in states of Gujarat, Maharashtra and Karnataka were supported to prepare performance improvement plans.

The PIP tool has been used extensively to prepare sanitation service improvement plans of four small towns in Maharashtra. Using the tool certain scenarios were build that consist of various technical options like on-site sanitation, non-conventional and conventional sewerage systems as well as different sources of finance for the various options like inter-governmental grants, public private partnerships-PPP, city's own sources and borrowings, and implications on tariffs. These scenarios were then compared and discussed with concerned city officials and elected representatives. These discussions have helped a great deal in making concerned stakeholders learn and sensitize that low or no-cost option, processes and policy related actions like regularizing illegal connections can help improve service levels and enhance revenues.

Capacity building workshops were held for city government officials and private consultants to disseminate the performance improvement planning approach and for training in the use of PIP tool. This tool is now being used for preparation of open defecation free city plans for 12 towns of Maharashtra. Our partner organization and private consultants are using this tool to prepare water and sanitation sector improvement plans in states of Karnataka and Maharashtra.

Customized reports on service levels and financial impacts provided in the tool helps users to compare performance, costs and implications on municipal finance. Such detailed analysis for different options provides a basis for an informed debate at stakeholders' consultation. This tool can be used during the project appraisal and for prioritizing the financial allocation for optimizing service performance.

Wastewater reuse and allocative efficiency in Sub Urban Bangalore



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Keywords: Wastewater reuse, Social acceptance, Decentralized treatment.

Introduction and objectives

Bangalore's urban agglomeration has imparted greater pressure on Bangalore Water Supply and Sewerage Board (BWSSB) to expand its water supply service to new sub urban areas. There are 110 villages which have become self-sustaining sub urban areas, though economically very productive they lack productive infrastructure with respect to water and sanitation. There is unregulated high groundwater abstraction. Hence, the focus of this study is to examine how effectively decentralized waste water treatment systems can be used and what is social acceptance level for implementing these technologies at a local level?

Methodology approach

Assessments were made at 4 sub urban areas spanning an area of 27 sq km. Primary and secondary data sources were used to determine the amount of wastewater generated and relative costs of wastewater treatment and recycling. This study emphasized on socio – technological approach to adopt wastewater management within a community. Contingent valuation techniques were used to determine the willingness to pay for the wastewater services and determine the environmental concerns and priorities of the respondents.

Analysis, results, conclusions and recommendation

This study is part of PhD research and data collections through questionnaires and field investigation is completed. Now the data are being collated and analyzed.

The presentation will showcase quantitative data on consumers' behavior modelled and results on the following:

1. Percentage of reclaimed water that can be allocated to street cleaning, firefighting, gardening, washing of cars and buses in garages.
2. Percentage of respondents who trust water authority and show greater agreement to reuse recycled water.
3. Percentage of respondents who perceived risk of reusing treated recycled water
4. Cost saving by adopting decentralized wastewater treatment systems than proposed centralized systems.
5. The study provides a helpful insight to water agencies to improve their allocative efficiency with respect to quality i.e., the reclaimed water of a certain quality to a certain non potable use.

From a project execution perspective we find that small scale solutions can be effectively enacted for a target group.

From policy perspective our study has identified that there are best practice policies and guidelines on

paper but due to lack of stringent monitoring mechanism, effective implementation is not seen. One such guideline is for usage of reclaimed water for construction activities and to treat the construction wastewater on site, but the builders are not following it.

BWSSB is planning to adopt centralized sewage treatment plant in these areas but it is capital intensive and time consuming task as they have to draw sewer lines. Instead low cost decentralized systems are proposed.

There are 10 sewage treatment plants which are ready to sell the reclaimed water, but agency is unaware of public acceptance. This study aided in bringing about the public perception towards usage of reclaimed water.

Promising initiatives are under way. Emphasis is on toilet to tap concept to make cities more resilient and sustainable.

Private Sector Delivery of Sanitation and Hygiene Services, Malawi



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Keywords: Malawi, private sector, Rural, Sanitation

Introduction and objectives

This report presents the findings on research in private sector participation in the delivery of sanitation and hygiene services in Nkhata Bay district, in Malawi. The study was aimed at analyzing and creating an understanding of the involvement of the private sector through the sanitation chain in program implementation and current and recommend measures to mitigate against the challenge within a rural district.

Methodology approach

In this study, data was collected through administration of questionnaires with key informants, in-depth interviews, field observations, focus group discussions (FGDs), household survey and non-participant observation. A total of 311 households were interviewed during this survey by trained research assistants and supervisors. The study also organized three review workshops, which were held in the District to review project finds.

Analysis, results, conclusions and recommendation

The study established the potential opportunities for sanitation as a business were eight fold, namely: (1) innovative improved latrine designs; (2) improved sanitation as public toilets in market area; (3) lack of service providers for emptying septic tanks; (4) tourist attraction center sanitation services; (5) motivated entrepreneurs; (6) high population growth rates (7) existence of motivated development partners and (8) high unemployment.

This study recommended: (1) to support private sector sanitation participation the sector should focus on commercial business loans to the private sector, rather than household (customer) loans; (2) low cost improved sanitation solutions should be available at a cost of less than MK12,132 (18£), or where households can reduce the cost of the private sector services by providing materials (bricks or cement); (3) marketing and community education is needed (4) commercial banks create sanitation funds to offer loans for sanitation business ; (5) the Nkhata Bay District Coordinating Team (DCT) should co-opt commercial financial Institutions in sector planning to promote funding mechanisms for build-up of the private sector, and modeling after water user association savings funds, the same model may have an opportunity to be extended for provision of sanitation services at the community level.

Improved WASH Services in Low Income Communities of Dhaka



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Keywords: public-private partnership, pro-poor policies, urban water supply, Water Operator Partnership, Community Based Organisation (CBO)

- Inhabitants develop knowledge and awareness about personal, domestic and communal hygiene aspects and put these into practice.
- CBOs are capacitated through training to monitor ongoing implementation procedure of infrastructure of water points, toilets and to control whether quality materials are being purchased as well as quality work is being ensured.
- Through close collaboration with the relevant drinking water department, the empowered CBOs can bring their concerns to the right authorities when needed.

Introduction and objectives

Dhaka, with its 12 million inhabitants, is one of the fastest growing cities in the world, absorbing an estimated 300,000 to 400,000 migrants annually. About 28% of the total population of Dhaka city is poor and lives in the slum known as low-income community (LIC). Vitens Evides International (VEI), a Dutch drinking water company, Simavi (a Dutch NGO) and Dushtha Shasthya Kendra (DSK), a local NGO have been working closely with Dhaka Water and Sewage Authorities (DWA-SA) involving civil society organizations to ensure the provision of Sustainable integrated WASH services to the inhabitants of LIC's in Dhaka.

Methodology approach

Service provision in the slum areas is potentially not sustainable, as they lack the tenancy rights. There is always a risk of denying use of the area by the private landlords. The “CBO model” was adopted by Dhaka drinking company, after they were convinced that communities can be seen as a reliable clients. This allows them to sell water via a bulk meter to a registered CBO which is formed/empowered by a NGO. The CBO is responsible for billing/ collection from the individual households and pays the bill. The illegal connections will be removed to decrease the non-revenue water.

Analysis, results, conclusions and recommendation

- Often, the poor population in LICs pay much more to illegal water vendors for their water bills compare to other inhabitants of city. They are therefore willing to pay the public utilities tariff (even higher), if regular provision of the water is ensured.
- The illegal water vendors can pose a serious risk to the provision of WASH facilities to LICs, since their business gets endanger. CBOs need to be empowered to be able to effectively intervene if such conflicts arise.

Results:

- Sustainable WASH facilities for inhabitants of LICs in Dhaka;
- CBOs develop full capacities to effectively and sustainably operate and maintain these WASH facilities in LICs;
- Effective cooperation between stakeholders, most notably CBOs, Dhaka drinking water company and Dhaka City Cooperation (DCC), is institutionalized; Drinking water company ensures supply of sufficient water to LICs and the CBOs in return ensure timely payment of water bills. Dhaka City Cooperation also ensures provision of other services such as solid waste collection from the slums. CBO also takes the responsibility of the O&M of the sanitation services in the slum.
- All unauthorized water connections in the area are legalized with water meter and all new connections are registered. Drinking water company (DWASA) will receive revenues from its registered customers.

STOCKHOLM INTERNATIONAL WATER INSTITUTE

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