SIWI WORLD WATER WEEK

Seminar: Smart solutions in water and waste management for liveable cities

ABSTRACT VOLUME

World Water Week in Stockholm
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Water and waste: reduce and reuse

Seminar: Smart solutions in water and waste management for liveable cities

Contents

Application of the UWU model for urban water use management

Presenting Author: Dr. Daniel Costa dos Santos, Brazil, Federal University of Paraná

Co-Authors:

Highlights

The IUWM approach offers real possibilities for water sustainability;
The IUWM approach allows stakeholders to deal with a complexity of water use;
It is necessary to consider a public vision for water management in urban areas;

Introduction and objectives

Given the dialectical conflict between a conservative approach and uncontrollable environmental changes, a new paradigm emerges in which the planning and management of water resources use requires a new approach. To deal with this context, the Integrated Urban Water Management (IUWM) approach offers contributions which aim to bring responses to these changes through alternatives that face this new paradigm. Thus, the aim of this work is to present an application of Urban Water Use (UWU) model which was developed under the IUWM and strategic planning approaches. This application was addressed to Almirante Tamandaré City, Brazil.

Methodology approach

The UWU Model, while base of a case study, was applied in Almirante Tamandaré. The UWU is composed by six steps: input data, vision building, scenarios elaboration, measures selection, outcomes and final evaluation. With input data collected, it is possible to build the vision by indicators selection. The scenarios consider external factors such as growth population rate, temperature and gross domestic product per capita. The measures are conceived based on Water Demand Management, Decentralized Sanitation, ECOSAN and SUDS philosophies. To conduct the final evaluation it is estimated the Effectiveness Index (EI) which establishes a hierarchy among group of measures.

Analysis and results

According to the Methodology Approach the measures were selected, as follow: Measure 01 - water consumption reduction by low-flush toilet; Measure 02 - greywater for toilets, cleaning and irrigation; Measure 03 - reduction of water loss in the distribution pipelines; Measure 05 - reuse of water using treated wastewater for agriculture; Measure 09 - expansion of the current wastewater treatment plant; Measure 11 - construction of new sanitation system. With these measures 4 groups were composed to apply the UWU. Observing the results for this specific case study, the Group II (composed of measures 1, 3, 5 and 11), and the Group IV (composed of measures 1 and 2), presented the best performance considering that they achieved the highest EI values. The EI values obtained for Groups II and IV were 4.0 and 4.1 respectively, which were classified as “good”. In these results it is important to highlight measures such as water consumption per capita reduction in buildings and decentralized wastewater treatment plants implantation because they are the cheapest and promote good results. Thus, with Water Demand Management and Decentralized Sanitation measures it was possible to build the management plan for water conservation in Almirante Tamandaré.

Conclusions and recommendation

It was possible to observe in this case study that the best strategies were Water Demand Management and Decentralized Sanitation. With these strategies it was possible to build a management water conservation plan for Almirante Tamandaré. The UWU application has demonstrated some flexibility to manage variables, due to the easiness to review the vision and to change the external factors. However, it is important to pay attention to the input data step and to fit coefficients in equations according to each studied reality. And for final evaluation it is recommended to have sensibility and knowledge enough to make good decisions.

People's initiatives for improving livable urban slums through ecological management

Presenting Author: Mr. Md. Azahar Ali Pramanik, Bangladesh, Society for People's Action in Change and Equity (SPACE)

Co-Authors: Ms. Sabekun Naher, Bangladesh, Society for People's Action in Change and Equity (SPACE)

Highlights

Adamjee slum dwellers efficiently manage newly installed innovative water, sanitation and waste recycling facilities to prevent diseases. They also manage stormwater keeping drainages functional during heavy rains and floods. Managing fecal sludge and solid wastes into organic fertilizers, they promote healthy environment, foods safety, promote marketing eco-products and urban-rural partnership.

Introduction and objectives

In each block, Adamjee slum dwellers are organized into groups for solving WASH and environmental difficulties. Installing solar operated water pumps, community eco-toilets, solar lighting and rainwater harvesters in one block, they experience encouraging results in energy savings, onsite fecal sludge management and accessing safe water to 100% households. New drainage and self-financed wastes management initiatives keep environment clean, what they have planned to implement in other blocks. People's initiatives in recycling and reusing wastes for making healthy residence give scope to conduct this study. This paper dedicates in presenting people-initiated models to wider audiences for scaling up.

Methodology approach

In quest of study question "How poor slum-dwellers have made their residences suitable to better live", the study was designed and framed for conducting. Participatory approaches have been followed for conducting the study. A set of data collection tools comprising of questionnaire for household survey, Key Informant Interview, face to face interviewing, transect walks, observation sheets and Focus Group Discussion were developed and trained data collectors collected data. To ensure quality of data, senior staffs directly supervised monitored and rechecked 10% of collected data. Findings have been documented by critically analyzing the qualitative and quantitative aspects of data.

Analysis and results

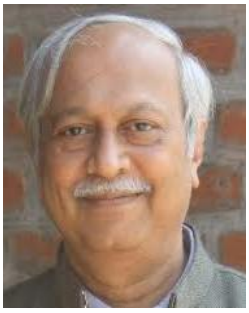
According to baseline study, about 10,000 lower income people from 1265 households live in Adamjee Colony with two squire kilometres area. It is divided into six blocks; an average 200 households with 1,000 populations live in each. Baseline findings reveals there were six demolished and unhygienic community latrines, severe water crisis, unhealthy waste dumps, clogged old drainage expose frequent health-threats. The report further reveals 100% children suffer from 7 to 10 times episodes of diarrhoea, stunting-growth trends found among 70% children, 80% mothers face intestinal and urinal infections, medical cost of each household was around US$ 150 to 350. Social cohesions among households were too weak. These unwanted effects aggravated their sickness and poverty levels.

Study after one year interventions in selected block with 218 households reveals 100% households have access to safe water, 85% households hygienically use Community Eco-toilets; recycle human excreta into organic fertilizers and market those. 100% households hygienically wash hands in critical times, keep children clean and manage wastes efficiently as part of social norms and control. Diarrheal diseases among children and medical expenses significantly decreased. Community drainages drain out stormwater. Positive results of the initiative have inspired neighbours for scaling up the same facilities.

Conclusions and recommendation

Despite over crowded population, severe water and sanitation crisis, improper waste management, water logging due to older and clogged drainage, the poor slum dwellers of Adamjee slums have reorganized them to prevent negative implications through undertaking an innovative initiative towards healthy and livable environment. The innovative new initiatives include integration of hardware and software mixed interventions e.g. assessing community needs, social preparation, Eco-friendly innovative technologies, strengthening community capacities for monitoring, linking with resource organizations, resources recycle for marketing, recovering partnership between urban and rural settings and involving multi-stakeholders towards suitable lives in urban cities to address the targets of SDG.

Rethinking urban water management: Improving water security



Presenting Author: Dr. Dinesh Mehta, India CEPT University, Ahmedabad

Co-Authors: Dr. Meera Mehta, India CEPT University, Ahmedabad
Ms. Upasana Yadav, India, CEPT University, Ahmedabad
Ms. Aditi Dwivedi, India, CEPT University, Ahmedabad

Highlights

The paper highlights susceptibility of cities in semi-arid regions to water scarcity. Climate change and resultant uncertain weather patterns are forcing cities to take extreme steps to combat water crisis. The paper describes efforts initiated by community based organization at reviving the lakes and recharging groundwater in cities in India.

Introduction and objectives

Bhuj, a city located in an arid region of Kutch in India, has suffered water scarcity in recent years. Community efforts have revived the traditional wisdom and explored alternative water sources to work towards becoming water secure. The study highlights the unique example of participatory urban water management approach through the efforts made by the community and local NGO. These efforts combine a deep knowledge of the history of water resources and in-depth technical assessment through participatory water management process. These efforts have led to influencing the new Development Plan and local government programmes.

Methodology approach

Water resources management approach in Bhuj incorporates a strong technical knowledge in disseminating information to the citizens through a citizens' forum called as Jal Strot Sneh Savardhan Samiti (JSSS). In the initial stages the forum was supported by NGO in the form of studies, research, data collection, capacity building, planning and monitoring. Along with this, they also undertook technical interventions and pilot demonstrations in the revival of the lake, flood control, groundwater recharge, rain water harvesting and decentralized water supply systems. It is envisaged that these efforts will make the city water secure through sustainable water resource management.

Analysis and results

Building up of the technical knowledge base and disseminating this knowledge to the citizens through strong citizens' forum is a key to the success of urban water resource management in Bhuj. Dissemination of the technical information to the citizens through simple messages and various awareness activities were also helpful. One learns from these efforts that sensitisation of local officials, capacity building of civil society and government officers and demonstrations through pilot projects are essential for successful urban water management. Another lesson is that it is essential to create specific institution and institutionalize the various processes of PGWM to make it sustainable. It also shows that citizens need to be involved in planning, implementing and monitoring. The whole process of integrated urban planning and renewal of traditional water system should be backed by a governance system that ensures sustainable efforts. The urban water resource management approach adopted in Bhuj has served as a background for initiating similar efforts in other cities to build their resilience in water security.

Conclusions and recommendation

The case of Bhuj shows a unique approach and offers valuable lessons in urban water resource management. Smartest way to de-risk from future uncertainty is to begin with the conservation of local water resource rather than depending on distant sources. There is a need to bring back that traditional knowledge to ensure self-sufficiency in water resources.

Reuse oriented faecal sludge management in Kenyan towns

Presenting Author: Ms. Alexandra Dubois, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Co-Authors: Mr. James Murage, Kenya, Water Services Trust Fund
Mr. Ismail M. Shaiye, Water Services Trust Fund
Mr. Simon Okoth, Kenya, Water Services Trust Fund/Stockholm Environment Institute

Highlights

- Improvement of environment through intermediate sludge management for cleaner cities and reduced groundwater and water bodies pollution.
- Reuse of faecal sludge coming from the DTF as soil conditioner or fertiliser, reducing the use of chemical fertilizer.
- Possible reuse of treated effluent from the DTF as irrigation water.

Introduction and objectives

Kenya's urban population continues to grow at an alarming rate of 4.2% annually. However, there is no commensurate development of basic water and waste water management infrastructure. Of about 13 million urban population, only 11% have access to sewerage services. The remaining 89% depend on onsite sanitation systems characterized by poor sludge management. To address the situation, a national sanitation up-scaling programme has been initiated in Kenya. The programme aims at improving sanitation services in urban areas of Kenya through implementation of citywide resource oriented sanitation built on the principles of natural systems for wastewater management and processing for reuse.

Methodology approach

The management of faecal sludge from onsite toilets is an infamously difficult problem in urban communities. Often, sludge is dumped directly to the environment, with likely negative impacts on health. However, there are opportunities in properly managing the faecal sludge through decentralized treatment facilities (DTFs) with the aim of reusing the processed sludge for soil conditioning and the treated effluent for irrigation. Utilities often accept responsibility only for sewerage, and not for FSM despite their institutional mandates for sanitation service provision. The programme exploits this legal mandate for the utilities to construct DTFs and promote reuse of the recycled resources.

Analysis and results

The intervention is currently being up-scaled in over 20 towns that do not have sewer networks. To date, a total of 7 DTFs have been constructed with the capacity to treat 24m3 of sludge per day and serve 10,000 beneficiaries each per day. A total of 70,000 people are expected to benefit from the FSM systems. The DTFs are small scale decentralized wastewater treatment plants which cater for sludge from dry and wet toilets brought in by the exhausters trucks among other sludge transportation equipments. The DTFs are designed to be located conveniently within the towns to provide sludge treatment for toilets which are of a standard that permits emptying. The Fecal sludge management is achieved through the transportation system and decentralized treatment facilities (DTFs). One key feature of the DTF design is the incorporation components for processing sludge by-products such as organic compost, soil conditioner, and treated effluent for irrigation as well as biogas. A robust business model has been formulated along the operations of the DTF including sales of the processed sanitation by-products. Already the programme through the utilities have constituted sanitation teams and have also developed guides for the DTF operators on how to co-compost.

Conclusions and recommendation

Marketing of the end-products of sanitation is not easy as utilities lack the capacities to market. Robust social marketing strategy that referring to the best practices in sludge management is already being implemented. There is potential for the DTF s approach to treat sludge to contribute to improved sanitation services while also creating opportunities for farmers to use the natural manure recycled from faecal sludge and treated water for irrigation. The use the sector structures and engagement of community groups as sanitation teams gives the reuse of manure from sludge and effluent credence thus marking the turning point for sludge.

T ▪ PARK: Leveraging the energy/water nexus in sludge treatment

Presenting Author: Mr. Laurent Auguste, Senior Executive Vice President of Veolia

Co-Authors: Mr. Dominique Gatel, Director – Water Public Affairs, Veolia
Ms. Anita KWOK, Hong Kong

Highlights

T ▪ PARK is the first sludge treatment facility in Hong Kong, treating sludge from 11 of Hong Kong's sewage treatment plants to achieve the government's vision of sustainable waste management and waste to energy. To facilitate community acceptance and raise awareness, it incorporates an environmental education center.

Introduction and objectives

Hong Kong has major challenges as one of the world's most densely populated cities. Ongoing upgrades of its sewage treatment plants have resulted in significant improvement of the marine environment but generate large quantities of sludge. Landfilling had been the only means of sludge disposal but the increase has shortened the capacity and stability of the landfills.

Methodology approach

T ▪ PARK combines technical innovations with creative measures for wider community acceptance. The intent was to build a facility that addresses the water, waste, and energy challenges and simultaneously provides opportunity for community awareness and acceptance. To manage the sludge volume, four fluidized bed incineration trains operate at 850°C and can handle a daily capacity of 2,000 tons of wet sludge containing 30% dry solids. Steam generated from the process produces energy for onsite use and export to the grid.

Analysis and results

T ▪ PARK began operation in April 2015 and has already proven to be a success in meeting its technical and environmental requirements. It is currently treating 1,100-1,200 tonnes of sludge per day. Sludge volume is reduced by 90% and all internal power requirements are met with steam-generated electricity derived from burning of sludge, with the excess power exported to the grid. An on-site desalination plant provides all of T ▪ PARK's water supply. Zero effluent discharge is achieved through onsite use of treated wastewater for process, cleaning, flushing and irrigation requirements. The Environmental Education Center opened in June 2016 and has attracted strong interest from the public with almost 40,000 total visitors over the initial six months. T ▪ PARK has also won numerous awards for its design that successfully integrates a large-scale industrial facility with its surrounding environment. The Hong Kong Environmental Protection Department has thus demonstrated that a large-scale waste treatment facility can be built and operated embracing the principles of environmental sustainability (self-sufficiency for water and energy), circular economy (giving value to what had none) and achieve acceptance by the community by providing both an educational and leisure experience.

Conclusions and recommendation

T ▪ PARK provides a sustainable solution to manage the growing amount of sludge from more extensive sewage treatment in Hong Kong. Reducing landfill usage, it also turns waste into energy, paving the way for a sustainable source of electricity. T ▪ PARK has created a new model for development of such facilities, incorporating innovative and creative features to raise awareness and encourage public acceptance.

True or false: 'pilots never fail, and never scale'?

Presenting Author: Ms. Titia Wouters, Netherlands, VIA Water

Co-Authors: Ms. Willemijn Nagel, Netherlands, VIA Water
Ms. Jacqueline Barendse, Netherlands
Mr. Aart van der Horst, Netherlands
Mr. Sjef Ernes, Netherlands

Highlights

- Showing promising water innovations in urban Africa of African innovators;
- New approach of searching for the African initiatives focusing on local ownership and sustainability;
- Simultaneously learning and innovating leads to a higher rate of successful innovations potentially making the transition to a sustainable business or social change

Introduction and objectives

VIA Water is a Dutch programme that supports innovative solutions for urban water, waste and sanitation problems ('pressing needs') in seven African countries: Benin, Ghana, Kenya, Mali, Mozambique, Rwanda and South-Sudan. The Dutch Ministry of Foreign Affairs funds VIA Water. UNESCO-IHE Institute for Water Education and Aqua for All are carrying out the programme. Our goal is to realise about 60 applicable innovations and to have an inspiring, active learning Community operational. At Stockholm, we will share our experiences and start an interactive discussion on the sustainability of pilot projects, that just come out of the research phase.

Methodology approach

VIA Water's intention is to identify critical success factors of social innovations in the African urban context. For this research, VIA Water supports a postdoctoral researcher (from Rwandese origin). VIA Water designed a learning strategy, in which three levels of learning are defined; project, programme and concept. On each level VIA Water carries out activities to uptake the knowledge collected there.
These activities entail Learning Tours, workshops, competitions and follow-up VIA Water Cafés in the countries concerned. Also country reviews were carried out by the African Studies Centre in Leiden.

Analysis and results

VIA Water is in the midst of its operations. On all three learning levels, see above, we have collected important learnings/results that we want to share with the Stockholm crowd. Our project owners will be present to tell their story.
Some preliminary results:

1. To keep focussing on the continuity of the pilot after conclusion, is key to success. Who is potentially interested, what is your market, what is the willingness to pay?
2. Key success factor is to give projects access to networks and financing to assure the continuity. Trying to get away from grant funding.
3. Combining innovating and learning is unique and of added value
4. Innovations in sanitation often focus on closing the value chain, adding economic value
5. Many innovations look at the usage of ICT in the water sector
6. Dynamics in the urban context help to attract innovations
7. The importance of skills development for African project leaders (business development, project management, technological knowledge)
8. The importance of connecting African innovators with international implementers to share knowledge and experiences

We dare to argue that under the conditions mentioned above, the statement above: 'pilots never fail and never scale' can be considered as false.

Conclusions and recommendation

The major steps taken by VIA Water in two years: over 523 applications received, resulted in 36 contracts and another 26 in the pipeline with an (online) Community.

With 82% of the applicants coming from African lead partners, the goal is reached of getting most initiatives coming from partners abroad.

But the biggest challenge is in the phase after conclusion of each VIA Water project. Without the extra support on improving skills, investing in coaching, linking participants to potential investors and making the learning more hands-on, the projects remain pilots and not sustainable solutions to pressing urban water needs.

Valuing sustainable urban drainage systems for water smart cities

Presenting Author: Ms. Katie Spooner, United Kingdom, Business in the Community

Co-Authors:

Highlights

Business in the Community (BITC) has worked with leading developers and water companies in the UK to develop a business case for sustainable drainage systems (SuDS). This project has sought to demonstrate the direct and multiple benefits of SuDs so that they can be integrated with future urban planning

Introduction and objectives

SuDs supports improved water management and quality in cities. These systems can be a mix of hard and green infrastructure that can store water for reuse or to slow its progress to the water course, making them a key tool for supporting climate resilient cities.

This project assessed the investment costs vs. savings in surface drainage charges to assess payback periods as well as quantifying multiple benefits to encourage investments in SuDS for cities. By demonstrating the value of SuDS we hoped to encourage wider use of the approach both by retrofitting existing buildings and within new builds.

Methodology approach

The concept was that non-domestic customers, working with schools initially, could be incentivised to implement SuDS through re-investing subsequent savings from surface water charges.

Greater Manchester was chosen as the pilot area as it is a region that places direct costs on surface water charges. there are currently over 1,000 schools paying together over £4.3m in surface water charges to United Utilities per year. If they could all move down one charging band, this could save over £2m which could be reinvested to cover the costs of SuDS measures in the short-term and educational benefits in the medium term.

Analysis and results

This project has identified that there is potential to create a model that can make it easier to significantly increase the uptake of SuDS in the North West, using Surface Water Drainage Charges to help incentivise implementation. This could work for individual organisations, but would be most effective at a programme level (city/city region or collection of smaller conurbations). While the project focused on schools the process could work as well with businesses, local authorities, the NHS etc. and could lead to more holistic solutions at a landscape level.

Between January and March 2017 we will be valuing the multiple benefits of SuDS and engaging with a government led national level review of how SuDS can be mainstreamed into UK urban planning. From July 2017 we will also be starting a pilot to design and implement SuDS in three sites as part of a practical demonstration of this project. This additional work will be presented to participants of the conference as part of a comprehensive example of the value of SuDS that can be applied globally.

This work was project was a partnership with Arup, Costain, MWH, Marshalls and United Utilities supported by the UK government(DEFRA).

Conclusions and recommendation

By identifying the additional benefits for water quality, air quality, biodiversity and making our cities better places to live and work the benefits of SuDS can be applied to a global context. Urban planners, national policy makers and developers can be incentivised to invest in SuDs as part of a strategy of smart solutions in water for climate resilient and liveable cities. Whilst this case study is based in the UK, SuDS technologies are globally applicable and accessible.

Poster: Green infrastructure in context: Public health and ecosystem services

Presenting Author: Dr. Laura Schifman, United States, NRC Postdoc with U.S. Environmental Protection Agency

Co-Authors: Dr. Alessandro Ossola, United States, NRC Postdoc with U.S. Environmental Protection Agency
Christopher Nytch, MS – Doctoral Candidate, Environmental Sciences Dept., University of Puerto-Río Piedras Campus
Dr. William Shuster, United States, U.S. Environmental Protection Agency
Danny Wiegand, MSPH, PE – Environmental Engineer, US Environmental Protection Agency
Matthew Hopton, PhD – Research Ecologist, U.S. Environmental Protection Agency

Highlights

Integrating socio-hydrology and public health principles into urban stormwater management can inform urban planning to incorporate resilience to changes in climate forcing and vector ecology. We present two case studies that identify potential green infrastructure benefits toward public health in subtropical urban areas (Caguas, PR and New Orleans, LA).

Introduction and objectives

Using interdisciplinary approaches to urban water management strategies can yield benefits for sustainability. While green infrastructure (GI) has primarily been used to increase infiltration and reduce runoff in urban areas, targeted situating of GI can provide additional socio-ecological benefits such as habitat for biodiversity, enhanced public space and communities, and reduced heat island effects. By situating GI in the broader context of the city as a socio-hydrologic system, we emphasize that traditional stormwater management services and anticipated public health benefits can be jointly realized. We present two case studies where contextual GI emphasizes public health and stormwater management.

Methodology approach

We describe a planning approach for contextual GI that targets the persistence of standing water after rainfall in subtropical urban areas, thus disrupting and alleviating the severity of vector-borne disease transmission and infection. To develop portfolios of suitable landscapes for GI toward both stormwater and vector control, we used remotely sensed data of vegetation, topography, and rainfall patterns in conjunction with field measurements on soil parameters and surface hydrology, in relation to the abundance of Aedes aegypti and A. albopictus populations in Caguas, PR and New Orleans, LA.

Analysis and results

Landscape and mosquito data are overlaid and zonal statistics calculated to generate easily interpretable maps that differentiate among site suitability for GI using color-coded areas in red (low suitability), yellow, and green (high suitability). This approach is used to rate sites where GI could be prioritized and installed to provide multiple ecosystem services.

Conclusions and recommendation

This interdisciplinary work recognizes that GI can serve multiple objectives that cut across social, environmental, and institutional gradients in cities. We argue the importance of integrating both field and remotely-sensed data for use in designing GI with the intent to control stormwater runoff and limit or eliminate Aedes spp. habitat. Finally, incorporating eco-hydrological principles into city planning can strengthen resilience to changing socio-environmental conditions and help implement innovative solutions for dealing with coupled human-water issues, particularly those related to public health management and watershed planning that enhances urban areas.

Poster: Holistic Surface Water and Groundwater Management for Sustainable Cities

Presenting Author: Prof. Chrysi Laspidou, Greece, University of Thessaly, Department of Civil Engineering

Co-Authors: Mr. Dimitrios Kofinas, Greece, University of Thessaly, Civil Engineering Department
Mr. Nikolaos Mellios, Greece, University of Thessaly, Department of Civil Engineering
Dr. Stamatia Rizou, Greece, Singular Logic S.A.

Highlights

Water4Cities project will focus on water management, urban infrastructure management, sensor networks, data mining, data visualization, system integration and urban planning. Due to the multi-disciplinary nature of the project, staff exchanges will allow partners working closely together to deliver high quality results and contribute towards urban water sustainability.

Introduction and objectives

This work is part of the new Horizon 2020 project "Water4Cities" funded by the EC Horizon2020 Marie Skłodowska-Curie RISE program. Urban water management becomes progressively more challenging in the view of population growth and increasing complexity of water management infrastructure. In this line, Water4Cities project will enable water providers and public authorities to critically evaluate the existing water ecosystems at city level in respect to the water supply, waste water treatment, reuse potential and the effect the growing population has on the water ecosystem and endangered species.

Methodology approach

The Water4Cities project will rely on sensor technologies, data and visual analytics to enable localization, visualization and analysis of urban water (both surface water and groundwater) at a holistic urban setting providing services to multiple water stakeholders. More specifically, the Water4Cities project aims to develop the necessary models and associated platform that will enable water providers and relevant stakeholders to monitor in real-time the urban water resources, support their decisions for optimal urban water management causing minimal environmental impact and involve policy makers, corporations and the public to provide the support for sound and balanced decision-making.

Analysis and results

The project will contribute in sustainable management of urban water by relying on the design of a holistic integrated methodology for urban surface water and groundwater monitoring and management, the construction of a beyond the state-of-the-art data collection mechanism and the enablement of real-time spatiotemporal visualization of water resources for sustainable urban water management. It will provide water managers the appropriate tools that will enable them to assess the implications of their decisions, such as groundwater over-exploitation, trade-off between energy and water use, different land uses and the effects of climate change on available water resources. Example decision support services are: a)improved groundwater management (e.g., planning of infrastructure such as location of municipal waterwells, planning of groundwater abstraction, enrichment of groundwater), b)improved water supply planning (e.g. selection of optimal water source w.r.t. energy and water use, water quality), c)improved water reuse potential (e.g., assessment of waste/storm water, water treatment) and d)implications of different land uses: city managers and urban planners will have all relevant information and data to decide the effects of a new project—such as a hotel, a swimming pool, a golf course, buildings with underground garages—expansion of tourism sector, etc.

Conclusions and recommendation

Overall the scarcity of groundwater data and their poor exploitation through existing ICT tools, calls for new solutions assisting groundwater management. However, groundwater management cannot be seen in isolation from the overall urban water ecosystem. Both surface water and groundwater should be viewed as part of the extended urban water ecosystem with its spatiotemporal availability, quantity, quality and competing uses being taken into account. Unlike existing approaches, Water4Cities will conduct research on an integrated approach to tackle multiple issues concurrently, and assist in understanding trade-offs between different measures and investments and in optimizing resource use in the urban water ecosystem.

Poster: How to revitalize decentralized wastewater treatment plants in Nepal

Presenting Author: Ms. Susanne Shatanawu, Netherlands, Simavi

Co-Authors: Jimena Duram, Netherlands
Ms. Saskia Geling, Netherlands, Simavi

Highlights

- Assessment of the functionality and management of decentralized waste water systems in Kathmandu Valley, Nepal.
- The understanding of factors that affect functionality, sustainability and management of decentralized wastewater treatment plants.
- The inclusion of private sector in the management of decentralized wastewater treatment plants.

Introduction and objectives

Decentralized Wastewater Treatment Systems (DEWATS) have popularity as an alternative to centralized wastewater treatment systems. In this study, the authors present an integrated analysis of the functionality of wastewater treatment plants installed in Kathmandu Valley, in order to understand the factors that affect its functionality and management and design frameworks that allow long-term sustainability. The introduction of DEWATS in Nepal has facilitated improved environmental conditions and usage of biogas and sludge. However, problems persist in sustainability and management. A possible solution to this challenge is the consideration of a multi-stakeholder approach and the inclusion of private sector management

Methodology approach

The study was conducted in two phases. The first phase took place in the month of December (Winter Season) in which the existing DEWATS inside the Kathmandu valley were explored. The operational conditions of the treatment plants were prioritized to make a category based on it and the site conditions of the plants in full or partial operation were assessed. The second phase of the study was conducted in April (Summer Season) for comparative analysis variation in functionality, flow pattern and site conditions.

Analysis and results

In the case of the municipal plants, the application and management aspect is very weak and the significant reasons for the failure of such systems are lack of periodic maintenance, lack of ownership, lack of monitoring from the concerned authorities and lack of awareness among users. In the case of institutional plants, the scenario is opposite and functioning of the system is given priority. The reason behind this is about proper care, maintenance and management system. A possible solution is private sector management or public-private partnership approach. In order to assure transparency and a good relationship, a system for accountability of all activities must be developed.

However, the study still revealed that the majority of the systems visited were operating at least partially and there were a lot of positives to take from the 8 selected for detailed study. The more awareness among the user committee and ability to maintain the systems led to increased functionality; positive examples were shown in Shreekandapur and Kathmandu University where ownership was taken and the condition of the system significantly improved over the course of the study.

Conclusions and recommendation

The study shows that treatment plants fail during the operation phase and their sustainability is a bigger issue in Nepal. The major limitation behind the failure of the systems is weak management and low involvement from major stakeholders during the operation phase. The study highlights several recommendations useful for the guaranteeing better performance of wastewater units that concern: 1) the empowerment of the caretakers of the system; 2) the collection of wastewater treatment tariff from the users; 3) incorporation of proper biogas and sludge production in the design; 4) the engagement of private sector entrepreneurs.

Poster: Interactive map of urban wetlands

Presenting Author: Ms. Camila Teutsch, Chile, Patagua

Co-Authors: Mr. Francisco Vasquez, Chile/Colombia, Independent Researcher

Highlights

- Multi-stakeholder participation is being promoted for urban wetlands protection and management.
- An integrated approach is being used to study urban wetlands as part of a green infrastructure system, highlighting their relevance regarding stormwater management, water supply, public space and climate change control.
- Relevant public information on environmental and urban water issues is being produced.

Introduction and objectives

The enormous array of environmental services that wetlands provide is hardly appreciated in Southern Chile. Real estate development has become a major threat to these valuable ecosystems, hence the urgency of making them visible and raising awareness among city inhabitants and decision makers. The Interactive Map of Urban Wetlands aims to contribute as an innovative tool for integrated urban water management. The initiative is currently being piloted in two towns through a participatory process that is shaping the online platform to better fit the needs of different types of users, and that is also gathering information to feed the map.

Methodology approach

This is a social innovation project which has multi-stakeholder participation at its core. The participatory process involves collaborative mapping, workshops, focus groups and other activities, which bring together representatives of local governments, civil society organisations, education institutions, and the productive sector. The participatory approach has been undertaken to identify information needs as well as to gather, produce and validate part of the information that will feed the map. Also, extensive research has been undertaken to understand what makes a social mapping platform useful, practical and alive.

Analysis and results

Although research is still ongoing at the time of writing, some key preliminary results can be highlighted:

1. Different stakeholders have different baseline knowledge on urban wetlands, but they are all eager to contribute to the mapping process and to get involved in wetland protection and management.
2. There is clear scope to use the interactive map of urban wetlands as a tool to support the ongoing process of updating urban development guidelines for both pilot towns involved.
3. Participatory mapping has resulted in valuable information on urban wetlands at a high level of cost-efficiency.
4. The multi-stakeholder participatory approach has enabled cross-sectoral collaboration for urban water management.
5. Active participation of local governments and other decision-makers has contributed to the engagement of other relevant stakeholders.
6. Different stakeholders have different information requirements and see different potential for the interactive map of urban wetlands. However, some of their shared information needs are: i) current and past wetland location; ii) land ownership/ public space potential; iii) urban biodiversity; iv) risk

and protection areas; v) development projects; vi) existing and potential paths and trails; vii) touristic spots and highlights.

7. Research shows that collaborative mapping platforms tend to lose strength when they are too ambitious in terms of the scope of information they cover and the applications they offer.

Conclusions and recommendation

Participation of multiple stakeholders is key for the design, development and information gathering of an IWRM tool such as the Interactive Map of Urban Wetlands. In order to be successful and sustainable, this kind of platform needs to be as simple and intuitive as possible (less is more). Once the interactive map is adjusted to its final version, there is clear scope for replication in other territories.

Poster: Runoff and site suitability analysis of rain water harvesting structures

Presenting Author: Prof. Kumar Veluswamy, India, ACRI-TNAU

Co-Authors: Dr. Alagu Raja R A, India, Thiagarajar College of Engineering, Madurai
Mr. Antony Joe M, India, TCE Madurai
Mr. Subbu Venkatraman R, India, TCE Madurai
Mr. Balasubramaniyan S, India, TCE, Madurai

Highlights

- Suitable water harvesting sites are identified to create macro level rainwater harvesting structures.
- The runoff potential map generated for this work will be useful for various applications such as flood risk zone analysis, crop suitability area analysis.

Introduction and objectives

A smart city is an innovative city that uses technology to improve the quality of life which has to support growing population's needs along with efficient management of natural resources. Increasing population density in cities creates more demand for water. Among essential natural resources, available water has already become a commodity due to its scarcity. Rain is the primary source of water. Due to climate change, rainfall pattern becomes unpredictable and extreme events as floods and droughts occur often. Moreover, Groundwater is being exploited in a worrisome manner. Therefore it is critical to harvest rainwater to recharge groundwater.

Methodology approach

This paper presents a GIS-based approach for identifying the suitable sites for rainwater harvesting structures in Madurai, one among 100 cities in India selected by Government of India. Site selection is made using runoff potential of location, soil characteristics, slope details and land use pattern data. Runoff potential map is generated using Soil Conservative Service –Curve Number method. Slope map is derived from the contour. Land-use Land-cover data are obtained from NRSC, Hyderabad. Precipitation data is received from Global weather data, Texas A & M University. These spatial data are processed with GIS software to obtain the required thematic layers.

Analysis and results

An Analytical Hierarchy Process (AHP) – weighted overlay analysis is performed using GIS with priority values for different spatial layers. The purpose of the weighted overlay analysis is to apply a common scale of values to diverse and dissimilar data input to create an integrated analysis. The layers used for this work are LULC map, soil map, slope map and runoff potential map. Each layer has its own influence, based on its importance and necessity. So different weightages are assigned to each layers. As a result of this process, the suitable macro level rain water harvesting sites such as farm pond, percolating tank and check dam are identified. The runoff potential map was also generated and it will be useful for applications such as flood risk zone analysis, crop cultivation area analysis. From the study area of Madurai district, the Madurai metropolitan area alone is extracted for validating the result. From the validation process, it is cleared inferred that the areas highlighted are highly suitable for setting up the rain water harvesting structures.

Conclusions and recommendation

Rain water harvesting structures are critical to conserve the scarce resource. It will be helpful to check floods during rainy season. Madurai is now facing acute shortage of water and getting it from long distance. Growing urban area and shrinking water bodies in the city makes the need for creation of more water storage structures to cater both agricultural need and drinking purpose. With that view, Madurai is selected for identification suitable sites to create water harvesting structures utilizing remote sensing and GIS technologies and several suitable sites are identified for macro level rain water harvesting structures.

Poster: Using urine as a smart solution for sustainable food production

Presenting Author: Mr. Joel Ssekabembe, Uganda, Kawuku Womens Group

Co-Authors:

Highlights

- Urine was tested and evaluated as a crop fertilizer in small scale farming.
- Urine contributes to significant yield improvements among urban farmers.
- Social barriers against diffusion are negotiable.
- Action research can create pathways towards sustainability.

Introduction and objectives

Urine though understood as a human waste,it is valuable for enriching soils for sustainable food production in developing countries like Uganda. Urine fertilization is valued as a low cost and low risk practice contributing to significant yield, increases food security and lower poverty levels especially in this era of enormous climate change with worn out soils. Kawuku Women's Group is promoting the use of urine among small scale urban farmers as a smart solution for sustainable food production in Uganda. However, the scale up of the project is still a challenge which needs to be addressed.

Methodology approach

- Urine is collected and stored in 5 gallons capacity from bathrooms among the mobilized communities.
- In one (1) gallon of urine you add 4 gallons of water to dilute the urine because it is strong and concentrated.
- Apply the urine to the outer perimeter of each plant that you feed.
- Give one (1) pint to each plant and water the plants thoroughly after applying the urine.

Analysis and results

- Using urine as a fertilizer enriches the soils and contributes to sustainable food production in urban areas.
- Urine contributes to yield improvement and positive farmer evaluation.
- Urine fertilization is a low cost and low risk yet it contributes to food security and increases urban farmers incomes.
- It is an appropriate method for purposes of sustainable land management, food security and urban livelihoods.
- The importance of culture and social norms should be recognized but not taken as absolute barrier to diffusion of the practice.

Conclusions and recommendation

In conclusion, urine fertilization should be acknowledged as a smart solution for sustainable food production and land management, food security and urban poverty reduction and livelihood. It is important for agricultural research to collaborate with urban farmers in all stages of development in research for affordable, locally anchored and sustainable practices. It is also important to to support the scaling up of such projects in more and larger areas for better results.