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Sustainable Urban Water Management Strategies

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ABSTRACT:
In present century conventional urban water management of cities facing difficulties of scarcity of water due to global climate change pressure which escalating the costs and risk to meet the current water demands. These challenges have generated approaches and technologies in urban water management of existing cities to adapt future changes with more sustainable solutions.Urban water management in cities are complex and dynamic is driven by multitude of purposes includes water supply for domestic and industrial consumption, adequate sanitation, and protection of humans and infrastructure from natural disasters. It also comprises of numerous interacting components and multiple decision-makers including users, water companies, municipal boards, and other authorities.The strategies for sustainable urban water management are needed at different levels such as governance policies, institutional frameworks, political and global regimes. The aim of this paper is to strengthen the sustainable urban water management strategies with best management practices that consider the natural and artificial system and their interaction.

KEYWORDS:*urban water management, water management, wastewater management, storm water management, future challenges*

I. INTRODUCTION

In present century urbanisation is a global trend with gradual increase in the proportion of the population in the cities. Urbanisation is long term continuous process which is socio-economic transformation and also called socio-economic phenomenon. Urban water management is inherently connected with urbanisation with the development process and as necessary strand in the economic system. In urban region anthropogenic activities produces wastes and pollutants that may be washed out in the natural and ground water resources. Land use land cover also associated with urbanisation comprises impervious areas which result changes in the urban storm water hydrograph (Goonetilleke et al., 2005).The sustainable urban water management is becoming very important and requirement new methodologies and strategies to get more incorporated information and knowledge from social, economical, environmental and global point of view. The sustainable urban water system management strategies should be high degree flexible, robust, adoptable, decision making and easy to understand by water users. The intention of this paper is to present importance of sustainability in urban water management.

II. URBAN WATER MANAGEMENT

Urban water management includes urban water infrastructure in which there are stronglyconnections between water collection, storage and treatment, water distribution, waste water collection, discharge of individuals, industrial effluents, storm water and also impact on receiving water bodies along with drainage network. Urban water management should be conducted by performance assessment of new interference strategies by developing a holistic approach which encompasses various system elements and criteria including sustainability in which integration urban water components including water demand management, waste water management and storm water management. It also characterized by an urban water cycle similar to the hydrological cycle which includes the flow of water and nutrients (Butler and Maksimović, 2001). This typical urban water cycle includes the water stream flow around the environment and where as nutrient cycle includes the flow of nitrogen and phosphorous. Urban water management seeks to change the impact of urbanisation on the water cycle based on the premise that by managing the urban water cycle as whole. This management's strategy requires an understanding the natural, pre-development and post-development water balance. Pre-development and post development a system is an important towards the impacts of urbanisation on water cycle. A research program SWITCH (Sustainable Water Management Improves Tomorrow's Cities' Health) funded by European Union to facilitate a new concept in urban water management. According to SWITCH there two key approaches for the sustainable urban water management; 1. A holistic frame work embracing all aspects of the urban water system in cities and 2. Adaptability in the face of uncertain future changes with sustainable, robust and flexible technologies.

There are some major objectives of SWITCH for sustainability in urban water;

1. Require to develop long term strategies for sustainable development in urban water management.
2. Impact of urbanisation broadcasting to stakeholders through a learning alliance approach
3. Develop effective water, waste water and storm water management with proper drainage system.
4. Provide an interactive institutional action that cover whole urban water cycle and water bodies.

1.1 Water demand and supply management

Along with the growing urban population providing adequate water services to the metro cities poses major challenge for urban water demand and supply. In spite of being fact that water users consumes only small amount of water for consumption, delivery of sufficient water volumes constitutes a complex logistics and economical problem. Thus an urgent requirement for additional water and sanitation services either from government policies or in partnership with the various responsible organisations (Biswas et al., 2004). This will be point out the importance of having integrated approach to water demand and supply management. It should be build on understanding by the peoples based on information and education programs. With information and knowledge, useful tools in water supply and demand management should be metering of water consumption for different water quality and also introduced compensating mechanisms for pricing of water. The management of these characteristics are howevercritical if a city is to provide an acceptable level of service to its citizens. The conventional methods for water supply management based on the perception of available water resources in the cities and additional urban infrastructures to meet user demand. This conventional method includes different management components such as;

1. Resources: Introduced rivers, bore holes, digging wells and construction of dams to store water
2. Demand: Water demand in the cities based on historical and current scenarios.
3. Abstraction: Water abstracted from different sources as per demand.
4. Treatment: Applied according to the quality of water
5. Distribution: Pipe network used for distribution

This conventional approach arises some questions from sustainable water demand and supply management point of view andthat also resultinadequate operation, poor service, and hazards to cities environment. Solutions of these problems should be overcome by more sustainable techniques in water demand and supply management; these are;

1. Awareness-Promoting educational campaigns to reduce water consumptions and water audits.
2. Leakage reduction and active leakage management-Survey pipeline with detection equipment by identifying and repairing mal-functioning consumer meters and also linked to GIS (Geographic information system) and simulation model.
3. Aquifer storage and ground water recharge- Injecting surplus supplies into existing aquifers during periods of high water flows.
4. Soil aquifer treatment-Removal of contaminants by different combination of membrane system, efficiently reduced micro pollutants.
5. Rain water collection- By rainwater harvesting and ground water infiltration

1.2 Waste Water Management

Waste water is a mixture of domestic waste consisting of black-water (excreta and urine) and grey-water (kitchen and bathing wastewater); water from tradeorganizations, including hospitals; industrial effluents, storm-water and run-off ; agricultural waste water, either dissolved or as suspended matter (adapted from Raschid-Sally and Jayakody, 2008).The existent challenge for the cities of the future is the sustainable waste water management of scarcer and less reliable water resources to satisfy the water demands and handle waste water disposal without creating environmental risk, social or economic damage. Mostly disposed waste water remains untreated and become hazardous when it mixed with untreated industrial effluents in many cities. The management of waste water in the urban areas is often multifaceted when systems in the cities are not well designed and inadequate than the resulting waste create waste leads to infections. The management of waste water includes the collection, conveyance, treatment and reuse of disposal in different levels. The conventional methods of waste water management is based on centralised system, sludge disposal, waste water collection and treats as combined flow; when volume increases in this system it is severely affected human health. There are also some major issues in the conventional methods such as cost, high energy demand, no-flexible, pollution risk and high water demand. To avoid this drawbacks; more sustainable approach consider which is reliable, economical, energy recoverable and ecological; which are as;

1. Decentralized wastewater system: The collection, treatment, and disposal/reuse of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, as well as from portions of existing communities at or near the point of waste generation" (Tchobanoglous, 1995).
2. Wetlands: Vegetation provides a surface for attachment of bacterial films, aids in the filtration and adsorption of wastewater constituents, transfers oxygen into water columns and controls the growth of algae by restricting sunlight penetration.
3. Urine collection and use: Urine separation decreases the energy requirement for waste water treatment.
4. Using waste water for efficient heating solutions (Therm liner system): Recoverand draws heat from waste water of the city.
5. Subsurface disposal: Consists of buried field and either a leaching field or seepage pits. It is generally not economical to build.

2.3 Storm Water Management

Storm water is surface water in abnormal quantity resulting from heavy precipitation such as rain or snow. Due to construction of impervious areas this will result in change of hydrological cycle, infiltration and groundwater recharge decreases and runoff is striking high peak flows, huge runoff volumes and accelerated transport of pollutant and sediments from urban areas. This will bring the establishment of storm water management in the cities to maintain the social and economic development. The main aims of storm water management shifted to security of the natural water cycle and ecological systems by prefaceof local source control and treatments in natural constructed biological systems such as ponds, wetlands and rivers. The most conventional methods of storm water management used are to convey runoff from the areas as soon as possible by using drainage system and underground pipes. There are various concerning issues with conventional methods includes: combined sewer overflows, erosion and sedimentation, costs, flooding in downstream, and water pollution. Some of the basic sustainable storm water management strategies are;

1. Green and brown roofs: Roofs are characterised by thin growth substrates, low maintenance and lower costs.
2. Restoration- Reclamation of Disturbed sites to natural landscapes that will effectively reduce stormwater runoff.
3. Retrofitting- Providing effective structural for runoff storage.
4. Vegetation: It absorbs the energy of falling rain, preventing erosion, maintains the soil's capacity to absorb water, promoting infiltration. It slows the velocity of runoff, reducing peak discharge rate.
5. Grassed Swales or grassed water ways: A shallow trench which has side slopes flatter than three feet horizontal to one foot vertical.

II. FUTURE URBAN WATER CHALLENGES

These sustainable urban water management strategies need to be more resilient in planning and decision making process. It should also thinking about future urban water challenges. These challenges may be due to climate change, emerging technologies, governance polices, urbanisation, energy costs, deterioration of infrastructure, degraded natural water system, water quality and conservative financial system. Along with this sustainable management of urban water requires conceptualisation for drawing the attentions of polices maker and stakeholders.

III. CONCLUSIONS

In the future urban water management will face the extrachallenges as demographic trends and continued increasing of theworld population in metropolitan areas and they leave their imprint onurban water quality and quantity (Endlicher et al., 2011).An integrative conceptual framework of the urban water system is a key component to understand the urban ecology, current and future water challenges and promote suitable urban water management. Strategies towards sustainable urban water management may pay special attention to increase the income of poor and provide amenities to them, so they also take the advantages of urbanisation. It should be supportive to the needs of a rapidly increasing population along with urban environment.

REFERENCES

[1] Aharoni A., Adin A. and Cikurel H. (2010) Results of Strategic Planning Process in Tel-Aviv-Yafo, Presentation delivered at 5th SWITCH Scientific Meeting, Lodz, Poland, and October.
[2] Ashley, R. M., Hvitved-Jacobsen, T., & Bertrand-Krajewski, J. L. (1998). Quo vadis sewer process modelling? In Butler, D. &Maksimovic, C. Proceedings of the fourth international conference on urban drainage modelling. London, 21-24 September.
[3] ASCE and UNESCO. Sustainability Criteria for Water Resource Systems—Prepared by the Task Committee on Sustainability Criteria, Water Resource Planning and Management Division. Virginia, USA: ASCE, ASCE, and working group UNESCO/IHP IV project M-4.3, 1998
[4] Butterworth J., McIntyre P. and Da Silva Wells C. (Eds) (2011) SWITCH in the City: putting urban water management to the test, IRC International Water and Sanitation Centre, The Hague, Netherlands.
[5] Bahri, A. (1998). Agricultural reuse of wastewater and global water management. Stencil- private communication.
[6] Chang, C., Wen, C., Lee, C., 2008. Use of intercepted runoff depth for storm water runoff management in industrial parks in Taiwan. Water Resources Management 22 (11), 1609-1623.
[7] Darteh B., Sutherland A., Chlebek J., Denham G. and Mackay R. (2010) 2nd Review of SWITCH Learning Alliance and research in Birmingham, Birmingham City Assessment.
[8] Elliott, A.H., Trowsdale, S.A., 2007. A review of models for low impact urban storm water drainage. Environmental Modelling & Software 22 (3), 394-405.
[9] Lundin M, Molander S, Morrison GM. A set of indicators for the assessment of temporal variations in the sustainability of sanitary systems. Water SciTechnol 1999; 39:235–42.
[10] Malmqvist P-A. Sustainable urban water management. Vatten 1999;55:7–17
[11] Niemczynowicz, J. (1997b). State of the art in urban storm water design and research. Paper presented at a workshop and inaugural meeting of UNESCO center for humid tropics. Kuala Lumpur, Malaysia, 12-14 November.
[12] Roesner, L. A., Howard, P. E., Mack, P. E., &Ramdett, C. A. R. (1997). Integrating stormwater management into urban planning in Orlando, Florida. In P. Rowney, P. Stahre, & P Roesner, Proceedings of engineering foundation conference on sustainable urban water resources management. Malmo, 7-2 September.
[13] Stahre, P. (1993). Assessment of BMP's being used in Scandinavia. In Proceedings of the sixth international conference on urban storm drainage. Niagara Falls, vol. I (pp. 939-944)
[14] Urbonas, B. (1997). Design & selection guidance for structural BMP's. In P. Rowney, P. Stahre, & P. Roesner, Proceedings of engineering foundation conference on sustainable urban water resources management. Malmo, 7-12 September
[15] WMO, (1982). Report of the meeting of experts on urban and building climatology. Report WCP-37, Geneva.