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20
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Water Management in Mega Urban Development: Case of Dwarka, Sub-city of Delhi

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Rapid growth of urban population has been the characteristic of Indian urbanization (Reut, et al, 2002). This rapid growth of cities is putting an increased strain on already over-stretched water resources. The main infrastructure requirement for the process of urbanization is water supply. Large scale urbanization and development means increasing demands for water (Rohilla, 2012). To accommodate the population growth in mega cities in India one of the strategies is to expand urban area through mega urban extension projects. In case of Delhi the urban extension is being done through three mega sub-city projects (Dwarka, Rohini and Narela). The impact of such developments on the environment, transportation, infrastructure, and quality of life are now common issues. The development of infrastructure is not able to keep pace with the increase in population and activities in the rapidly urbanizing areas (Rohilla 2012). These mega development projects have a critical role in future development of mega cities and sustainable provision of water to these urban extension area or sub-cities are real challenge. The water management for these areas also will become a matter of prime importance and critical issue. Dwarka, sub-city of Delhi can be considered as case study of such mega development and water management issues in Dwarka to be critically investigated.

The main threats to provision of water to urban areas are considered as **water scarcity**, decreasing water quality and pollution, ground water overuse, alternative water provisions associated with institutional and social problems. Therefore better understanding of the water risks in such development is necessary to take action in order to reduce, mitigate, or avoid those risks (Reut, et al., 2011).

Water scarcity is a prime issue in Dwarka. Dwarka is getting around 25% of their demand from the Delhi Development Authority (DDA) (Lalchandani, 2008). So there is huge demand supply gap. It has been seen that where the government provisions and piped water supply does not match the demand of the population, several strategies have emerged at the individual and community level in order to cope with the inadequacy of service utility. These strategies have lead to the creation of *alternative systems* to differentiate them from the *conventional systems* (Levasseur and Maria, 2005). In Dwarka the residents manage their water demand by procuring water from government tankers or purchasing water from private tankers or groundwater extraction within their plots which are unsustainable in terms of environment, health and economic point of views. The water supplied by tankers is uncertain and quality of underground water in Delhi is doubtful. The authority offered linear solution, drawing increasing volumes of water and discharging waste at ever increasing levels, thereby causing escalating stress on receiving environment. This approach is towards increasing the quantity of supply. The water crisis is considered here as a crisis of availability of water. This type of increasing supply oriented approaches proved to be insufficient to deal with strong competition for available water, growing per capita water use, increasing population, urbanization,

SEVENTH FRAMEWORK PROGRAMME

pollution and shortages of funds (Kolokytha and Mylopoulos, 2004). Water is a critical component for survival and economic development. So with the continuous increasing demand on this finite resource we must find a sustainable use of water (Engel, et al., 2011). The impact of inadequate supply of water falls primary on the poor. The government sector provision of water is inadequate and not reliable so poor people make their own arrangement which is also inadequate, unsustainable to meet basic survival needs. Many of them also end up paying high prices to water vendors or informal provisions of water which do not ensure quality. It has been seen that these informal arrangements put disease burden to the poor people than those who can afford for individual purifier to treat the poor quality of water provided. On the other hand the higher income group people can afford private solutions to these problems also. Inadequate water to the poor increases their living costs, lower their income earning potentials, and damage their well-being and life become risky (Levasseur and Maria, 2005). Almost all group housing societies and plotted housings in Dwarka have their own private bore wells, leading to the over-exploitation of groundwater and the amount of freshwater is decreasing at a rate of 0.5 m per annum. The ground water quality is also deteriorating due to over exploitation of ground water. The alternative water management system in Dwarka has spatial variation as the water supply quantity, quality and availability of alternative provision of water are different in different typology of residential development. Therefore it is necessary to understand this for sustainable management water in such type of development.

To make water management sustainable urban water management must integrate a larger proportion of solutions like raising awareness to reduce consumption, law enforcement and controls, reuse and recycling of storm-and wastewater, and climate change adaptation. Raising awareness on water risks, efficient water use must be through stakeholders' involvement in water management. Identification of key actors and their role in water management must be investigated for sustainable water management. The development control, policies, laws enforcement situation must be investigated. The estimated breakup of the per capita water demand (Khare, et al., 2006) clearly shows that 40% of the domestic demands in Delhi need not to be potable water and recycled greywater can be used which can be applicable for Dwarka also. The Central Groundwater Authority made it mandatory for buildings (for plot area 100 m2 or more) in Delhi to make provision for rainwater harvesting. The byelaw is applicable for Dwarka also; however the implementation of the same is not being monitored by the government concerned agencies and its technological appropriateness and maintenance is doubtful. The Delhi Government has modified the building byelaws (GOI notification 28 July 2001) to promote reuse of wastewater in buildings where daily wastewater generation is 10,000 litres or more. DDA initiated use of dual water supply systems in Dwarka in 2002-03 to promote the reuse of rainwater and recycled wastewater. The Master Plan for Delhi 2021 has also emphasized the recycling of treated wastewater through dual supply systems, however, these concepts have not been implemented in Dwarka until today. Government agencies also have not taken any action to implement the act because they are not clearly aware of the technicalities for the system. The area has been notified which means no groundwater extraction is permitted unless approved by the CWGA. However, it is a known fact that there is rampant illegal boring in the area (Lalchandani, 2008).

The climate change consideration and its adaptation in water management in Dwarka have not been considered. National Action Plan on Climate Change (NAPCC) has listed eight national missions. Out of these eight missions few talks about the water issues in the perspectives on climate change. The National Mission on Sustainable Habitats has given emphasis on the infrastructure management which includes water supply, sewerage and sanitation. The National Water Mission has given emphasis on the water use efficiency, exploring the option to augment water supply in critical area, this mission

strategies also include studies on the management of surface water sources, management and regulation of ground water sources, upgrading storage structures for fresh water and drainage systems for wastewater, conservation of wasteland and development of desalination technologies. The National Mission on Strategic Knowledge for Climate Change tends to identify the challenges of and the response to climate change through research and technology development. Applicability of these missions' strategies for Dwarka is not clear but it is necessary for sustainable water management.

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