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A REVIEW ON WATER SUPPLY AND WASTE WATER MANAGEMENT IN URBAN LOCAL BODIES OF INDIA

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Water supply management

In spite of the significance of water as an essential good for the survival of humankind, the overall situation of water supply especially in urban areas continues to be unsatisfactory. Although a national policy to provide protected water to their citizens was initiated in the First Five Year Plan itself, a real emphasis to urban water supply was laid down in the beginning of Sixth Five Year Plan (1980-85) which coincided with the declaration of the International Drinking Water Decade Programme, (1981-90) under the National Master Plan of India.

In urban areas because of rapidly Industrialisation, Urbanisation and unplanned development of houses, building and commercial sectors raises big issues of mismanagement of water supply in a quantity and quality effectively. Because of lack of public private partnership, existing old infrastructures, and lack of awareness among the people there is a need to assess and evaluate the existing water management utilities of urban cities in the country. Water supply system in urban India suffers from a number of problems. There exists serious mismanagement in water supply system in urban India (Kundu et al., 2006).

As per the available statistics, roughly 85 percent of India's urban population is being served with potable water supply. However, availability of water both in terms of its coverage as also quantity differs widely from one state to another. The notion that the water supply is more adequate in the larger cities is not supported by the data. In many of the cities, per capita levels are substantially below the average level. These are Hyderabad, Vishakhapatnam, Ahmedabad, Surat, Bangalore, Nagpur, Ludhiana, Jaipur, Coimbatore, Lucknow, Kanpur, being the lowest in Madras and Madurai.

It is usually argued that municipal bodies, primary agencies for water delivery systems in urban areas are facing severe financial crisis in managing water supply systems in their areas of operation. Therefore, it is necessary to examine the financial performance of municipal bodies on the service concerned. According to NIUA municipal expenditure survey in 1986-87, water supply ranks 3rd in the municipal spending outlay. In terms of percapita spending however, the position is critically worse and more than 70 per cent of sampled municipal bodies reported to have incurred even less than Rs.20 per capita, per annum on operation and maintenance of water supply systems. This amount seems to be reasonably low to maintain the service efficiently5 (NIUA 1989).

Kirkpatrick et al. (2004) analysed the water services of Africa in state versus private sector using the following variables viz., Operating and maintenance costs (US$) – Non capital cost, Water distributed per year (m 3) Output, Number of hours of water availability per day – Quality variable, Manpower costs per employee (US$) –cost of labor, Water resources per capita – control variable, Population served per connection –density variable, GDP per capita (US$) – (to capture the economic development and quality of governance), Freedom index – control variable (to capture the economic development and quality of governance), Number of pipe breaks that occurred in a given network per year and Ownership dummy (1=privately owned)– in order to account the effect of ownership on the performance. They used stochastic frontier analysis (DEA and SFA) and Cobb Douglas cost unction, half normal distribution

Nagues et al. (2008) used SFA and Translog cost function to study variable like volume of water delivered, volume of waste water treated , Labor cost, energy cost and miscellaneous cost, Average duration of water supply services in hours per day, Efficiency measure (total volume sold /total volume produced), Percentage of metered connection and Number of towns served by the utility

Filippini et al.(2008) studied the variables like operating and capital expenditure, Total Water delivered in m 3, Price of labor, (avg annual wages / avg no of employee per year), Price of material (material cost / length of the network in km), Price of capital (capital cost / capital stock) or capacity of pumps in litres / second (Capital cost consist of depreciation and interest), No of customers served (Sum of households and non household customers), Size of Area Km 2, Water loss(dummy variable) (1 – less water loss, 0 – otherwise), Treatment of water (dummy variable) using translog function

Baranzini et al, 2008 studied the Variable total cost, Output (volume of water delivered), labor Price Energy price, Material price, Capital price, Environmental variables, Consumer Density (no of customers per meter of network), Load factor (max amount of water distributed per customer per day/mean amount of water supplied per customer per day

Scaratti, et al., 2014 evaluated the municipal management of the three basic sanitation services (water supply, sanitary sewerage and solid waste) using Data Envelopment Analysis (DEA).

Solid Waste and Waste Water Management

Generation of waste is defined as any unwanted material, linked to human activities, and refers to something that has been discarded, rejected, abandoned or released into the environment. However, the intrinsic value of waste as a resource or an object for further utility may eventually become recognised as it is removed from the waste stream. The net result is to reduce the expenditure of waste disposal by meagre allocation of resources. If not managed properly, waste materials can have adverse impact on the environment, arising from contamination of soil, water or air and the spread of diseases through vectors thriving on waste, causing serious consequences for public health (Toxics Link, 2005).

The properties of waste can be divided into hazardous, stable or unstable, recyclable or compostable, easy to deal with or problematic. This is a helpful basis on which to categorise waste since processing options are different for materials with different properties. (WasteNet, 2005). The key ideas of the waste hierarchy focus on the requirement to move from a “throwaway society” to a waste minimised and sustainable one (MORI, 2004). This involves retaining as much energy and materials as possible in a useful state and avoid releasing that energy or matter into the environment as a pollutant.

The next option is aimed at turning waste back into useful solid material, which diverts a significant percentage of the waste stream from being disposed. Material recycling is the process in which waste materials are broken down into raw materials and reprocessed into products of an identical (closed loop) or similar nature (open loop) (Figure 5). The list of potentially recyclable material continues to grow as technological developments enable more materials to be recycled. However, it is rare for a product to be made of 100% recycled material because of health concerns, production and technical restraints and the fact that most materials have a limit on the number of times they can be recycled (WasteNet, 2005).

The main processes of biological treatment refer to digestion or composting of readily ecomposed organic matter by the action of microorganisms, where the benefits are enrichment of soils, a cost effective alternative for remediation of contaminated solids, and prevention from pollution. (U.S. EPA, 2007) The five primary variables that need to be controlled in these processes are feedstock and nutrient balance, particle size, moisture content, oxygen flow and temperature. Anaerobic digestion (fermentation) takes place in the absence of oxygen either naturally or under controlled conditions. The process converts organics into digestate2, liquid fraction (may be used as agricultural fertiliser) and biogas (may be used to generate heat and electricity or upgraded for use as vehicle fuel through thermal treatment). The technology is appropriate for ideally clean organic waste but also in combination with sewage sludge. (Surroop, 2007) (WasteNet, 2005). Thermal treatment is a generic term for covering a variety of technologies with a unique feature, lowering the waste volume to 10% and weight to 20"30% (Tsosos, 2004).

The process generates a substantial quantity of energy, which can be converted into electricity and heating/cooling power, from combustible, organic and non"recyclable waste. It can be considered as a renewable technology of energy source since the end product of its operation replaces original use of non"renewable sources. There are three main categories of thermal treatment; gasification (partial oxidation), pyrolysis (absence of oxygen) and combustion (enriched with oxygen) (Surroop, 2007).

In case of sanitation, although nearly 50 percent of the urban population is covered with sanitation services, only 28.5 percent of the urban households are connected to the public sewerage system. Further, where as approximately 300 urban centers have a sewerage system, only 70 of them have sewage treatment facilities. The position, with respect to the collection and disposal of garbage (solid waste)-one of those services that has high negative externalities is worse; apart from the low population coverage by garbage collection services, on an average roughly one-fourth of the garbage generated in the cities is left uncollected daily. The uncollected and undisposed waste can result in various kinds of diseases, and present serious health risks in the urban settlements. It contributes to the pollution of the entire environment - air, water and soil. A recent Statistics as reported in the NIUA study (1997a) for the selected metro cities of India indicates a poor state of affairs in terms of collection efficiency of garbage.

Significantly, in most cities, solid waste is collected from bins and transported to dump sites at the periphery of the city. The indiscriminate dumping of waste in the nearest available low-lying area often causes damage to the soil. Very few cities practice scientific methods of sanitary landfill or convert the waste into compost or energy. This is largely due to the fact that solid waste is not separated prior to collection. The physical characteristic of solid wastes collected by municipalities is not readily suitable for recycled into compost or energy. The major problem of municipal solid waste relates to the mixing of hospital and toxic industrial waste with other wastes. Although, major hospitals by law are required to incinerate their wastes, they often dispose off their waste in municipal bins. The industries are also required to dispose off their toxic waste through prescribed procedures, but they often do not practice them. These wastes create a serious health hazard in urban areas. However, after the plague outbreak in Surat in 1994, there has been a greater concern at the national level regarding the status of urban solid waste in the country.

Anna Gustavson, 2008 studied the Solid Waste Management in Kancheepuram district,Tamil Nadu state of India using the theoretical approach and empirical studies. He has approached scientifically and interview method.

SOURCE	TYPICAL WASTE GENERATORS	TYPES OF SOLID WASTES
Residential	Single and multifamily dwelling.	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires) and household hazardous wastes.
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants.	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes.
Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
Institutional	Schools, hospitals, prisons, government centres.	Same as commercial.
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings.	Wood, steel, concrete, dirt, etc.
Municipal services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants.	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge.
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing.	Industrial process wastes, scrap materials, off-specification products, slag, tailings.

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