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AN EVALUATION OF WATER SUPPLY SCENARIO IN KHULNA CITY CORPORATION AREA

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Abstract: In the urban areas of Bangladesh, service standard of community facilities lacks far behind of any recognized planning standard. Khulna City is an instance of having typical urban problems particularly the crisis of safe water. Approximately 45% population in this area is covered under piped water supply network. In this study an attempt has been made to evaluate the existing water supply system in the Khulna City Corporation (KCC) area regarding water supply installations and their capacity, water consumption pattern, satisfaction level of water supply and water demand-supply analysis. Structured and open-ended interview schedule were used as primary data collection tool. A two stage stratified random sampling was adopted and some statistical conventional techniques were used to analyze the data. The study reveals a wide gap between water supply and demand in KCC area. Again, the study shows that above 90% people use tube well (shallow and deep) water for drinking instead of supplied pipe water. It is shown that most people are not satisfied with quality and quantity of the supplied water for their daily usages. This study suggests to adopt the appropriate policy measures in order to safeguard the interest of the people for water supply, which would eventually improves the living and socio-economic conditions of the people in the study area.

Key words: Water supply, drinking water, urban area, Khulna, Bangladesh

Introduction

Supply of safe water is one of the important environmental issues in the developing countries. Like many other developing countries, there is a huge demand for safe water in Bangladesh (Ahmed and Rahman, 2000). Khulna is situated in Southwestern part of Bangladesh along the Bhairab and Rupsha rivers. It is an expanding urban center of Southwestern Bangladesh, which is being directly influenced by the tidal water and salinity. These tide-dominated rivers are contaminated by untreated effluents and wastes from various industries and urban household (Anon, 1997). Due to salinity and huge pollution load, the river water is not used for household supply by the Khulna City Corporation (KCC). Thus, the problem of safe and available water is more acute than any other urban area of the country. Ground water, available from the shallow and deep aquifers, is used for this purpose. Ground water withdrawn by wells is the primary source of water for the KCC water supply system. It is primarily based on small groups of production tube wells. Besides, there is one surface water treatment plant. There are only five overhead tanks in the city but two are not active (Anon, 2000a). The total system has been developed over many years and has been constructed using relatively small diameter pipes.

Water Works Department (WWD) of KCC currently recovers its operating costs through connection fees for new services and a flat monthly charge based on the size of service connection. In 1981, KCC was able to provide 5 million gallons of water in each day. But it was not enough to serve the urban population because the total demand was 15 million gallons (Ahmed and Haider, 1997). In the year 1991 water supply capacity rose to 8 million gallons but demand rose even higher and KCC was able to supply only 34% of the total

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demand (Anon, 2000b). At present, the total demand of water is about 30 million gallons but the supply of water is half of this including the wastage by which only 45% people are served (Anon, 2006). About 90% of the total populations of the KCC area collect their drinking water from shallow and deep tube wells instead of network water supply system from KCC (Anon, 2001). On the other hand, the water supply management of KCC is not systematic and having limited expansion capabilities which requires designing, constructing and managing to face future challenges. This study searches for an evaluation of the existing water supply system through analyzing the existing usage pattern and supply-demand situation of water in KCC area.

Materials and Methods

A reconnaissance survey was conducted in KCC area to assess the water supply system. The study was carried out based on field surveys and secondary data. Structured and open-ended interview schedules were used as primary data collection tool. The questionnaire was used to detect the problems of the existing water supply system and satisfaction level for both in quality and quantity of supplied water by KCC. In order to achieve representative ness, a two stage stratified random sampling was adopted. KCC area was first divided into three zones *viz.,* the northern zone, the central zone and the southern zone regarding population distribution. The northern zone has 15.5%, whereas the central zone and the southern zone have 30.2% and 54.3% of the total KCC population respectively (Anon, 1999).

The city has been again divided into 31 sections by ward numbers, with 5 wards in the northern zone, 10 wards in the central zone and 16 wards in the southern zone. Considering population distribution in the three zones, out of 31 sections, 6 sections were selected as primary sampling units, taking 1 from the northern zone, 2 from the central and 3 from the southern zone using stratified random sampling techniques. Twenty-five households were taken randomly for questionnaire survey from each of the primary sampling units. Thus, 150 households were investigated, taking 25 from the northern zone, 50 from the central zone and 75 from the southern zone. All the primary sampling units and households' samples have been taken according to the percentage of population and household numbers. It was done for the advantages of data collection and presentation of an average scenario of water supply in the whole city. Collected data were analyzed through standard statistical methods and data were presented graphically or tabular form.

Results

Existing water supply system and components: Only 45% of the households in KCC area have access to the pipe water supply. The remaining 49% have access to hand tube wells and only 6% use water from secondary sources. Table 1 shows the different sources of water supply in KCC area.

Table 1. Existing water supply system in structure plan area of KCC.

Sources	Population coverage (%)
Pipe water	45.70
Street hydrant	4.50
Tube wells	43.80
Other sources (ponds, rivers, wells etc)	6.00
Total	100.00

Source: KCC, 2006.

Water supply installations: There are only 50 production tube wells used for groundwater withdrawn in case of pipe water supply, 9,200 hand tube wells (both deep and shallow) and one surface treatment plant to supply water to the consumers. In addition, there is only 265 km pipeline for supplying water. Total installed capacity of the production wells is 40,700 m^3/day. The yield is 3.3 m^3/day and 6.6 m^3/day for shallow and deep hand tube wells respectively. The overall existing water supply installations in KCC area is shown in the Table 2.

Table 2. Water supply installations in the KCC area.

Description	No. of existing installations	Capacity (m^3 day^{-1})
Overhead tank	5	2,815
Production tube well	50	40,700
Deep tube well (Hand)	3,600	23,760
Shallow tube well (Hand)	5,600	18,480
Surface water treatment plant	1	450
Distribution pipelines (75-300mm dia.)	265 km	-

Source: KCC, 2006.

Domestic water consumption pattern: The consumption pattern of domestic households shows that about 95% of households use tube wells (shallow and deep) as a source of their drinking water. About 48.5% of the households depend on shallow tube wells for cooking purpose followed by piped water supply 25.4%. About 48.5% of the households use pipe water for washing utensils and clothing. Again, a large portion of the city dwellers depend on pipe water supply for bathing purpose. The domestic water consumption pattern is shown in the Table 3.

Table 3. Domestic water consumption pattern in the KCC area.

Purpose	Sources of water (%)					Total
	Pipe network	Hand tube well (deep)	Hand tube well (shallow)	Pond	River	
Drinking	5.2	45.2	49.6	-	-	100
Cooking	25.4	20.1	48.5	5.4	0.6	100
Washing	48.5	12.8	30.4	7.8	0.5	100
Bathing	43.2	8.9	33.5	13.2	1.2	100

Satisfaction level of the existing water supply: City dwellers' satisfaction level in the study area mainly depends on quality, quantity and distance factor. Table 4 and 5 represent the satisfaction level of the respondents considering quality and quantity factor with respect of different usages.

Table 4. Quality of water as perceived by the city dwellers in KCC area.

Perceived quality	Type of uses (%)			
	Drinking	Cooking	Bathing	Washing
Satisfactory	17.8	26.7	47.3	57.9
Moderate	23.1	52.9	40.4	30.2
Poor	59.1	20.4	12.3	11.9
Total	100.00	100.00	100.00	100.00

The supplied water is used mainly for washing and bathing. About 57.9% people uses this water for washing, only 17.8% people seems that it is satisfactory for drinking and about 59.1% people seems that it is very poor quality for drinking. Again, about 48.2% people seem that the quantity of water is very low for washing.

Table 5. Quantity of water as perceived to the city dwellers in KCC area.

Perceived quantity	Types of use (%)			
	Drinking	Cooking	Bathing	Washing
Satisfactory	32.8	33.3	21.1	19.6
Moderate	52.1	43.6	36.8	32.2
Poor	15.1	23.1	42.1	48.2
Total	100.00	100.00	100.00	100.00

Water demand and supply: The Water Works Department (WWD) supplies only 15 million gallons water per day including wastage against 30 million gallons of demand per day. The sector wise water demands in KCC per capita per day and year basis water supply are shown in the Figure 1 and 2 where domestic need is high.
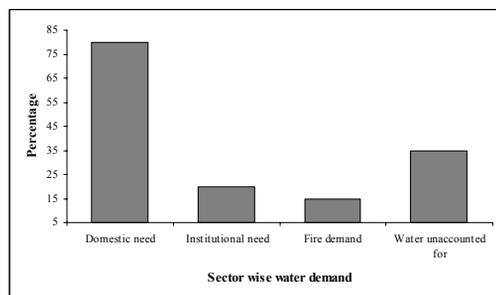

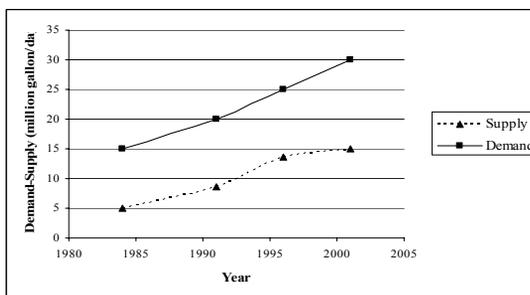Fig. 1. Sector wise water demand in KCC.

Fig. 2. Year basis water supply and demand in KCC.

Discussion

The yield of the production tube wells is considered less because of operating conditions. Among the hand tube wells, more than 4% of both shallow and deep are not working due to lack of maintenance. The yield of

surface water treatment plant is less than the yield of newly installed production well because it loses the production capacity due to becoming old (Ahmed and Haider, 1997). People are reluctant to use pipe water for drinking purpose as it is often found to be contaminated. It is shown that the supplied water is mainly used for washing and bathing due to its poor quality. City dwellers are not satisfied with the present water supply condition. They do not get enough water as they need. Because there is shortage of water source in the area and the existing sources are not in well condition. Most of the people in the KCC area state that the quality of supplied water is very poor, because the supplied water contains odor, algae, dirt and other organisms. Though increasing trends are observed in both demand and supply situations, but the gap between them remains, and even seems to be widening over the years. Therefore, addition 15 million gallons of water is needed to supply to the population of KCC area at urgent basis.

Conclusion

Developing an efficient water supply system for KCC area is an enormous task, because the total water supply system faces fragility. For the urban mass, there is need of water about 30 million gallon/day where KCC is able to supply only 15 million gallon/day including wastage. So, a wide variation is seen between the total demand and supply of water. The supplied water is mainly used for washing and bathing purposes. The respondents' opinions regarding the quantity and quality of supplied water by the KCC show a limited degree of satisfaction level. Therefore, KCC authority should take immediate measures to find effective remedy for the overall water supply problems in KCC area. As well as other aspects and views to develop the water supply system in KCC area should be taken into consideration. In order to supply safe water in KCC area the integration of social power and combined effort towards the establishment of water supply installation is urgent.

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