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Water Consumption Status in Lalitpur Sub-Metropolitian City Area in Nepal

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Abstract: This research is undertaken with main objectives of surveying and analyzing the present condition of public's water consumption pattern from different water sources in Lalitpur sub-metropolitan city area. This is entirely based on field research and various steps of field research tools were used. Field observation and Key Informant Survey were carried out to collect for general data of the water sources and then to categorize them on the basis of their performance. Structured questionnaire survey was the undertaken with the users to assess the water use. Comparing different scenarios and results from users survey it is find that maximum 33% of demand fulfil by NWSC-supply,7% fulfil by private well,3% fulfil by neighbours well,10% fulfil by public well 10 % fulfil by tanker supply,3 % fulfil by rain water and 7 % fulfil by NWSC-Collection tank and 27% water demand fulfil by traditional stone spouts. Per capita water consumption of the users vary from a max 49 Lpcd to a minimum is 29 lpcd. This is mainly fulfilled by NWSC- supply, well, tanker supply and NWSC collection tank provided in different place in LSMC area and stone spouts.

1. Introduction

Kathmandu valley comprises of three administrative districts viz. Kathmandu, Lalitpur and Bhaktapur. Among the cities mentioned above Kathmandu is categorized as metropolit an city, Lalitpur as sub metropolitan city, while three others as municipalities.

The early settlement appears in the valley had started around 7th century BC. Lalitpur sub-metropolitan city (LSMC) is the city area under Lalitpur district in Kathmandu valley under the jurisdiction of the Lalitpur sub-metropolitan. The population of LSMC, as per census 2001, is 1, 62,991 living in a total of 68,922 households with an average family size of 4.66 persons. In the intervening ten years, between 1991-2001 the population growth rate was 3.47 percent per annum, which is much higher than the national growth rate of 2.24 percent per annum. Projecting the trend of urban growth, the population of LSMC is expected to reach 2, 29,852 by the year 2011.

In LSMC, there are basically two water supply systems to the water demand of its population, i.e. traditional water supply and piped water supply.

Patan's large-scale traditional water supply system of network of canals (Rajkulo), which could have connected the city's Hitis (Dhungedhara) ,wells and ponds to sources at the edge of the valley's floor for continuous supply and recharging ,constitutes a grand and historically layered system. Additionally water holes and deep wells (Inara) providing a supplementary layer of hundreds of small-scale water sources for the city, probably from a very early date. (City profile LSMC-2005)

According to a record at LSMC, there are 60 stone spouts or Hitis, 226 wells, 25 major ponds in the city, majority of which are concentrated in the traditional core area of the city. With the unplanned haphazard urban development, the traditional water supply system is gradually crumbling, polluted, drying up and even vanishing.

According to Nepal Water Supply Corporation (NWSC), the modern day piped water supply system in LSMC has two sources at Sainbu reservoir and next Chapagaon reservoir. Sainbu Reservoir is located at Sainbu Bhaisepati at the south of the city. There are two reservoir each capacity 2700 cu.m. It collects water from surface runoff from Satmool intake, Sesh Narayan intake and Kuturi intake.It is said to collect ground water through deep tube wells in Pharping during dry season. The total yield is 22 mld in wet season and 16 mld in dry season. It is the main source of bulk of the municipality area.

The Chapagaon Reservoir is located at Chapagaon .It has two reservoirs located at Tahakhel-old and new-each has capacity of 500 cu.m. These reservoirs collect water from surface runoff from Naiiu khola, Deaki spring, Basuki spring. It also collects water from Muidole pump house and Charghare poumpe house. The total yield is 10 mld in wet season and 6mld in dry season. It is also important source of municipal water source. This piped network supplies 32 millions liters per day of water in wet season and 22 millions liters per day in dry season, while the total demand is 38 millions liter per day.

2. Water Sources, Conditions and Uses

Private water connections, wells, public taps, and public wells are the major sources of water for the sample households. A typical household can access at least three sources, with approximately 87 percent of households claiming that they could get their water from a private water connection if they wanted. In terms of attributes of water, most households felt that water from a private connection tasted poor, was dirty or very dirty, posed serious or some health risk, and was irregular or unreliable. About 71 percent of the sample households are connected to the NWSC system, and about 66 percent use water from a private connection. Among the latter group, about 70 percent have a functional water meter and receive a monthly bill, which is about NPR 100 .On average, water is available from private connections about 2 hours per day in the rainy season and 1 hour per day in the dry season. Respondents' main complaint about their existing level of service is that they cannot get 24 hours a day water supply. Typically, a household uses two sources. Fifteen percent of the sample uses only private taps, whereas another 19 percent use only a combination of private taps and wells. In contrast, about 25 percent of the households rely exclusively on some combination of community sources—including rainwater, ponds and streams, and neighbors in addition to public taps, stone taps, and public wells—that are typically free. Drinking, cooking, bathing, and washing comprised the major uses of water from any source. About 63 percent of households treat their water before drinking and cooking by boiling, filtering, or adding chlorine. About 51 percent of households have one or more storage tanks with a median capacity of 1,050 liters and a median cost of NPR 4500. Among households who are connected to the existing NWS system, this research find that 23 percent can be classified as poor using the statistical definition of poor. In contrast, among unconnected households, they can classify 61 percent as poor. Approximately 88 percent of these poor unconnected households rely exclusively on some combination of free community sources. The median amount of water collected from these sources is about 60 liters per day. Only 12 of the poor households have a storage tank, with a median capacity of 450 liters.

3. Willingness to Pay for Improved Water Services

Contingent valuation questions measure the maximum amount of money (WTP) that the respondent would be willing to pay for the proposed improvement in water supply. This data is related to but not equivalent to demand. Nor is it equivalent to a households monthly WTP. Maximum WTP and CV response data define household values, underlie their demand for improved water supply, and, therefore, inform tariff design. They asked households for their WTP for a service that will provide a specific amount of clean and safe water, 24-hours a day, with regular and fair billing based on metered use. The distribution of responses to the WTP questions show how many people would connect at different levels of the proposed monthly bill and exhibit the expected downward sloping property that is consistent with demand theory. This study find considerable demand for improved water services. Almost 70 percent of the households who are connected to the network are willing to pay a monthly bill of NPR 600 .Among households who are currently not connected to the network; almost 50 percent are willing to pay a monthly bill of NPR500 for a similar service. Information of this nature can be used to evaluate alternative tariff policies for water in Kathmandu.WTP data from CV surveys measure the amount of monthly income that the household could give up after obtaining the improved water supply and be just as well off as in a situation without an improvement in water supply. Thus, it is a measure of the households' economic value. For the sample of households who are connected to the network, the median WTP is NPR 900 per month for improved services, which includes about 500 liters of water a day that is risk free and bills that are regular. That is, at least 50 percent of the sample are willing to give up NPR 900 from their monthly income to obtain the improved services. Based on this definition of economic value, the mean WTP for is NPR 1030 per month among connected households. For poor households currently connected to NWSC, the mean WTP of the poor households is NPR 800 per month. Among unconnected households, the mean WTP for and improved service from a private connection, which includes about 500 liters of water a day that is risk free and bills that are regular, is NPR 840 per month. The mean WTP for an improved water supply from a shared connection, which is similar in all respects except that it will provide about 250 liters of water a day, is NPR 230 per month. The mean monthly WTP of poor households currently not connected to NWS is NPR 630 for a private connection and NPR 240 for a shared connection. Multivariate regression techniques were used to further analyze the determinants of WTP responses. As expected, individuals with higher incomes had statistically significant higher WTP for private connections and lower WTP for shared connections. Households who believe that water contamination is the most important environmental problem have a higher WTP. Households who believe existing private water connections provide risky and unreliable water are willing to pay more for a private connection. WTP is lower for households who use community water resources exclusively. Finally, households who engage in substantive averting behaviors such as treatment and storage of water are willing to pay more. The overall significance of the regression models and the expected correlation between WTP and socio-demographic, water usage, and attitudinal factors lend credibility to the model and the survey results.

4. History of City Water Supply System

City water supply system was established by Rana Prime Minister Bir Shumsher in 1895 A.D. by implementing two schemes mainly Tri Bhim Dhara Scheme in the north-west and Bir Dhara Scheme in the north. Under the first and second schemes seven and two surface sources were tapped respectively and water was diverted to a number of collecting points for treatment and short term storage in service reservoirs before supplying to the people of Kathmandu. Also in the

same year Kharipati Scheme was introduced in Bhaktapur. Doodh Pokhari scheme for Lalitpur was however implemented only in 1904 A.D.

Valley water supply system was gradually expanded in 1960 when water from the tailrace of Sundarijal Power Plant was tapped and supplied to the people of Kathmandu after treatment in a treatment plant of 20.50 MLD capacity. To properly address the need of increasing population, HMG in 1973 created a separate entity known as "Water Supply and Sewerage Board". The same Board was later on converted into present Nepal Water Supply Corporation.

With the introduction of World Bank Projects (1974 A.D. to 1981 A.D.), valley water supply system was further expanded to many parts of the city by tapping more surface sources like Sat Mools (Seven springs) and Kutori Mools located in the south of the valley and by extracting ground water sources from various part of the valley mainly in the north. With the increase in the population and subsequently in the water demand, more deep tube wells were dug and more surface sources were tapped to ease the water supply situation in the valley.

Because of the continuous water deficit in the supply system, Melamchi concept was bought into the surface in 1988 A.D. through a pre-feasibility study. The project, which was officially targeted to be completed in 2004, could not be completed in time due to several reasons. HMG has put another target to complete it in 2009, but the concerned officials are still doubtful with regard to new the completion date

5. Conclusions

Comparing different scenarios and results from users survey it is find that maximum 33% of demand fulfil by NWSC-supply,7% fulfil by private well,3% fulfil by neighbours well, 10% fulfil by public well 10% fulfil by tanker supply, 3% fulfil by rain water and 7% fulfil by NWSC-Collection tank and 27% water demand fulfil by traditional stone spouts.

Public water consumption pattern in LSMC area is a max of 49 lpcd and a minimum of 29 lpcd which is mainly fulfilled by NWSC- supply, wells, tanker supply and NWSC collection tank provided in different place in LSMC area and stone spouts. Community water management practices in Iku hiti, Alko Hiti and Haku Hiti were good and it is better to apply the same in other good types of stone spouts.

Due to inadequacy of NWSC-Supply, stone spouts source has become the main secondary source in LSMC area. It is also found that the discharge from each stone spout is being reduced every year and conservation is becoming urgent for the future.

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