Assessing the Performance of Urban Water Utilities for Water Supply & Environmental Sanitation: Towards Multiple Objectives, Criteria and Indicators

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Abstract

Benchmarking is essential for monitoring and bringing about continuous improvements in the performance of urban water utilities. Evolving comprehensive criteria for performance assessment and deriving measurable indicators which sufficiently explain these criteria are the first step towards this. The article attempts the following: evolving broad criteria for urban water utility performance assessment that truly reflect the concerns of urban centres of developing economies like India; deriving quantitative variable that explain each one of these criteria; and listing out the procedure for computing the values of these variables as standardized coefficients for working out a composite index that enables comparative performance evaluation. They are, in total, 38 indices falling under five broad criteria used to arrive at a composite index for performance assessment, viz., physical, financial, economic, institutional and managerial and environmental. While computing the composite index, each one of the five broad indicators is assigned equal weightage.

1.0 Introduction

Benchmarking is essential for continuous monitoring and bringing about constant improvements in the performance of urban water utilities. Evolving comprehensive criteria for performance assessment and working out measurable indicators which sufficiently explain these criteria are the first step towards this (WSP, 2008a). The traditional approach to urban water management, which concerns itself with augmenting water supplies to meet the increasing demands, wastewater collection and disposal, storm water disposal for flood control and solid waste collection, impedes the pursuits of advancing sustainable urban environmental management (Thomas and others, 1997; Newman and Kenworthy, 1999; Wong and Eadie, 2000). Ensuring sustainability of urban water management approaches calls for: fully utilizing the potential of water demand management that minimizes the need for new water projects and wastewater volumes; treatment and reuse of wastewater; sustainable storm water management rather than its disposal; and recycling and use of solid waste apart from its collection and disposal. Therefore the criteria and indicators for performance assessment of urban water utilities have to change from the traditional ones.

2.0 Why a Utility Performance Index

It is general tendency to look at performance of urban water utilities in relation to the average per capita water supplied at the end user level, number of people connected and the financial working of the utility. But, this provides lope-sided and skewed assessment of the overall performance. For instance, in a developing country context like ours, cross subsidization of water prices is a commonly-adopted strategy, wherein the domestic water supply is heavily subsidized and very high water rates are charged from industrial and commercial users (ADB, 2007). Such a practice would eventually result in many rich urban domestic consumers indulging in wasteful use practices (Higgs, 2001) or diverting water to low valued uses, apart from appropriating lion' share of the subsidy benefits (HDR, 2006). Therefore, following such simple financial criteria would force us ignore how the costs are being recovered, and the lost opportunities.

Instead, how the principle of economic efficiency, that is capable of achieving demand management, is followed in fixing water prices in different sectors of urban economy needs to be known. From that perspective, what matters is what percentage of the consumers pays the real costs based on volumetric consumption. Also, instruments such as pollution taxes and tradable pollution permits can create disincentive for wastewater generation and pollution and improve quality of urban environment (Boyd, 2003; Kraemer, 2004). This in turn can improve the sustainability of water use. So, it is important to know whether pollution taxes are levied by the utility or not.

Further, it is possible to enhance the physical performance of the utility with more water supply and sewerage connections and greater recovery of solid waste etc. by hiring more staff, more labourers and more materials and equipments, and indulging in expensive water transfer projects. While this would add to the capital and operating costs, the agency might still be able to pass on the addition burden caused by this on to the consumers, putting the poor and vulnerable urban consumers at higher risk of water-related health problems.

This cannot be called good performance as affordability of the services and cost efficiency should be an important objective. The issue of affordability might get addressed through huge government subsidies and bail outs. But, the cost incurred for producing and supplying a unit quantum of safe water should be brought down to as low as possible (WSP, 2008a). Nevertheless, it is important to mention here that in certain cases, the utility is able to produce water at very low costs by virtue of good resource endowment in the locality. Hence, this will not reflect on the real performance of the utility. In light of this, other indicators for assessing economic performance also need to be explored.

More importantly, utilities try to augment their existing water supply in an effort to meet the growing demand. The concept of water demand management is not followed in practice by most of them. Most utilities in large urban centres obtain water in bulk at highly subsidised prices from irrigation departments, which manage the bulk of developed water resources. The prices they pay neither cover resource cost nor the cost of environmental degradation caused by resource over-allocation to that sector and wastewater generation. Generally, it covers the cost of development of water resources by the irrigation agency, which is the bulk supplier of water. Often, the utilities default payment to the agency. Hence, they do not have any incentive to conserve the water or reduce the pollution through waste reduction and wastewater treatment. Therefore, the actual performance of the utility cannot be assessed in relation to their ability to increase water supplies to meet the growing demands alone. Environmental sustainability should be an important consideration.

Also, how efficient is the running of urban water system deserves merit. It is important to know how many people are employed to cater to a fixed size of the population, be it for supplying water or sewerage collection, drainage or solid waste collection and disposal. In certain cases, the agency might be able to operate at very low levels of management efficiency, and still make be able to maintain good financial health, by virtue of the low capital cost of the system. On the other hand, it might be possible for the utility to improve the management efficiency including that of staff by restricting its services like connection and solid waste collection to the population living in the immediate neighbourhood and rich neighbourhood and not attending pockets in the urban fringes where mostly poor people live (source: EPA, 2006). This may not have much adverse impact on the revenue, but can help them cut down costs significantly.

It is also important to know to what extent poor and vulnerable communities are provided with water for basic survival needs, and access to environmental sanitation, as the health and socioeconomic benefits of interventions are higher when targeted at the poor (DFID, 2001; WHO, 2002). This would reflect on the institutional adequacy. Institutional adequacy can also be rated on the basis of the provisions the agency makes for water quality monitoring and treatment.

In no case, the public water utilities are able to cater to the entire population through individual tap connections. Also, as reported by NIUA study in 1999 and the ADB survey in 2007, in many cities and towns water runs through the pipes for limited hours (NIUA, 1999; ADB, 2007). This encourages the people living in rich neighbourhoods to install pump sets to tap water from the sub-mains leading to negative pressure and deprivation of tail enders.

Further, in many Indian cities/towns, slum population is very large. Since most people living there don't have independent water connections & private toilets, what matters in such cases is the number of public stand posts and toilets provided by the utility. In sum, it will be quite improper to assess the performance by taking aggregate view of percentage of population covered by water supply and sewerage connections. Improving access to water supplies and basic sanitation should be one of the objectives of the utility.

In nutshell, assessing the performance of urban water utilities should not be on mere physical and financial objectives, but on economic, environmental, institutional and managerial objectives as well. Given these multiple objectives, the criteria for performance evaluation, which are measurable, need to be worked out. Only the use of such complex criteria can help assess the sustainability of utility performance. Use of such criteria by the financing institutions and governments could also force utilities to bring in sustainable improvements in their performance to achieve integrated water management.

International agencies have developed criteria in the past to evaluate the performance of utilities. These agencies use very limited number of performance indicators, based on limited criteria of physical, financial, managerial and economic performance (see for instance, Water Utility Partnership, 2000; ADB, 2007; WSP, 2008a). But, they become too abstract for Indian towns where a large section of the urban population still lacks formal access to basic infrastructure and services. On the other hand, complex technical performance indicators for the engineering infrastructure for water and wastewater treatment are also available (see Mays, 2000). Since most Indian towns don't have such sophisticated infrastructure, such indicators are irrelevant. More importantly, values of these indicators are not mutually comparable. For instance, the measure of cost recovery, expressed in percentage terms, cannot be compared with the measure of cost effectiveness, which is expressed in Rs/m^3 of water. This makes comparative performance evaluation

Therefore, the first challenge is to identify performance indicators that characterize the urban water situation prevailing in countries like India. The second challenge is to convert them into certain standardized coefficients, which can enable use of these indicators in a composite index and assessment of comparative performance. The article attempts to achieve the following: evolve the broad criteria for urban utility performance assessment; derive quantitative variables that explain each one of these criteria in Indian situation; and discuss the procedure for computing the values of these variables standardized indices for working out a composite index that enables comparative evaluation of performance across cities/towns.

3.0 Deriving a Utility Performance Index

Keeping in view the foregoing discussion, it can be said that the performance of the urban water utility can be assessed using five broad criteria, namely, physical, financial, economic, institutional and managerial and environmental. These broad criteria are further explained using quantitative and measurable variables, and the premises on which they are used are also discussed. In order to convert them into standardized coefficients, relative indices based on maximum and minimum values are worked out.

The quantitative variables which explain a given performance criterion (say, economic for instance) and the procedure for computing them are given separately for each criterion.

3.1 Physical Performance

Basic Premise: higher per capita water supply is an indicator of good physical performance. Greater the number of households connected to water supply & sewerage system, better is the physical performance. Extent of solid waste collection is also an indicator of physical performance of water utility. Theft and leakages are indicators of poor performance (WSP, 2008b; USEPA).

1. Total amount of water supplied per capita as a fraction of the daily water requirement norm for the city/town: computed as a relative index based on maximum and minimum values found in cities/towns falling in the same category.

2. Population connected to water supply system as a fraction of the total

3. Population connected to sewerage system interpreted as a fraction of the total

4. Amount of wastewater collected as a fraction of wastewater generation

5. Fraction of the urban service area covered by the storm water drainage system

6. Total solid waste collected and safely disposed as a fraction of the total generation

7. Inverse function of the proportion of un-accounted for water-UFW (1-UFW)

8. Quality of water supplied: physically, chemically and bacteriologically pure water will have a score of 1.0

3.2 Financial Performance

Basic Premise: The financial performance is said to be better if the greater proportion of the registered users pay for the services. Almost all urban water utilities provide water at subsidized prices to domestic sector thereby making huge revenue losses. But, the same is compensated through levying much higher charges in commercial and industrial sectors. Hence, an "average price" which is close to the cost of production & supply can be a good indicator of the financial performance (ADB, 2007). But, at the same time, higher price charged might result in lesser number of people paying for the water services and vice versa. Hence, the average collection against the expenditure is also important. Again, it is important to know the pending payments of the previous years, as defaulters are often permanent defaulters.

1. Rate of recovery of water/sewerage cess:

2. Average price of water[1] against its unit cost of production & supply:

3. Annual revenue collection against the revenue expenditure in the past year (capital and O & M): relative index

4. Total Amount of backlog in water cess per capita population: a relative index

3.3 Economic Performance

Basic Premise: Economic performance assessment goes beyond financial performance assessment. It must be done in relation to how efficient is the water production system[2]; how efficient is its distribution from an economic perspective; how efficient is the pricing and use of water. A lot of inefficiency in production and supply of water can be passed on to the consumers through inflated prices. Efficient production calls for minimizing the cost of production per unit volume of water, and maximizing the volume of water supplied per unit of money spent in overheads. In water scarce areas, pricing in sectors which generate high private income returns (but no social returns) should be higher than that give low income returns, but high social benefits. The ratio of water price for industry to that for domestic sector for basic survival needs can be used as an indicator. Alternatively, the ratio of water price charged to higher levels of use in domestic sector, to that for basic survival need can be used as an indicator. Again, the water tax levied to industries should be close to the average cost of treatment of effluent. Water use would be more efficient, if the users are confronted with marginal cost of using water.

1. Cost effectiveness of water supply (relative cost against the minimum & max. costs): $[C_{max}-C]/[C_{max}-C_{min}]$

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[1] Average price of water = the total billing for the year/ the total volume of water supplied in the year.

[2] It is important to remember here that the cost of water supply is very much a function of the water balance situation in the region under consideration. Hence, this should be factored in as much as possible while using this as an indicator, particularly when comparisons are made across regions of differential water resource endowments.

2. Extent of volumetric pricing of water supplies: no. of connections/volume of water for which pricing is based on consumption against the total no. of connections

3. Efficiency in water pricing in different sectors of urban economy Again, relative index is to be worked out.

4. Volume of water supplied per unit expenditure on salary & wage overheads: a relative index. This is included because cost effectiveness can come by virtue of the hydrology also.

5. Level of pollution tax against the average cost of treatment of industrial effluent: pollution tax should be raised to a level where the funds generated should be sufficient to treat the effluents.

6. Economic value of the water wasted in leakage per capita population: relative index

7. Economic value of water pilfered per capita population: relative index

3.4 Institutional and Managerial Performance

Basic Premise: Good economic performance can be achieved by levying high pollution tax, but if the same is not used for setting up water treatment systems, the water environment would still degrade.

1. Equity in distribution of water (Gini co-efficient): equity in distribution is a good sign of an effective institution

2. Affordability of water (inverse function of the amount incurred for payment for water & sanitation across classes against the monthly income

3. Number of public taps built per 1,000 people: relative index

4. No. of hand pumps built in slums[3] per 1,000 people: relative index

5. No. of connections handled per staff member in the utility: if large numbers of connections are managed by the utility with less number of staff, it is a good sign of efficient management. It is a relative index

6. No. of complaints attended per day as a ratio of number of complaints received: if greater proportion of complaints is disposed off by the utility, it is a sign of a managerial efficiency. It is a relative index

[3] Please refer to the UN-HABITAT for definition of slums

7. No. of BPL households having water supply (tap) connections as a fraction: normally this is achieved through targeted subsidies; good sign of effective institution: a relative index

8. Ability to respond to emergencies: number of water supply tankers per 10,000 people: relative index

9. Number of government agencies involved in urban water management: increase in number of agencies involved increases the coordination needs: relative index

10. No. of bulk purchasers of water, including apartments & commercial complexes, as a fraction of the total connections: relative index

11. The amount of money invested for environmental management services per unit volume of wastewater generated: relative index for measuring the institutional performance

12. Total volume wastewater treated per unit amount of money spent in 0 & M (if at all it exists). This is a management performance indicator

13. Frequency of water quality testing (daily; weekly; monthly, once in a while): Greater the frequency, better the safeguard against water contamination and health hazards. It is a relative index, which considers the highest and lowest frequency encountered

14. Number of performance indicators on which data are acquired by the utility against the total number of indicators mentioned (under 3.1 to 3.5): Greater the amount of data generated, better would be the chance for the utility to monitor its own performance.

2.5 Environmental Performance

Basic Premise: Good physical, financial and economic performances do not guarantee environmental performance. The reasons are: good water can be maintained by exploiting the local resource beyond their sustainable limits thereby causing environmental stresses. Further, it is easy to maintain high financial performance by investing less money in WWT system, and staff for its operation etc. But, that would eventually affect the quality of treated water/effluent.

1. Level of treatment of wastewater: preliminary, primary, secondary or tertiary. A score of 1 is given for full treatment; 0.7 for secondary treatment; 0.3 for primary treatment; and 0.10 for preliminary treatment.

2. Degree of over-exploitation of local groundwater in block in which the urban area falls: safe/white block=1.0; grey =0.7; dark =0.5; and over-exploited=0.3

3. Physical, chemical, bio-chemical and bacteriological properties of the receiving waters in the locality, such as ponds, lakes, rivers (Good=1.0; bad=0.0 for each one of the attributes).

4. Chemical and bio-chemical contamination of the groundwater in the aquifer underlying the city/town (Yes=1.0; No=0.0 for both chemical and bio-chemical)

5. Total solid waste which is recycled as a fraction of the total generated

3.0 Concluding Remarks

Evolving comprehensive criteria and measurable indicators for performance assessment is the first step toward improving the performance of urban water utilities. An attempt is made here to first evolve a broad set of criteria for performance assessment that truly capture the concerns of developing countries like India, and then identify quantitative variables that can adequately explain these criteria. In total, there are 38 indices: eight for physical performance; four for financial performance; seven for economic performance; 14 for institutional and managerial performance; and five for environmental performance. The values of most of these variables are computed as relative indices so as to enable comparative performance evaluation across utilities. Nevertheless, all these indices are coefficients, with their values in the range of 0.0-1.0. While computing the composite index, each one of the five broad indicators is assigned equal weightage.

More than developing indices, it is important to make sure that their relevance is fully understood by the utilities and the external agencies and groups which assess the performance. Generating reliable data relating to these indices is extremely important for continuous monitoring and performance assessment. This aspect also needs to be covered while assessing the institutional performance.

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