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**Cost structure of water supply system in Kolkata:
analysis of Kolkata Municipal Corporation budget**

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Water supply in Kolkata Municipal Corporation is primarily dependent on river Hoogly. River Hoogly supply almost 80 per cent of total water supply, in terms of surface water. The rest 20 per cent is met up from ground water source. This duality regarding source of water supply is affecting Kolkata's urban water supply system in every respect. Cost structure is also got affected from this duality. There is no homogeneity of cost structure across the whole KMC. It varies from borough to borough. The purpose of this paper is to highlight how the duality in water supply source is determining the cost expenditure of a typical borough. This paper works as a background exercise for further analysis of determination of cost of water supply in Kolkata.

Water Supply System of Kolkata is one of the oldest water supply systems in India. Comparing from production capacity and service area network coverage point of view, it is the India's largest water supply system. It does not only cover its own municipality, but also supply filtered water to adjoining municipalities as well. But a close observation of the water supply system, starting from its production unit, transmission unit and distribution unit will entail a lot of loopholes, which in turn generates a series of problems. For example, what is the actual quantity of water produced, and how much of it is distributed for final use, or what are the mechanisms that has left open to tackle the leakages and wastages of water during transmission from production unit to distribution unit. Why does some areas not getting adequate supply of water, while other area flooding with excess water. Or what are the pros and cons of dual supply of water in terms of ground and surface water. Or what are the distribution network picture for fringe and newly added area. How far economically weaker social group, particularly those live in slum area are covered by the water supply system, what are their problems, how do they cope with these problems, and what could be the policy backup for their problems.

Water supply system in Kolkata has been categorized under two part. The first is that of Production part and other one is Transmission & Distribution part. Again Production part can be sub categorized into two part. One is for Surface water and other one is groundwater. Each category and subcategory consists of various items. For example, Production category, under surface water sub-category consists of intake station, filtration unit, chlorination plant, clariflocculation & sedimentation unit, estate, and pumping stations. Whereas under groundwater subcategory it basically consists of big diameter tubewell and small diameter tubewell. In contrast to these, under Transmission & Distribution category, we have pipeline network, house connection, ferule connection, chlorination plant, bustee service, and so on. Details are given Table below

With this specification, we bring cost structure to the respective category. Each item in the respective category has six cost head. That is establishment cost, maintenance cost, supply cost, miscellaneous cost, financial charge cost and capital expenditure cost. In the table (Table-II) below, we are providing the details of these cost heads as per KMC budget.

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Transmission & distribution cost	Production cost	
	Surface water	Ground water
1. pipeline network 2. house connection 3. ferule cleaning 4. chlorination 5. bustee service 6. water charge to CMWSA 7. tala-palta main 8. tala pumping station 9. Auckland & RSM 10. wattgunge Pumping Station 11. mallikghat Pumping Station 12. water supply by lorry 13. water supply to ships	1. intake station palta 2. filtration unit palta 3. chlorination plant palta 4. clarifloculation & sedimentation unit 5. estate maintenance 6. palta Pumping Station	1. big-diameter tubewell 2. small diameter tubewell

Source: The Kolkata Municipal Corporation

Cost items	Components
Establishment cost	Payments, including salary payment, allowance, and other
Maintenance cost	Maintenance of plant, machinery, maintenance of transport vehicles, office equipment, other maintenance, maintenance of cathodic protection.
Supply cost	Included here all kinds of material & supplies
Miscellaneous cost	Rent, tax, electricity bill, traveling and conveyance, depreciation & write off (material)
Financial cost	Repayment of loans, interest & other charge for loan, principal & interest on short term loan, discounts, fines, damages etc. refunds
Capital expenditure	Acquisition of land and buildings, plants, machinery & equipments, service line: renovation, improvement and new works, transport purchase,

Source: The Kolkata Municipal Corporation, mayor's budget estimates of receipt and expenditure, various years

Next we note that all the cost structure has been considered for three consecutive years, namely 2011-12 to 2013-14. The selection of these three years has some explanation. This is because in starting 1998, water supply scenario began to change, due to external factor, for example, French protocol agreement, World Bank conditionality, Asian Development Bank's proposal and collaboration with KMC in water supply mega project. Secondly, need for marketization are being felt during this period. Everything is considered in terms of price. Thirdly, budget structure has been modified in 1999. West Bengal witnessed a massive all through change in its political structure from 2011, so keeping that track we have considered the first three years of the new regime.

The administrative structure of Kolkata begins with 'Ward'. The whole KMC area has 141 wards. A collection of contiguous wards constitutes a 'Borough'. There are all together 15 Boroughs. Among these 15 Boroughs, Borough I to Borough X constitutes the 'KMC core area'. Borough XI and Borough XII, Borough XIII and Borough XIV, and lastly Borough XV have been added with KMC in early eighties (KMC Act 1983). Thus these added Boroughs constitutes the 'Added Area'.

In our analysis, we have considered Borough I-Borough X under one category. This is the core Kolkata. From the cost figure we find that, in Transmission and Distribution category, establishment cost constitutes

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a major share of total cost, almost around 50 percentage of total cost. Capital expenditure and maintenance cost together constitutes 30 per cent to 40 per cent share to total cost. It seems that investment is more or less consistent. Absolute magnitude of capital expenditure cost is do not have much variation. This is again supported by maintenance cost expenditure. Its figure also does not have much variation. Miscellaneous and supply expenditure accounts are also not showing anything striking. When considering the price aspect one should take note of high establishment cost as well as magnitude of capital expenditure cost and corresponding maintenance cost.

Regarding surface water production part, we see that supply and maintenance cost constitute 50 percentage of the total cost. And this is very much consistent throughout the time range. This is because production part cover basically Palta filtration unit. Its filtration process requires constant supply of direct and indirect materials. But what is really striking is that, capital cost holds a very marginal position. Both are in terms of absolute as well as relative terms. Establishment cost is also well under 50 or below 50 percentage point. From the above structure we find that production cost of surface water is not much costly, or its cost are not escalating at faster rate. So claim for higher cost of production of surface water is not valid.

Groundwater production also gives us similar cost structure, but relatively higher establishment cost. It is because the production units are smaller compared to that of surface water, and are numerous in nature. This is evident from a number of pump houses, and other supporting man and personnel are scattered with smaller number through out the relevant area. So it may have higher establishment cost. Other argument may be that KMC is now maintaining the policy of retrenching the groundwater supply, so cost per unit, in any head, particularly goes up.

Next we come to Borough XI-XII. Here we found that in Transmission and Distribution category, capital expenditure constitutes a major cost head. Not only that its maintenance cost is also high. This may due the fact that these area are added area. So in order to develop the existing water supply system and find the new way of supply provision some considerable amount of capital expenditure is necessary. And corresponding to that, funds should be kept for maintenance purpose. Again areas of these two boroughs are very large, hence distribution cost becomes very high.

In the Production category, in this Boroughs are solely dependent upon groundwater. Surface water what is supplied, is purchased from CMWSA from its Garden Reach water works unit. So cost structure will have a different configuration. Capital expenditure cost shares the almost 50-percentage share of total cost incurred. Maintenance cost becomes the second highest cost item with marginal variation. Again it should be noted that maintenance cost is around half percentage-point in relation to capital expenditure. So again what is proved from here is that development investment and expenditure is at its initial stage. Since these Boroughs came under KMC not a very long ago, hence the Boroughs are still at its initial stage of development as far as water supply is concerned.

Apart from the above observation, there are some other observation that are striking is that, the capital expenditure gap between transmission & distribution category and production category. Transmission and distribution category has more than 75-percentage share of total cost, whereas production category has below 50-percentage share. One explanation might be that these area are basically fed with groundwater. There is total absent of surface water. Now cost of installation of a ground water extracting or tapping is not so high, but there is huge cost when it is to supplied to the end user. As a result, transmission and distribution cost becomes very high.

Borough XIII-XIV, is still at the initial stage of development, regarding water supply system is concerned. This is evident from high capital expenditure cost along with low maintenance cost. There is not much presence of existing plant and machinery, therefore maintenance cost of plant and machinery is low, because investment in plant and machinery are of recent origin. Another point is that in these boroughs, supply of ground water is also not very abundant and also of very low quality, compared to other boroughs. Therefore cost of extracting and production of ground water also goes up, which is reflected in higher capital expenditure cost. One interesting feature of these two borough is that, here we find ground water complemented by surface water supplied from Garden Reach water works, but due to distant factor, water could not be supplied all over the boroughs not evenly. As a result, cost of pipeline network, pumping station, reservoir, are shot up, resulting high capital expenditure cost.

As far as Borough XV is concerned, cost of water supply, both in terms of transmission & distribution category and production category, is very low compared to rest of the KMC boroughs. This because, firstly, although KMC provides water in terms of ground water, but surface water is also supplied from Garden Reach Water Works. KMC purchases water from Garden Reach Water Works, and supply it to Borough XV

and in some part of Borough XIII-XIV. This low cost of water either in terms of transmission & distribution and production category is reflected in the cost structure. We see that figure for capital expenditure in absolute term, constitutes only Rs. 106.77 lakhs to Rs. 113.6 lakhs. In production category this figure is even lower, only ranging between Rs. 46.84 lakhs to 59.43 lakhs. But what is striking is that, maintenance cost in the transmission and distribution category ranges from 11.31 to 17.23 percentage. With respect to ratio of maintenance cost to capital expenditure cost, it comes out with the range 34.04 to 37.63. This is because, the borough has already existing pipeline network and other requisite essentials. And vicinity of Garden Reach water works has given this borough a relatively advantageous position than other.

So keeping in background these aspect of cost of water supply system, we have to take into account the variation of production cost and transmission and distribution cost across the various boroughs. One point that is obvious, particularly with respect to core Kolkata, namely Borough I-X, establishment cost should in no way be covered from pricing of water. It should be curtailed, and if not being curtailed, it should be borne by the water supply provider i.e KMC itself. Again existing technical condition and situation of borough groups has to been taken into account separately. Gross aggregation should not be done. Because there exists wide variation in terms of existing transmission and distribution infrastructure and production infrastructure. When pricing are to be considered, this heterogeneity has to be taken into account, otherwise pricing will either become grossly underpriced or overpriced.

There is a popular belief among water supply administration, engineer and officials, and also various international fund providing organization, that cost of water supply is escalating year after year. And water should not be treated as free commodity. So water supply authority should think about introducing appropriate method for covering the cost of water supply. The picture is not wholly true. The major cost of water supply in either category (transmission-distribution or production) is reflected from high establishment cost. On the contrary, production cost of water, in terms of capital expenditure and maintenance cost is coming out to be in low to moderate range. So when talking about pricing of water we should determine that price which will cover capital expenditure cost and maintenance cost of water supply system.

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