INFRASTRUCTURE ASSET MANAGEMENT

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Abstract - *Infrastructure Asset Management (IAM) is one of the critical branches gaining worldwide importance due its application in the CAPEX and OPEX during the life cycle period of the asset. In today's world where technological innovations are overtaking the human intervention to reduce the man made errors in various systems, it is critical to look for sustainable tools to manage critical infrastructure like water, waste water, sewerage etc. Researcher has taken up for research purpose one such asset i.e. water supply system of one of the promising nodes Kharghar, within Navi-Mumbai which was being planned as ambitious node for achieving footfall to the entire MMR region , to identify its position in terms of best in class and sustainable utility..*

Key Words: Asset, CAPEX, OPEX, Customer grievances, water losses, social, functional, financial

1. INTRODUCTION

Infrastructure Asset Management (IAM) is one of the critical branch gaining worldwide importance due its application in the CAPEX and OPEX during the life cycle period of the asset. The above two terms are vital for the sustainability of the utility and has a social angle to it in the growing populous and developing country like India. Customer satisfaction is extremely sensitive aspect of any infrastructure /utility and therefore having close watch on the health of each of the utility becomes a primary task for the authorities. Every utility which has various assets definitely has an environmental impact as well as social impact during its life cycle. Understanding of this life cycle and the necessity to negotiate its impact on environment can also be one of the major components of IAM. In democratic country like India, the social angle plays critical role in the overall satisfaction of end users. Therefore, managing the asset to address this is also a part of IAM. Broadly it is necessary to understand the, Meaning, Components, Need, Objectives and analytical process, why does asset management matter? Why is it useful? How does it improve organizational effectiveness? How will it help me as an engineer, accountant, operational manager or director?

2. OBJECTIVES

In India, growing demand of population, which is currently 130 corers and estimated to touch 180 corers by 2051, would need systematic analytical technologies or organisations that would handle the life cycle of infrastructure. There would be increasing demand of Water, Power, Gas, Cleaner air etc with deterioration of the existing infrastructure. The reamplification of the existing infrastructure and need to lay new utilities is also important to meet this growing demand. Along with this, it is also essential to operate and maintain these utilities to keep them in good health to serve the end users at required/desired service levels. Infrastructure Asset Management can be one of answer to this and thus the following objective: -

1. To understand what asset management system is and the terms in it.
2. To examine the current practices followed in the study area for capital maintenance.
3. Study the probable environmental effect of the asset over its life cycle.
4. Formulate and execute long and medium-term plans for improvement in asset performance

Study and relate any analytical and optimisation models to support decision making in the capital maintenance.

To provide a platform for a given area to manage, operate, maintain a particular asset so that it can meet the desired end user's requirement throughout its life cycle.

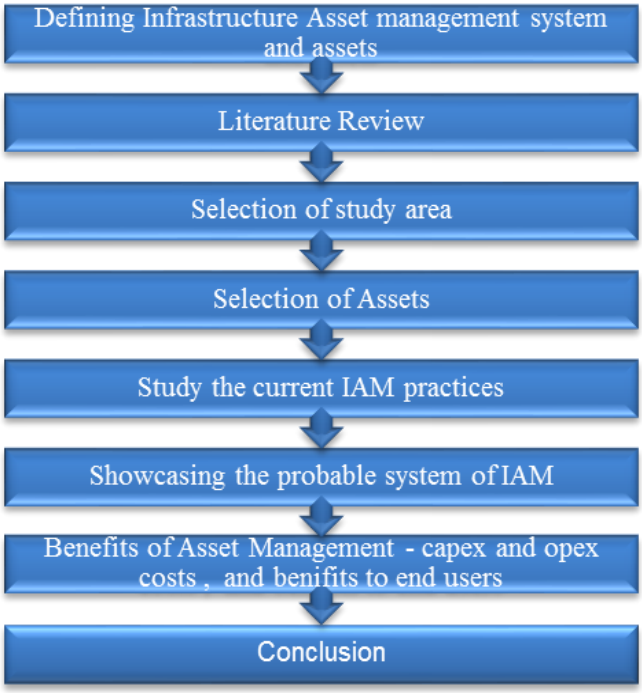
3. LITERATURE REVIEW

Concept of IAM was evolved way back in 1980's in Great Britian who looked to manage and operate the asset in more comprehensive manner. In Australia, "asset management" was adopted in the public works in 1993 when the Australian Accounting Standard Board issued a standard called Australian Accounting Standard 27 – AAS27. This Standard AAS27 required government agencies to capitalise and depreciate assets rather than expense them against earnings. The Australian State Treasuries and the Australian National Audit Office were foremost office to principally accept the concepts and of Asset Management in Australia in which they defined it as "a systematic, structured process covering the whole life of an asset". This initiative led other Government bodies and industry sectors to analyse, develop, refine and apply the concept of asset management in the management of their respective infrastructure assets. Therefore it wont be wrong to imply that this concept of IAM evolved as upcoming profession during the late 1990s. Through literature survey it is also understood that any European countries are currently managing their asset on the principles of Asset management. The Asian Development Bank in 2013 has also issued guidelines on policy and strategic level alongwith asset management enablers. Lisbon in Portuguese has developed their own Asset

Management System on the basis of IAM and is successfully handling water asset through principal of tactical diagnosis of various components of asset.

4. METHODOLOGY

There are consultants and experts who work constantly in this field of IAM and bring out more techno aspects and analytical tools in it to address the various issues of the assets.



The study has commenced by defining and explaining what exactly the meaning of the IAM is and what are the assets that can be considered for analysis.

After understanding the definition and the learning from the literature review, an Asset from a site is selected wherein the IAM can be applied to see the benefits it brings out. To accurately assess the need of IAM, the existing system of management is examined and the grey areas in the aspects of the system evaluated and analysed so as to bring it in the main stream of the IAM system. Inorder to establish an Asset Management system, a study area would be evaluated to understand the prevailing system of asset management and what issues are faced both by the managers of the system and the end-users. This would help to formulate tools and prepare a conceptual dashboard enlisting the various activities, which needs to be addressed at policy, strategic and functional level.

The researcher at final stage shall make an attempt to provide a template or dashboard whichever possible to give an overview of the platform from where the entire asset can be managed throughout its life cycle.

5. NEED OF STUDY

Adhoc and 'run to failure' or reactive maintenance practices has left unhappy customers and unhealthy assets, thereby replacing them much before potential end of their life and increasing capex and opex costs." Timely intervention to verify the physical condition and the performance of an asset is paramount to bring down the expense to admissible level. Therefore it is necessary to evaluate the IAM system for any given area to judge the practices followed and improvement suggested for performance management of an asset.

6. STUDY AREA

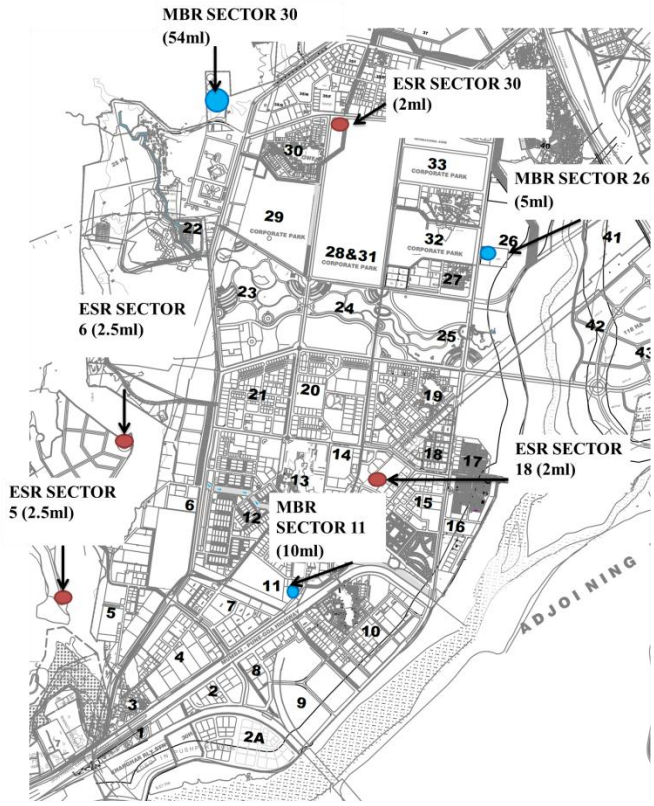
A study area selected is in state of Maharashtra and satellite town of financial capital of India, Mumbai. This satellite town is Navi-Mumbai within which CIDCO is the nodal agency who has developed series of Nodes totaling to 14, out of which Kharghar is a node of Navi Mumbai smart city. It is situated at the Northernmost tip of Raigad district.

The area started developing in 1995 and now is flourishing with large scale projects both in the commercial and residential segments. Kharghar is now administered by recently established Panvel Municipal Corporation. Kharghar measures about 1700 ha, 7 km long and 5 km wide. There are 12 village settlements located in Kharghar node having a combined population of 20,000.The total target population with 100% occupancy is around 5,20,000, divided into 43 sectors. With regards to the landuse of the study area, it's an integrated mixed landuse development with residential, commercial, amenity, social facility and many other regional level facilities like Golf course spread over 150 acres, central park spread over 250 acres and other upcoming complexes like International Corporate Park (ICP).The study area receives drinking water from Hetawane dam located in Pen, which has a capacity of around 350 mld out of which 150 MLD of drinking water is supplied to Kharghar, Ulwe, Dronagiri, Taloja, Pen-Uran and other nearby villages along with a small part of Nerul in NMMC area. Total amount of water sanctioned for Kharghar Node is 70 MLD.

7. FIELD ANALYSIS

To evaluate Asset Management System in study are, water supply system is selected. This supply system consists of two MBR's having capacity of 10 mld and 5 mld at sector 13 and Sector 26 of the study area. Water is received from

Hetawane dam via 800mm dia MS pipe upto the MBR-1 (Master Balancing Reservoir) located in Sector 13 and MBR 2 located in Sector 26. From MBR-1 the water is distributed to some portion via direct pumping upto the Underground Storage tank of individual plot through metering system, whereas MBR – 2 pumps water into HSR having total holding capacity of 54 mld from where the drinking water is supplied by gravity system. There are few developments which receive direct connection from the source line.



The distribution system is around 98 kms in length with pipe size varying from 100mm dia to 150mm dia CI/MS and GRP pipes. All the pipes are installed almost 15 years before with few augmentations in the networking. The distribution system is through direct pumping till the consumer end. Although the HSR's are constructed at various locations, the distribution is done through pumping since it was observed by the operator that these HSR's would drain out once the water was stored in it for distribution. It was believed that the supply can be in controlled manner through direct pumping. The pumping hours around 10 per day to the consumers, but the MBR's function for 24 hrs with rest period of 2 to 4 hrs in between. There are about 4000 no's of consumers within the study area which are of different categories like residential, commercial, gardens etc.

8. PROBLEM SATEMENT

Within the study area the researcher has observed that the customer satisfaction levels is poor due to various reasons, like

1. Inadequate supply hours
2. Drop in pressure
3. Quality of water
4. Frequent maintenance activity leading to cut-off/non supply of water
5. Improper sizing of tap off leading to inadequate water.

Above are few of the resident problems, while there is separate set of issues faced by the authority while managing of the asset like:-

1. Leakages in trunk main & Pipe burst.
2. Pumping station maintenance.
3. Inadequate CAPEX and OPEX.

Table 1 Water Demand

Sr. No	Particular	No of Consumer	Minimum water Requirement cum/day	Qty. in M3
1	Commercial	1349	0.75	1,011.8
2	Hospital	2	50	100.0
2	Institutional	54	180	9,720.0
3	Tenements (86364Nos) 80% Occupancy	69091	0.75	51,818.3
4	Villages	20	200	4,000.0
5	Bulk Consumers (Tata/CISF/ RAF/JAIL)	4	400	1,600.0
Water demand in m3/day at user end for Kharghar Node				68,250.0
Add 15% losses (Distribution/transmission/leakages etc.)				80,294.1

The total prevailing water demand based on the household connection provided is around 80 mld and the sanctioned water supply from Hetawane dam is 70 mld. Therefore there is deficit of 10 MLD which is around 5.5 % of the demand. It is to be noted that this demand would shoot up considering planned population of 5.20 lakhs. Considering a demand of 135 lpcd, the future water demand would be around 9.5 mld, which is almost equivalent to the water losses.

Table 2 Current Consumption

Sr. No	Description	Period - Qty in MLD		
		April-May 2019	June-July 2019	August-September 2019
1	**Domestic**			
i	Societies	2,782	2,705	2,723
ii	Bungalows	87	91	89
iii	Villages	111	111	107
	Total Domestic	**2,980**	**2,907**	**2,919**
2	**Commercial connection**	301	303	299
3	**Institutional connection**	121	123	126
4	**Hospitals**	7625	7,625	12,690
5	Railway connection	5	5	5
6	Flat Rate	0	--	--
Total Kharghar Consumption		**3,408**	**3,338**	**3,349**
7	Taloja Node			
i	Societies	415	419	454
ii	Commercial	22	19	41
Total Taloja Consumption		**437**	**439**	**495**
8	**Total Consumption**	**3,844.37**	**3,777.07**	**3,843.80**
9	**Qty Procured**	**4,532.71**	4,128	4,443
10	**Losses (9 - 8)**	**688.34**	**351.40**	**599.29**
11	**% Loss**	**15.19%**	**8.51%**	**13.49%**
13	**Total Water Consumption per day for corresponding period (MLD) - Kharghar**	**56.79**	**55.64**	**55.82**
14	**Total Water Requirement considering Water losses at 15% - Kharghar**	**66.81**	**65.46**	**65.67**

Considering the water losses & future demand the deficit can increase to 20 mld. Therefore, there are two fold strategies to be developed, firstly to control the losses through proper identification of losses and augment the demand. In terms of operational expenditure – OPEX, the total revenue demand is around Rs 3.6 Cr and the OPEX is around Rs 4 cr .This is besides the revenue loss due to not accounted for water. It is observed that the current practice of IAM is very basic in nature with collection system through photographs of meter reading and entering the data into a simple excel format. Also, the water distribution within the sectors keeps varying for the same period and there is not tracking system to understand water theft and losses. The network check in terms of pressure spikes, failures, leakages are rectified in reactive maintenance and no failure detection or leakage detection system is established to address this aspect. However, since the overall water losses is within 15% the current management of system is able to handle this balanced structure. But, if policy makers are looking at this node as "Preeminent", the infrastructure assets needs to be more techno oriented with nest practices followed worldwide, which would provide opportunity to be more efficient functionally with best consumer satisfaction level. An answer to this can be Infrastructure Asset Management through design of such a dashboard that would provide all information of the system in terms of accounting, consumer Reddressal, Engineering data management, Work order management, Asset Life cycle management, MIS reports, Asset Conditions etc.

9. FUTURE SCOPE

In the future scope of this research it would be prudent that analysis is made on the platform to be designed to cover all aspects of management that would unable the authority to form system of Capital Expenditure – CAPEX, OPEX and CAPEX in OPEX. Merits need to be set out for to guage an idea of consumer level satisfaction of the asset performance with reference of benchmarking. For timely maintenance it would be essential to gather real time information of the system which is possible by establishing Supervisory Control and Data Acquisition system. But this needs to be integrated on a platform which also provides information on the OPEX timely activities, asset health condition assessment, failure predictions and budgeting for renewal.

10. CONCLUSION

The current paper presents an overview of evolution of Infrastructure Asset Management, its history and countries that have adopted this practice long back since 1980's. Constant improvement is being made by the experts in this field. The paper takes up a case study of such an area which is planned as one of the best node by the planners since 70's and considering the proposed development, this area can flourish like World Class facility center for commercial sectors due to its proximity to the upcoming airport also. Considering this futuristic aspect, this paper analyses lacunas of the assets of study area, expectations of the residents, grievances and the current management practices adopted. Therefore to give justice to this upcoming development, state of art infrastructure needs to be established and most importantly, monitored in such a systematic manner that the grievances of end users are addressed in systematic manner through development of unified portal system. In essence it can be concluded that IAM has to be adopted by the authority at the earliest and this being the right time so match the pace of development within the study area.

11. Acknowledgment

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