

# Importance of Life Cycle Costing (LCC) in Infrastructure Assets

Shiladitya Chanda  
INSDAG

## Introduction

Life Cycle Cost (LCC) is a costing approach that assesses the total cost of an asset over its entire life cycle in terms of present value including initial capital costs, maintenance costs, operating costs and the asset's residual value at the end of its life.

It is important to calculate LCC of an infrastructure asset and try to optimize the spending throughout the life-cycle of the asset. LCC is particularly helpful to ensure the cost-effectiveness of an infrastructure project among different competing alternatives to purchase/construct, own, operate, maintain and, finally, dispose-off an object or process, when each one is equally appropriate to be implemented on technical grounds.

Infrastructure is the backbone of the country. Adequate infrastructures such as road and railway transport system, water and air transport, logistics, power, communication, water supply and sanitation, irrigation, storage and oil and gas pipeline network and their efficient working are needed to ensure our country's economic and social prosperity.

However, physical infrastructures tend to deteriorate after years of continuous usage and exposure to climatic conditions. As a result, periodic maintenance, modernization/upgradation and replacement in whole or part of ageing infrastructures are necessary to continue with the intended and/or modified purpose of such physical assets. As per Report on Indian Urban Infrastructure and Services, Ministry of Urban Development, GoI, annual expenditure on operation & maintenance/modernization (O&M) is typically ranging from 2% to 20% of capital expenditure (CAPEX) on average depending on various factors. Size, capacity, nature, purpose, design, materials, quality of construction, exposure to environment are some of the important factors that determine the cost of maintenance. O&M expenses or OPEX are expenditure over the

period of life span of the physical asset or the utility or assessment period (min 50-60 years in Indian context). Hence, it is highly possible that OPEX throughout the life cycle of a particular asset is substantially more than the CAPEX. In absence of such analysis (or any such mandatory requirement), we do not visualize such costs when we build our assets.

Government has, on realizing the importance of O&M costs, started to bundle together operation and maintenance contracts along with construction contracts for projects built under the hybrid annuity and BOT models.

At this outset, it is tremendously important for policy makers to intervene and legislate appropriate methodology (ies) such as cost effectiveness analysis in form of LCCA while appraising physical asset creation.

### **Rationale & Objectives**

When we try to establish the cost-effectiveness of our infrastructural projects through competitive bidding (generally a two-step process: technical bid and commercial bid), we need to critically look into CAPEX and OPEX the life cycle of the utility/asset in totality (rather than in isolation, i.e based on initial or direct cost) and optimize. LCC helps to envisage effective capital planning prior to the actual cost incurred and improve efficiency during the usage of time and resources. Stakeholders' confidence also improves as reduced uncertainty in cost planning can lead to better asset performance and decrease the disruption and risks to the business.

Operationally, all future O&M costs (OPEX) are usually discounted (with appropriate discounting factors reflecting the specific risk attributable to project under review) and totalled to a present-day value known as present value (PV). A life-cycle model (may be different for different implementable options) is usually incorporated with the total cost of ownership (TCO) to provide a more complete and comprehensive ownership model to the owner of the infrastructure asset.

Therefore, Life Cycle Cost Analysis (LCCA) have the following targets, typically:

- Minimise the total Life Cycle Cost or TCO of a facility or asset, including design, build, operate and decommissioning costs.
- Optimise the balance between CAPEX & OPEX based upon factual data rather than subjectivity and make informed choice/s
- Maximise the performance of the facility and minimise the risk of failure through design efficiencies incorporating optimal operability, reliability and maintainability characteristics
- Identifying appropriate technologies, products and services that are environmentally, economically and socially sustainable

### Implementation Technique

Detailed LCCA requires the development of LCC model on each competing alternative through value engineering on the cost profile. A flexible LCC model can adjust the type and cost for assets and materials of construction and simulate the total spending over complete life cycle of the asset. As each asset or material might have different specifications in terms of the acquisition cost and maintenance characteristics, value engineering process could help the developer or concessionaire to decide the type of assets and materials to be used. For example, a more expensive asset might have better quality and performance, but it might incur lower amount of maintenance costs. However, a cheaper asset might need more frequent maintenance and therefore, the overall spending could be higher over the entire life span.

Following step by step method can be followed to carry out an exhaustive LCCA,



Based on the above approach, developer/concessionaire / project owner may decide the type, material and technology of physical infrastructure.

## **Current Status on LCC in GFR, Department of Expenditure, Ministry of Finance**

As of now, General Financial Rules (GFR) – 2017, Ministry of Finance, Govt of India – stipulates vide Rule no. 136 (iii), Page 39 that –

*“while designing the projects etc, principles of Life Cycle Cost may also be considered”*

Carrying out LCCA on infrastructure project would require substantial expertise in terms of design, construction, operation and maintenance and extensive cost data on such activities would form the LCCA model. Such expertise is presently limited only to a few established builders and consultants.

In absence of enough expertise & data on carrying out LCC, Government of India, through Department of Expenditure, Ministry of Finance recently initiated a reform in public procurement and project management to execute infrastructure projects. The current guidelines permit alternative methods for selection of contractors, which can improve speed and efficiency in execution of projects based on merit. In appropriate cases, quality parameters can be given weightage during evaluation of the proposal in a transparent and fair manner. This can be done through the quality-cum-cost based selection (QCBS) as an alternative to the traditional L1 (Lowest Cost) system. Earlier the old system gave weightage to the lowest commercial bid only.

Quality-cum-cost based selection (QCBS) was included in the General Financial Rules (GFR) 2017 for Consultancy projects only (Rule 192). The current guidelines allowed the same for Works and Non-Consultancy Services also.

### **Conclusion**

It is time for policymakers to take note of the importance of LCC and make a conscious effort to formulate LCC technique(s) with authentic data on O&M so that the same is acceptable to all stakeholders.