

# A sustainable life-cycle method

**Diruji Dugarte** <sup>[1]</sup>

*University of Twente, Faculty of Engineering Technology*

## **Abstract**

The need for innovative and cost effective approaches for infrastructure maintenance has never been more crucial. In fact, this has been a popular topic in technical reports like the McGraw Hill Construction, the Dutch Cobouw construction magazine and the new multidisciplinary journal “Infrastructure Asset Management” by the Institution of Civil Engineers. The financial status of Industrial Parks (IP) and Business Parks (BP) in the Netherlands, as well as in the rest of the world, has been greatly influenced by the 2007-2008 financial crisis. As a consequence, several IPs and BPs have suffered from infrastructural deterioration that needs to be revitalized.

Therefore, one of the priorities facing municipalities nowadays is stimulating companies to invest and redefine such areas with the goal of improving its economic output and optimize the expenditure on its maintenance costs. The different stakeholders involved in the life-cycle management of these parks make strategic decisions based on data that has been gathered over time by its users, either private or public. However, gathering data is becoming more and more complex with time. Infrastructures in these parks are increasingly demanding custom supply of services by the private industry to cope with their technical operations.

As a consequence, the level of detail of the assets information is very high. Hence, the digital collaboration and interoperability has become almost mandatory for enabling proper management in construction areas. Interoperability can be described as the ability of making systems and organization work together.

## **Keywords**

sustainability; life-cycle method; infrastructure maintenance; industrial parks; business parks; life-cycle management; digital collaboration; interoperability

## A sustainable life-cycle method for Industrial Parks and Business Parks

Diruji Dugarte

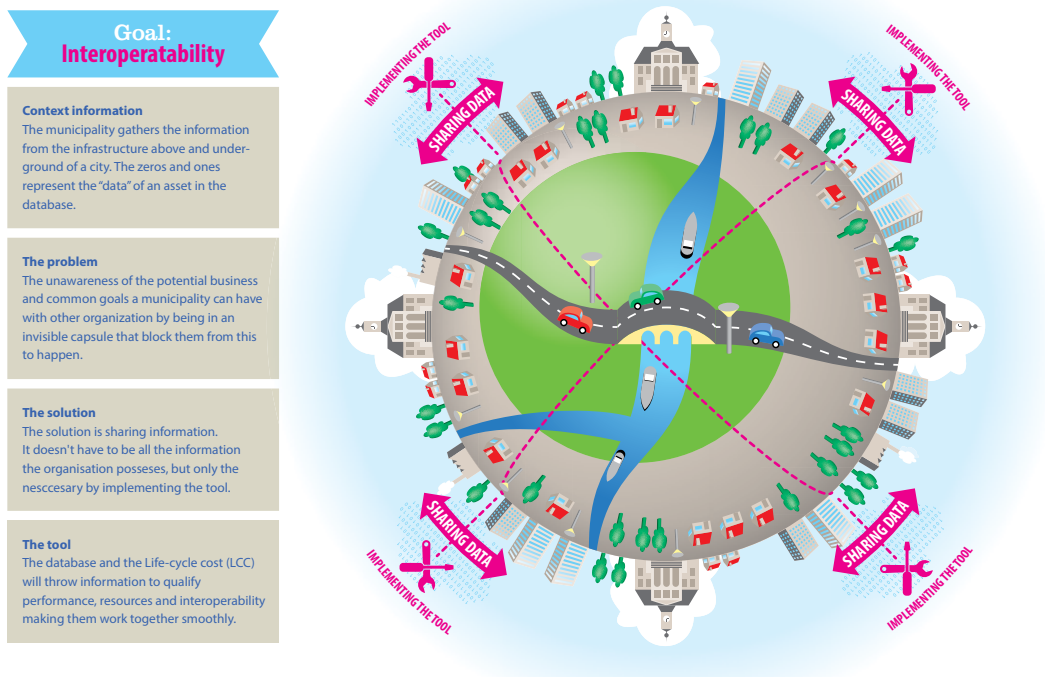


FIGURE 1 Graphical abstract

The provinces of Gelderland and Overijssel in the Netherlands are connected by a nautical channel, The Twentekanaal. A nautical channel is a dredged and marked lane of safe travel to vessels transiting that body of water. The Twentekanaal is composed by the nautical channel and six harbors. The water of this channel is managed by Rijkswaterstaat (the Dutch government body responsible for waterways) but the infrastructure of each harbor is in charge of the municipality it belongs to: Lochem, Goor, Almelo, Delden and Hengelo to Enschede. The Twentekanaal is mostly used for the transport of sand, gravel, salt and cattle food but also for recreational function like sailing and fishing.

The current administrative structure of the Twentekanaal is not integrated, making of all of its owners separated entities. As a consequence, issues like maintenance are undertaken by each harbor independently. Moreover, under the current structure, Rijkswaterstaat has a direct but independent relation with each harbor, decreasing the effectiveness and efficiency of decisions that should be taken together.

To improve this situation, the municipalities and governmental instances related to the Twentekanaal have create the 'Gemeenschappelijk Havenbeheer Twentekanaalen' (GHT) a company to manage the commercial and recreational function of this channel and to support the future commercial plans for that area. The municipalities will still be the owner of its harbor, but will delegate the management to this new company. This structure will enhance collaboration and allow the integration of asset management decisions, such as execution of maintenance activities.

The project will explore how to unify the management of the different functions of the channel, such as its commercial and administration activities (i.e. managing usage control, unifying toll payments), its maintenance tasks (i.e. dredging), and its strategic investments (i.e. expansion of channel, addition of servicing infrastructure). To do so, it is required account for with an unified data structure, have one common data base, and integrating standardise life cycle management methods.

To provide an answer to the previous problem, in this project I will develop a BIM tool that enables efficient and effective asset management of the GHT, and that will provide a standardised means for enhancing the interoperability among the different harbours in the Twentekanaal. The goal of this tool is to support strategic decision making in accordance to the future business plans for the Twentekanaal, and improve its productivity and profitability. The tool will integrate a database, a LCA method and a decision-making engine based on the asset management requirements of this new company. The database will allow me to incorporate a proper classification of the assets, and in combination with the LCA method, it will allow me to overlap the life-cycle cost of each one of the assets at the IPs and PBs. This will allow asset managers to obtain tailored information for making construction and acquisition decisions, renewal and rehabilitation activities, and replacement and disposals tasks. In the short term, this will enable the documentation and communication of the behaviour of different assets among the different stakeholders. In the midterm, this will also allow to predict the behaviour of the assets at the harbour and create strategic plans grounded on this. Furthermore, users will always have access to the database, such that it can be maintained and kept up-dated. The ambition with this tool is to be able to adapt to several IPs in the Netherlands and abroad. It should also be suitable for different categories of IA & BP levels (i.e. big, medium or small project's dimension).

### Support

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### Supervisors

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