A system-centric approach to infrastructure asset management planning

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Abstract

Urban water assets are the most valuable part of the public lifeline infrastructure worldwide, and utilities and municipalities are vested with the responsibility of keeping and expanding them for current and future generations. Infrastructure inevitably ages and erodes, but society places increasing demands for performance, risk management and sustainability. As many systems reach high levels of deferred maintenance and rehabilitation, the combined replacement value of such infrastructures is overwhelming, demanding wise spending and efficient planning. However, the best possible use of manpower and financial resources in the long run is hardly ever ensured by traditional risk-based, component-centric AM approaches, such as like-for-like prioritization and replacement.

The AWARE-P project (www.aware-p.org; Alegre *et al.*, 2011) aims at providing water and wastewater utilities with the know-how and the tools needed for efficient decision-making in infrastructural asset management of urban water services. All the project's results – from best practice handbooks to business cases, training courses and e-learning materials – are placed on the public domain and are freely distributed as they become available.

The infrastructure asset management approach developed in the project is a broad management process that addresses the need for a fundamental plan-do-check-act cycle at the utility's various decisional levels – strategic, tactical, operational – aiming at alignment of objectives, metrics and targets, as well as effective feedback across levels. Producing the plan is a problem-driven process, with a strong emphasis on thorough diagnosis in order to identify and assess the system's main issues and shortcomings, in view of the set targets, and to help decide where and how to act. Diagnosing and assessing a water supply or wastewater/ stormwater system, over given time horizons (at least the planning horizon and a longer, impact-analysis horizon), draw from a large range of methods and models for evaluating performance, risk and cost (Marques *et al. 2011;* Almeida *et al.*, 2011). For this purpose, a portfolio of techniques was selected that range from system statistics to network simulation models, to hydraulic and water quality performance, to component failure analysis and forecasting, to component importance and criticality, and to methods for estimating tangible capital and running costs.

An open-source software system based on a set of tools and models that assist in the analyses and decision support involved in the planning process has been developed in order to host the methods mentioned above. This paper presents the methodology and the software's objectives and features, describes the context and vision that led to its inception and details the main design requirements and technology options. The methods are illustrated through references to the business cases developed.

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