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## Management system for improving the efficiency of use water systems water supply

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### Abstract

This paper presents a management proposal to improve the efficient use of water resources in water supply systems. This is based on management tools, project management and is organized into three levels of planning (strategic, tactical and operational), following definitions of theories of strategic planning. This paper details these levels of planning, with a focus on strategic management, i.e., action plans at the strategic level, describing a methodology and detailing the main tasks that should be executed, as well as the main tools that can be used in each task, such as SWOT analysis and Balanced Scorecard.

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### 1. Introduction

Nowadays, water utilities of water supply systems in Brazil are facing a great challenge to save water, not only due to technical and economic reasons, i.e. to improve the performance of the whole system, but also because of the scarcity of water resources in many regions Brazil and the growing need for sustainable management systems. The water supply system in most Brazilian fund managers have water losses due to leaks and ruptures that result from the inevitable advanced age infrastructure, concepts and constructs deficient or inadequate operation and maintenance.

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The development and implementation of effective water losses strategies and procedures is of the utmost importance for water utilities. The current paper aims at the presentation of a methodology for the improvement of the water resources use efficiency in water supply systems. This methodology is based on tools of strategic management, project management and is organized into three levels of planning (strategic, tactical and operational), following definitions of theories of strategic planning, associated with actions short, medium and long term. The paper details these levels of planning, with a focus on management, describing a methodology and detailing the main tasks that must be performed, as well as the key tools and technologies that can be used in each task to aid decision making, such as indicators performance, hydraulic simulators and optimization procedures.

## 2. Water Losses Control

Programs to reduce and to control water losses as well as to rationalize the consumption of water and energy should be applied to the various stages of the supply, since the water intake, including the treatment, transport and storage, distribution and the final delivery to the consumer. Water input into the system has two main components – authorized consumption and water losses (Fig. 1). Water losses are the difference between the system input volume and authorized consumption (measured or estimated). Losses have two components: real or physical losses that correspond to leaks and ruptures in transmission or distribution mains, in storage tanks and in service connections until the consumer meter (i.e., water that inadvertently leaves the system), and apparent losses include measurement errors (flow-meters), illegal connections and uncounted for uses (e.g., irrigation, street washing, fire fighting) (Alegre et al., 2005).

While apparent losses can be minimized by using more accurate measurement equipment, installing meters at uncounted for consumption sites and regularly surveying the system looking for illegal connections, real losses depend greatly on normal operating pressures, burst frequencies, infrastructure age, construction processes, and rehabilitation strategies and leakage reduction. Leakage control can be carried out by different types of actions (Covas et al., 2008):

- passive control that consists of the repair of leaks and ruptures only when they become visible;
- active leakage control that consists of the establishment and monitoring of district metering areas and the implementation leak detection surveys;
- pressure management that presupposes the establishment of pressure zones by the redefinition of the network layout or the installation of PRV;
- Implementation of short-term and long-term rehabilitation programs.

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