

Chapter 9

Wastewater Systems Management at the Regional Level

Maria da Conceição Cunha
University of Coimbra, Portugal

ABSTRACT

Wastewater systems are very important environmental systems. They should be carefully planned and managed to contribute to a more sustainable development. Decision models are very useful tools that can contribute to defining the best solutions for these purposes. In this chapter an overview about the planning and management of wastewater systems and presentation of different decision models is given. Solutions methods are discussed and the results that can be obtained with such models are commented on. The vulnerability of such systems is reflected and new approaches are proposed to tackle them.

INTRODUCTION

Wastewater Problems in the Context of an Integrated Water Resources Management

There is a world-wide concern about ‘good water status’, a concept that should be analyzed within the framework of an Integrated Water Resources Management (IWRM). A systemic view should

be considered in order to develop methodological tools capable of handling simultaneously all the facets (environmental, economical, social and technological) involved in the IWRM approach. Wastewater systems are very sensitive water systems that should be properly planned and managed so that they can contribute to a better environment. These issues have to be tackled at regional level, because past experience suggests that in many cases it is impossible to find efficient planning and management solutions to wastewater problems unless these solutions are

DOI: 10.4018/978-1-60960-156-0.ch009

Figure 1. Extreme solutions for wastewater problems at regional level

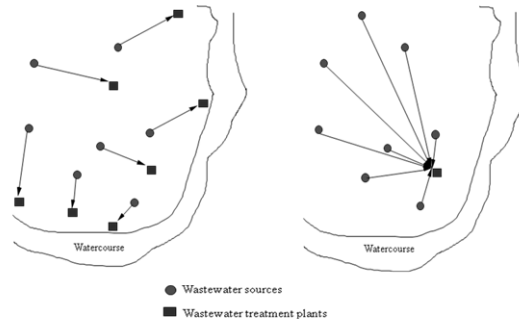
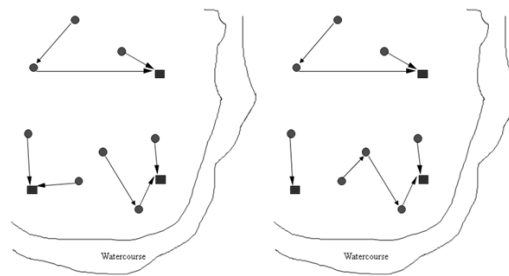


Figure 2. Different solutions for wastewater problems at regional level



sought for relatively large geographical areas. Local solutions often lead to the misspending of natural and capital resources and to the generation of pollution foci. The solutions that can be envisaged lie between two extremes: one where each community deals with its own wastewater and the other where wastewater from all communities is treated in a single plant (Figure 1).

The Role of the Decision Models

Decision models are crucial to obtaining good solutions that will enhance IWRM. They can be tailored to incorporate the various interdependencies and interactions between the technical, economic, environmental and social aspects appropriate to achieving consistent and harmonious solutions. Decision models for wastewater systems involve a

component for wastewater collection and another for wastewater treatment plants. How to design the sewer network to convey wastewater to the treatment plants? What location and size should be defined? These issues have to be considered simultaneously. The decision models should represent real world systems realistically and should include appropriate simulation models to carefully assess the effects of the decisions to be taken. The search for the optimum solution somewhere between the two extremes mentioned above is a very complex task, given the extraordinarily high number of possible combinations for collecting wastewater and transporting it to the various available locations of wastewater treatment plants (examples in Figure 2).

An important criterion for defining the solution is cost, with all the other issues involved in such

16 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/wastewater-systems-management-regional-level/49321

Related Content

Costs as Instruments of Decision Making Process in Competitive Economies

Carmen Veronica Zefinescu (2016). *International Journal of Sustainable Economies Management* (pp. 35-48).

www.irma-international.org/article/costs-as-instruments-of-decision-making-process-in-competitive-economies/166555

How Social Media Usage Influences Student Learning Outcomes

Uldana Baizyldayeva (2020). *Toward Sustainability Through Digital Technologies and Practices in the Eurasian Region* (pp. 193-207).

www.irma-international.org/chapter/how-social-media-usage-influences-student-learning-outcomes/251701

Efficient Heuristics for Large-Scale Vehicle Routing Problems Using Particle Swarm Optimization

A. Chandramouli, L. Vivek Srinivasan and T. T. Narendran (2012). *International Journal of Green Computing* (pp. 34-50).

www.irma-international.org/article/efficient-heuristics-large-scale-vehicle/69997

Learning about the Different Dimensions of Sustainability by Applying the Product Test Method in Science Classes

Mareike Burmeister, Janine von Döhlen and Ingo Eilks (2014). *Handbook of Research on Pedagogical Innovations for Sustainable Development* (pp. 154-169).

www.irma-international.org/chapter/learning-about-the-different-dimensions-of-sustainability-by-applying-the-product-test-method-in-science-classes/103504

Evolutionary Dynamics in Mediterranean Landscapes: The Changes in Forests and Semi-Natural Areas in the Iberian Peninsula – A Study From 1990-2018

José Manuel Naranjo Gómez, Rui Alexandre Castanho and Luís Loures (2021). *Management and Conservation of Mediterranean Environments* (pp. 1-13).

www.irma-international.org/chapter/evolutionary-dynamics-in-mediterranean-landscapes/271933