



BSI Standards Publication

General principles and guidelines for cost analysis in planning of decentralized wastewater treatment and/or reuse

National foreword

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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General principles and guidelines for cost analysis in planning of decentralized wastewater treatment and/or reuse

*Principes généraux et lignes directrices pour l'analyse des coûts lors
de la planification du traitement décentralisé et/ou de la réutilisation
des eaux usées*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 282, *Water reuse*, Subcommittee SC 2, *Water reuse in urban areas*, in collaboration with Technical Committee ISO/TC 224 *Drinking water, wastewater and stormwater systems and services*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

While energy consumption for water and wastewater treatment is significant, up to 80 % of it is used for conveyance. This includes pumping of wastewater to the treatment facility and pumping the effluent to its reuse site. In centralized wastewater treatment and reuse system schemes, the long-distance conveyance through piping systems and pumping stations is also associated with capital investment, which would be hard to bear for those people living in areas of low population densities.^{[1],[2]} Thus, a network of decentralized wastewater treatment and reuse systems will potentially reduce both the capital expenses (CAPEX) and operating expenses (OPEX) in some cases, compared with conventional planning of centralized wastewater treatment and reuse systems. Another benefit of decentralized treatment is enabling local reuse, mainly for irrigation.^{[3],[4]}

Distributed design is the concept of providing several decentralized wastewater treatment systems instead of one central plant, as outlined in other International Standards, such as [ISO 23056](#), which defines and describes different degrees of decentralization of wastewater treatment plants and discusses considerations that should be taken in the selection of each alternative. Due to development in automation and telecommunication, as well as in biological wastewater treatment processes, the distributed design concept has become a viable option. Potential savings in using distributed design include:

- lower collection and pumping system construction costs;
- lower collection and pumping system operation and maintenance costs;
- lower energy consumption for pumping;
- local availability for reuse in agriculture or industry or landscape irrigation.

However, potential drawbacks include:

- higher specific cost of each plant compared with a centralized wastewater treatment and reuse system;
- higher operator attention required for many plants compared with one plant.

This document aims to provide guidelines for life cycle cost assessment for any degree of distribution in the planning of a network of decentralized wastewater treatment and reuse systems in order to enable the cost optimization of the design.

General principles and guidelines for cost analysis in planning of decentralized wastewater treatment and/or reuse

1 Scope

This document specifies the general principles and provides guidance on the quantitative characterization of the life cycle cost of a complete wastewater management system, including collection, treatment and, optionally, reuse. It enables the consideration of different degrees of distribution, including non-sewered systems for one or more dwellings and associated trucking operations.

The methodology provided in this document is applicable to urban or rural areas wherein several decentralized wastewater treatment and reuse systems can provide a lower cost solution than a single centralized plant. Similarly, the same methodology can be applied for industrial reuse systems, where several separate plants on a large industrial site can be considered instead of one treatment system.

The scope of this document includes the following:

- a) Guidance on the determination of the degrees of distribution of decentralized wastewater treatment and reuse systems.
- b) A definition of the elements and components included in the life cycle cost of the different degrees of distribution in wastewater management systems, including construction, operation and maintenance.
- c) Guidance on the required steps for calculating life cycle cost indicators, including considerations of term and interest, operation and maintenance, replacement parts, equipment life expectancy, the value of water for reuse and other income from by-products.
- d) A definition of the metrics for reporting results, including the cost per unit, scope, term and interest.

The following secondary costs and other considerations are not within the scope of this document:

- cost of eventual disposal of the system;
- guidance on wastewater treatment process selection and design;
- health and sustainability considerations (although health and sustainability are primary considerations in design and decisions);
- social impact factors and/or environmental risks and impacts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[ISO 20670](#), *Water reuse — Vocabulary*