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Sustainable development indicators for wastewater systems – researchers and indicator users in a co-operative case study

Ulrika Palme*, Margareta Lundin, Anne-Marie Tillman, Sverker Molander

Department of Environmental Systems Analysis, Chalmers University of Technology, SE 412 96 Göteborg, Sweden

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Abstract

This paper presents a study where sustainable development indicators (SDIs) for sludge handling and wastewater treatment systems were constructed in co-operation with a large Swedish water company. Results from a life cycle assessment, a risk assessment, an economic assessment and an uncertainty assessment were used as inputs for ranking technical options of sludge handling by use of multi-criteria analysis (MCA). The MCA included assessment of the different technical options, valuation of different, and often conflicting, aspects of sustainability and weighting of various criteria. On basis of the preferences expressed in the MCA, a number of SDIs and, when possible, targets for sustainable development, were formulated. The resulting SDIs reflected economic, environmental, technical and social aspects of sustainable development of sludge handling systems. Where possible, the coverage of the indicators was extended to the entire wastewater system.

Keywords: Sustainable development; Indicators; Life cycle assessment; Multi-criteria analysis; Sludge handling; Wastewater systems; LCA

* Corresponding author. Tel.: +46 31 772 8607; fax: +46 31 772 2172.
E-mail address: ulrika.palme@esa.chalmers.se (U. Palme).

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1. Introduction

The production and delivery of drinking water and the conduction and treatment of wastewater are vital functions in any society; hence securing them for current and future generations is an important part of sustainable development. This has also been recognised in many of the initiatives to measure different aspects of sustainability and select appropriate sustainable development indicators (SDIs) that were launched following the U.N. conference on Environment and Development in Rio de Janeiro in 1992. Initially, a majority of the SDIs proposed were intended for use at the international, national, regional or other administrative or geographical levels (see, e.g. OECD, 1998; UNCSD, 1996; Verbruggen and Kuik, 1991), and included suggestions on indicators such as withdrawal of freshwater (OECD), sewage connection rates (OECD) and releases of nitrogen and phosphorus (UNCSD) (for review see Lundin, 1999). In the latter half of the 1990s the role and responsibility of companies in the implementation of sustainable development attracted increasing attention, leading to a new set of initiatives, now to develop SDIs for use at the company level. The use of SDIs within companies in general is described by e.g. Bennett and James (1999), Fiksel et al. (1999), Olsthoorn et al. (2000), Schaltegger and Burritt (2000), Veleva and Ellenbecker (2001) and Veleva et al. (2001). SDI projects applying specifically to the water industry are reviewed by e.g. Balkema et al. (2002) and Foxon et al. (2002). There are among these projects, within the water sector or elsewhere, few examples of successful implementation of SDIs, i.e. SDIs made operational. The reasons for this are most likely manifold, but it is increasingly understood that sustainability issues at company level call for extended involvement of employees if management towards increased sustainability is to be successful (Schelin et al., 2003) and this is often ignored (Azzone et al., 1996; Noci, 2000).

This paper reports on a co-operative case study aiming at the construction of operational SDIs for a water company. The study involved the indicator users (company staff and one member of the board) and researchers, in order to provide indicators that meet the needs of the company to indicate its contribution to a sustainable development. The study was focused on wastewater and sludge handling systems and included the conduct of LCA, risk and uncertainty assessment, economic assessment and multi-criteria analysis of a number of sludge handling options.

2. The case study at Stockholm Water Company – background, outline and assessments

The Stockholm Water Company (SWC) is the largest water company in Sweden and operates the municipal drinking water and wastewater system in Stockholm and Huddinge. Its activities extend to the production and distribution of drinking water for over one million people and the handling and treatment of wastewater for 900,000 people. The company has a long tradition of environmental reporting and has the goal of contributing to the long-term sustainable development of society (SWC, 2002). Over the years 2000–2002, a case study was performed in co-operation between researchers at Chalmers University of Technology and representatives of SWC with the aim of identifying SDIs. Researchers