

Summary

The Sustainable Water Industry Asset Resource Decisions (SWARD) project has developed a ‘guidebook’ to aid water service providers in incorporating sustainability assessment into their decision-making processes.

Developer: Richard Ashley (University of Bradford), David Blackwood (University of Abertay Dundree), David Butler (Imperial College), Paul Jowitt (Heriot-Watt University)

Applicable sectors				Function			
All Infrastructure	Water	Energy	Organisations	Design Guide	Option Appraisal	Construction Guide	Op&M Guide

Countries	UK	<p>Process summary</p> <p>The SWARD method consists of seven phases in the iterative decision-making process for evaluating the contribution to sustainability of a range of water service provision options.</p> <p>Phases 1 and 2 involve the review of past performance or the formulation of new targets for the setting of objectives for improving the performance of the water/wastewater system. A set of options for performance improvement is then generated.</p> <p>Phases 3 and 4 involve the selection of sustainability criteria and the collection of data to inform these criteria for each option.</p> <p>In Phase 5 and 6 the options are then analysed and a preferred option is selected, based on the criteria and method of analysis chosen.</p> <p>Finally, in Phase 7 the preferred option is implemented and its performance monitored so as to feed back into the assessment of system performance and into the development and choice of criteria for future decision making.</p>
Deployment & developments	The paper: Ashley R. et al. (2008). <i>Making Asset Investment Decisions for Wastewater Systems That Include Sustainability</i> . Journal of Environmental Engineering, was awarded a prize by IWA in 2008. This paprt outlined the SWARD framework and its development.	
Guidelines for sustainable design	SWARD does not offer guidelines for sustainable design in the water sector, however it provides extensive guidelines on data sources and methodology options for each phase of the SWARD process. For example, it recommends several methods for design option generation, for multi-criteria analysis methods or studies for data collection.	
Use with other tools	SWARD is a stand-alone, sector-specific methodology and as such has not been designed for compatibility with other decision-support or rating & certification tools - although calculators may be employed to inform its indicators.	
Level of support services	SWARD was developed by a UK research consortium. As such, the method is commercially available but is not currently accompanied by supporting services.	
Sustainability criteria	<p>SWARD sustainability criteria are classified under four categories and further sub-divided into primary and secondary (sub) criteria with example indicators for each.</p> <p>The four categories (and their primary criteria) are as follows:</p> <ul style="list-style-type: none"> - Economic (Life cycle costs; Willingness to pay; Affordability; Financial risk exposure) - Environmental (Resource utilisation; Service provision; Environmental impact), - Social (Impact on risk to human health; Acceptability to stakeholders; Participation & responsibility; Public awareness & understanding; Social inclusion) - Technical (Performance of the system; Reliability; Durability, Flexibility & adaptability). 	
		<p>Design option appraisal functions</p> <p>SWARD offers guidelines for option appraisal. Firstly, different environmental and economic calculators are recommended to support data collection that will inform indicators.</p> <p>A Baseline Assessment is also recommended to not only compare design options between them, but to compare them also to the current state of play (the do-nothing option). It is recommended that option appraisal is carried out through an Optioneering or Value Management workshop involving key project stakeholders.</p> <p>A series of multi-criteria analysis methods including Multi-Attribute Utility Theory (MAUT) methods (e.g. the Analytical Hierarchy Process) and Outranking Methods (e.g. Elimination and Choice Expressing Reality and the Preference Ranking Organisation Method and Enrichment of Evaluations) are recommended for ranking criteria according to preference, and ranking design options according to performance.</p>

Fee	<p>The guidelines can be downloaded from the International Water Association (IWA) website at a price of:</p> <ul style="list-style-type: none"> - £59.75 / US\$107.55 / €80.66 for non-IWA members - £45.00 / US\$81.00 / €60.75 for IWA members. 	Level of materiality (tailoring)	<p>SWARD offers guidelines for development of a preference structure which maps priorities of decision makers, thus enabling the useful comparison and assessment of options.</p> <p>The preference structure is created through formalisation of project objectives and a Materiality Test i.e. selection of relevant assessment criteria and indicators from the SWARD suggested list.</p> <p>Weightings are assigned to selected criteria and multi-criteria analysis methods are used to aggregate these.</p> <p>A Sensitivity Analysis or a Monte-Carlo simulation is recommended for determining how the weightings affect the ultimate score of each design option. Where options are found to be sensitive, the weighting for those options is revisited to ensure accuracy.</p>
------------	--	---	--

Case study

Project: Disposal of sanitary waste, Scotland

Brief Description:

SWARD was applied to examine the relative sustainability of a range of options for the management of domestic sanitary waste currently disposed of via the toilet. The case study catchment was a small coastal town (population circa 1500) in Scotland with 626 domestic properties, mostly detached or semidetached.

The case study had the aim of “managing the number of sanitary waste items escaping to the environment via storm overflow discharges in a way that is likely to be the most sustainable.” Six options were generated for assessment. The different approaches address the management of sanitary waste at different points in the system, and can be grouped into three generic methods: end of pipe; habit change; and spill reduction. SWARD was applied to assess which option is more sustainable given stakeholder priorities. The existing hydraulic system was computer modelled to incorporate each option individually to provide information for these different scenarios.

The water industry and other stakeholder collaborators were involved in each of the phases of the SWARD case study and provided feedback and validation on all aspects of the work. The involvement of a range of stakeholders in the decision-making process created the possibility of a diverse range of opinions on the values attributed to indicators and on their relative weightings in the analysis.

The outcome of the SWARD process was that public education would be the most sustainable option. However, decision makers considered this to be too risky as there could be no guarantee that toilet users would not continue to flush sanitary solids, notwithstanding their stated intentions not to do so. While this outcome was disappointing, it was agreed that the sustainability assessment had raised important questions on the policy of screen installation and it was agreed that the water services provider and the environmental regulator would consider further the implications of the case study.