

EviBAN Integrated Sustainability Assessment Tool

1. BACKGROUND AND INTENDED USE

The Integrated Sustainability Assessment (ISA) tool is an indicator-based assessment framework covering five dimensions of sustainability.

- Technical performance (Tp)
- Social (S)
- Environmental (En)
- Economic (Ec)
- Governance (G)

The ISA tool is intended to be used to assess alternative solutions for stormwater management or managed aquifer recharge. The perspective of the framework is that of an end user or decision maker wanting to assess NWRM or similar NBS and compare with other water management alternatives. The aim has therefore been that the tool should be flexible and possible to use for planning future implementation of NWRM and similar NBS, and for evaluation of solutions that have already been implemented.

A solution is thought to be sustainable when it has acceptable performance in all dimensions of sustainability at the same time. Further, sustainability is defined by the United Nations Sustainable Development Goals (SDGs).

The required information is related to a specific water management solution. However, the relation to sustainability differs between the types of impact the solution has. For direct impacts, the indicators should provide an estimate of the direct contribution of solution to achieving the sustainability goal(s). For added benefits of the solution, the contribution the sustainability will be more indirect, and the indicators should provide an estimate of the contribution towards sustainability from the added benefits of the solution.

The ISA framework was developed in collaboration with stakeholders from the case studies in EviBAN. Further, the stakeholder group was enlarged by collaboration with a Norwegian project, DRENSTEIN, funded by the Norwegian Research Council on permeable surfaces.

The ISA framework has seventy-seven indicators to describe properties of the solutions in the five sustainability dimensions. These have been developed and selected based on discussions with the stakeholders who provided inputs through on-line questionnaires and in workshops, and on review of previous studies in the open scientific literature as illustrated in Figure 1.

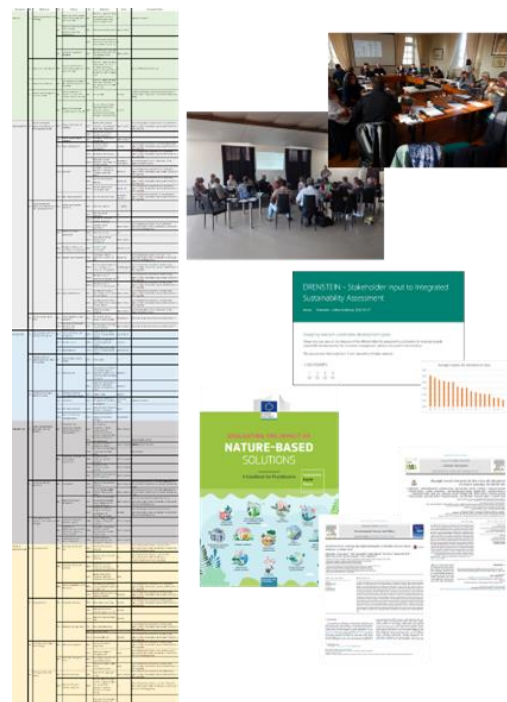


Figure 1 : Development process for the integrated sustainability assessment (ISA) framework

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2. USE OF THE EVIBAN ISA TOOL

The tool consists of an explanatory text manual and an Excel-file with the indicators and a template for filling data. The structure of the framework is like what has been used in other studies^{1,2,3}.

Responses, given on a Likert scale of 0 to 3, to the questionnaires answering how relevant the SDGs and the proposed objectives, criteria and indicators were to assess solutions to the water management issues in the case (stormwater or MAR/SAT) do not support using the same set of indicators for assessing both MAR and SWM applications, or even different SWM applications. However, none of the indicators were scored consistently low, indicating that a particular indicator should be excluded. Further, a score of 2 or higher on a scale from 0 – 3 was given for more than one indicator in each sustainability dimension by all the stakeholder groups.

The indicator set in the ISA framework should therefore be used as a point of departure to select a sub-set of the indicators that will be relevant for the specific solution(s) and local conditions. These indicators can subsequently be weighted and quantified in a process involving the local decision makers and stakeholders, and be used to assess alternatives for SWM or MAR.

2.4. Scope and scenarios

It is often taken for granted that the scope of the assessment is clear and well defined. However, several of the indicators require that the boundary of the assessment is precisely defined. The initial step of an assessment should therefore be to provide a clear description of the solution or alternative solutions that are to be assessed.

Assessing sustainability requires that one has a long-term perspective. In each assessment one may define the time horizon to be aligned with e.g., a planning process or a time horizon of a strategy. It is recommended to compare the current situation with a short-term or intermediate-term future, and finally long-term future, i.e., 25-30 years away.

For each time horizon one should define scenarios that cover essential conditions that one expects will change or that have foreseen impact on the functioning of the solution(s) in the assessment. A point of departure for selecting the conditions to include in scenarios are the factors included in the wider and specific contexts discussed in the governance assessment (GA) tool.

Working through the following steps, selecting relevant indicators, and finding data sources, may lead to some adjustments of scope or scenarios so a degree of iteration is foreseen.

2.5. Selection of indicators

The seventy-seven indicators provide a point of departure for selection of indicators that are relevant for the specific assessment. A column with a drop-down menu for selection of indicators is provided in the spreadsheet template.

Selection of indicators should involve local stakeholders and consider both the specific solution(s) and local conditions to be assessed. Initially one may select only based on the relevance, but an iterative process is foreseen where the selection of indicators is adjusted according to data availability.

¹ Alegre, H., Brattebø, H., Cabrera Jr, E. and Hein, A. Framework for Sustainability Assessment of UWCS and development of a self-assessment tool D 31.1. 2012. www.trust-i.net - info@trust-i.net.

² Van Leeuwen, C. J. City Blueprints: Baseline assessment of sustainable water management in 11 cities of the future. *Water Resources Management* 2013, 27, 5191–5206.

³ Helness, H., Damman, S., de Clercq, W. P., and Elema, N. M. (2017). A Framework for Integrated Sustainability Assessment of Water Cycle Services. *European Journal of Sustainable Development*, 6(4), 1-12.

<https://doi.org/10.14207/ejsd.2017.v6n4p1>

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It is recommended, however, to keep relevant indicators and initially provide only a rough estimate for indicator value that can later be made more precise rather than discarding relevant indicators due to lack of data at an initial stage.

Selection of indicators from the different dimensions should be balanced to avoid additional data processing to account for bias.

In addition to selecting indicators from the seventy-seven included in the framework, the user may define additional indicators to cover some particular aspects of the cause under assessment.

2.6. Weighting of indicators

The user should weight the indicators. A simple 3-level weighting is provided in the spreadsheet template by drop-down menu in a column. However, other weights may be applied. The weights of an indicator should be relative to all the other indicators in the framework. To achieve this, a structured approach where one first weights the different dimensions and thereafter moves to the indicator level may be useful.

2.7. Data sources

Quantification of the indicator values can be done from many data sources. As for weighting, selection of data sources and quantification of the selected indicators should involve local stakeholders.

In general, one should try to use local data if possible. This, however, depends on the scale of the assessment and the indicator. For some, national statistics can give satisfactory resolution and accuracy, for others, a value based on local conditions will be preferred even if only a rough estimate can be given initially.

The spreadsheet template provides references to data sources and how to measure or obtain data, especially for indicators that have been sourced from or inspired by literature findings.

2.8. Data processing

The indicators in the framework have been defined so they have a common optimal, even if hypothetical, value of 0, e.g., zero cost, zero pollutant discharge etc. This has been done to facilitate multivariate analysis to compare alternatives as presented in a previous study⁴.

Data processing will, however, be required according to the requirements for the following analysis. For presentation of results in e.g., a radar plot (Figure 2) normalisation of data to a common scale should be done.

2.9. Presentation of results

Results of the assessment can be presented in several manners. The nominal indicator values can be presented in tables (after suitable averaging), as bar charts or in radar plots (Figure 2). When a multi-criteria analysis is performed (ibid), results can be presented as an average sustainability score where alternatives can be compared in a bar chart (Figure 3).

⁴ Helness, H., Damman, S., Sivertsen, E., and Ugarelli, R. (2019). Principal component analysis for decision support in integrated water management. *Water Supply*, 19(8), 2256-2262. <https://doi.org/10.2166/ws.2019.106>

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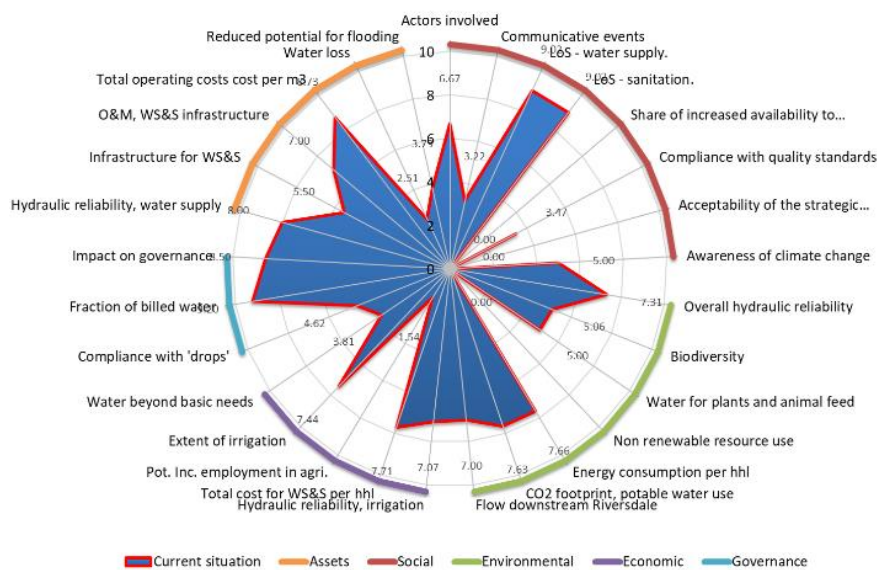


Figure 2 : Radar plot of assessment results, example from previous study by Helness et al. (2017), (ibid)

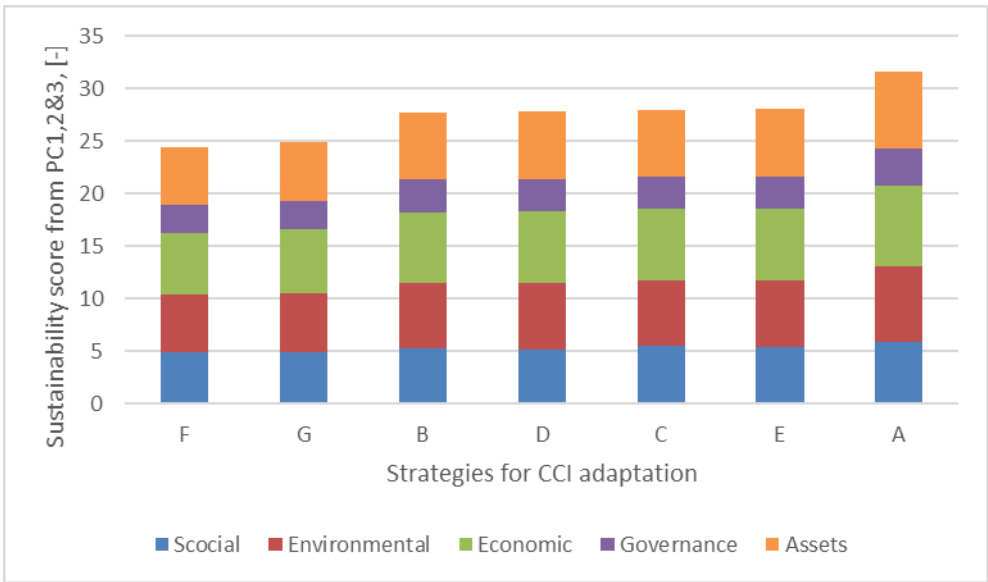


Figure 3 : Bar chart with average sustainability score overall and per sustainability dimension to compare alternatives after multivariate analysis, example from previous study by Helness et al. (2019), (ibid)