



Strategic Sanitation Planning with SaniChoice

A Step-by-Step
Practitioners' Guide



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Imprint

Published by: Eawag - Department of Sanitation, Water and Solid Waste for Development (Sandec)
Überlandstrasse 133
P.O. Box 611, 8600 Dübendorf
Switzerland

Design and Layout: [Alice Lapillonne](#), Paris, 2023

Photo Credits: Basile Weber, 2022

Quote as: Dorothee Spuhler, Cyril Willimann, Basile Weber and Christoph Lüthi (2023) *Strategic Sanitation Planning with SaniChoice: A Step-by-Step Practitioners' Guide*. Swiss Federal Institute of Aquatic Science and Technology, Department Sanitation, Water and Solid Waste for Development Eawag-Sandec. Dübendorf, Switzerland

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Acknowledgements: We thank the following persons for the critical review and valuable feedback that helped us in developing this Guide: Paul Donahue, Philippe Reymond, Mingma Sherpa, Vasco Schelbert, Kukka Illmannen, and Sital Uprety.




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Executive Summary

SaniChoice is an open source web tool that enables informed sanitation technology and system choices as inputs in strategic planning. It can be used both for capacity development (e.g. in trainings and workshops) and as a decision support tool. This Practitioners' Guide is for engineering and planning consultants who aim to apply SaniChoice as a decision support tool in a facilitated multi-stakeholder Structured Decision-Making (SDM) process that is part of such frameworks as City Sanitation Planning (CSP), Sanitation 21 or Community-Led Environmental Sanitation (CLUES).

SaniChoice helps in implementing the Citywide Inclusive Sanitation (CWIS) principles. It enables the user to select locally appropriate technologies along the entire sanitation value chain in consideration of stakeholder preferences, and allows for prioritising systems with resource recovery. For the selection of appropriate technologies, it provides data on 90 technologies, regarding 28 geo-physical, technical, socio-cultural, legal, financial and capacity and management appropriateness characteristics. It then allows the user to find the most appropriate technology combination along the entire value chain. Finally, it permits comparisons of different entire systems based on evaluation criteria, such as resource

recovery or investment level requirements, or system complexity.

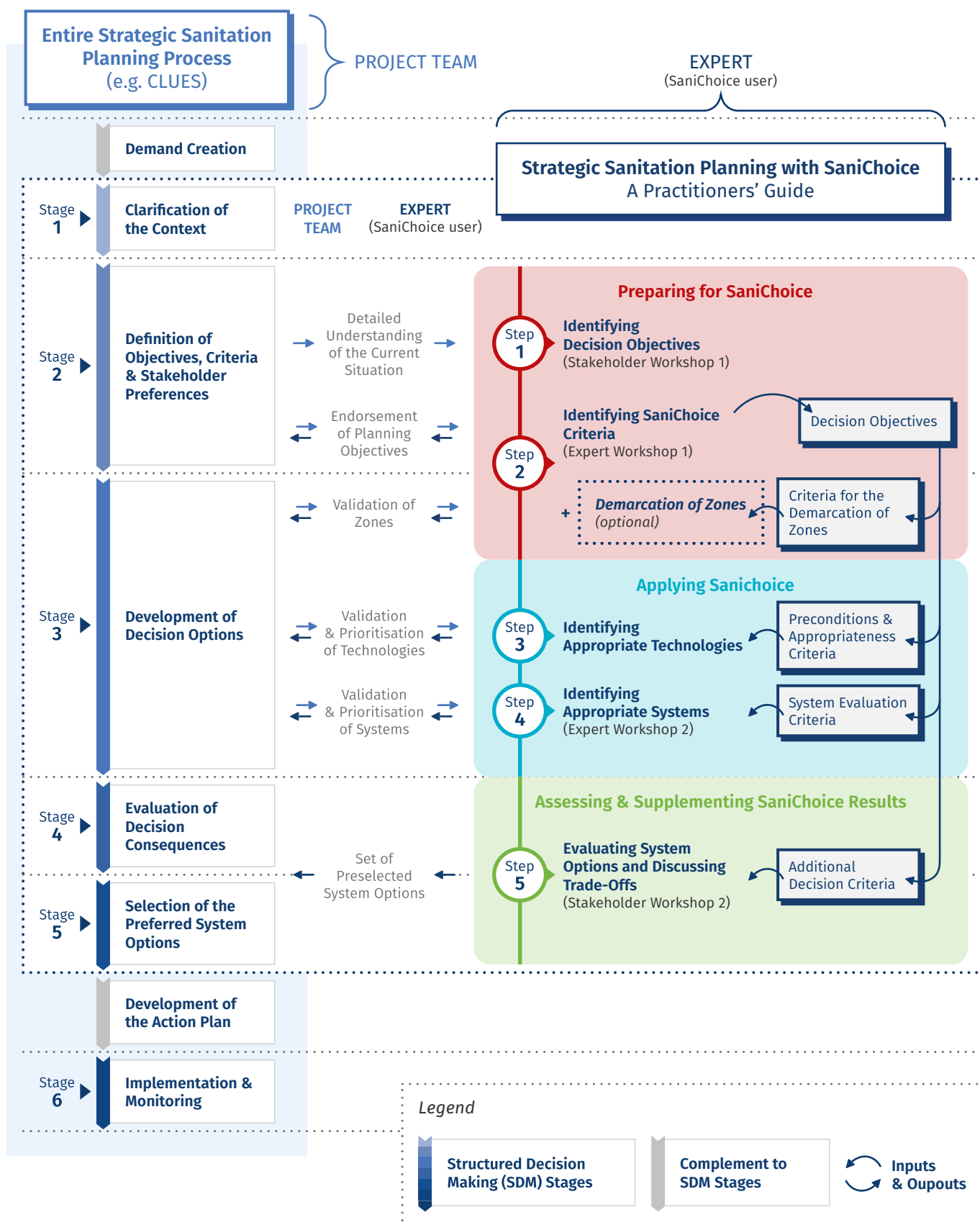
This Guide provides five steps to integrate SaniChoice into the SDM process. The SDM process is described in six stages: (1) clarification of the context, (2) definition of objectives, criteria and stakeholder preferences, (3) development of decision options, (4) evaluation of decision consequences, (5) selection of preferred options and (6) implementation and monitoring. SaniChoice requires information from steps (1) and (2), such as planning objectives, local conditions, stakeholder preferences, etc.. It then provides the decision options for steps (3) and (4) and some information required for (5). The five steps for the SaniChoice application and the communication of results are described in Figure 1.

A glossary is provided in the annex to enhance the reader's understanding of the content presented.

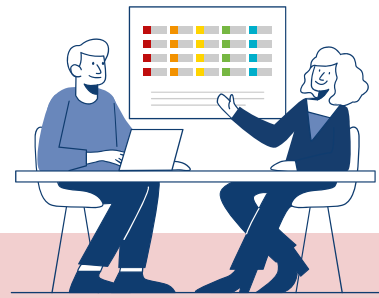
With this, we aim to contribute to the Sustainable Development Goal 6, by enabling the identification of more appropriate and more inclusive sanitation solutions, enhancing the transparency of the option selection, and enabling prioritisation of locally appropriate and resource efficient sanitation solutions for the future.

Disclaimer: This Guide is about how to apply SaniChoice in a strategic sanitation planning process. A manual on how to use the SaniChoice web tool can be found in www.sanichoice.net.

Figure 1: Schematic diagram explaining important elements of Strategic Sanitation Planning with SaniChoice - A Step-by-Step Practitioners' Guide.



Working with SaniChoice



Preparing for SaniChoice Implementation: Step 1 + 2

In Stage 1 of the planning process the local context is clarified through focus group discussions, household surveys, etc. In Stage 2 stakeholders jointly define the **decision or planning objectives** describing the desired result or end-point of the process. The planning objectives are then validated with experts and optionally complemented with criteria used to do the demarcation of zones. SaniChoice can be applied in parallel to different sub-areas of the city (zones) to consider the heterogeneity of a city.

Applying SaniChoice: Step 3 + 4

In **Stage 3 demarcation criteria, preconditions, appropriateness criteria** are derived from the planning objectives:

- **Demarcation criteria** are used for defining distinct zones within the city. Typical demarcation criteria are density, slope, vehicular access, flooding.
- **Preconditions** are used to exclude technologies that are not applicable or to include the one that are already existing:
 - Development phase: choose between acute, stabilisation, recovery or development phase
 - Existing infrastructure: ignore or fix some technologies.
- **Appropriateness criteria** are used to define the **case settings** in SaniChoice to calculate technology and system appropriateness. SaniChoice offers a list of 28 field-tested criteria and the corresponding technology data for geo-physical, technical, legal, socio-cultural criteria including aspects concerning capacity and management and for humanitarian settings. Per case, no more than 10 to 15 criteria should be used.

Additionally, the number of inhabitants can be provided to scale the resource recovery results.

To further narrow down the options, system templates can be included or excluded. **System templates** are characterised along technical characteristics: dry/wet; onsite, decentralized, hybrid and centralized; producing sludge, urine, biofuel, or based on blackwater.

Assessing and Supplementing SaniChoice Results: Step 5

Evaluation criteria are also derived from the planning objectives and are used to compare systems. These evaluation criteria often involve trade-offs and need to be discussed with stakeholders to align different preferences. Typical trade-offs are related to investments costs and treatment level, or risk of exposure and resource recovery. SaniChoice provides data on the following evaluation criteria:

- Total system appropriateness scores
- Resource recovery and loss potentials for nutrients (nitrogen and phosphorus), total solids, and water
- Technical maturity presenting an indication of how well-established the technologies are
- Capital and operational expenditures requirements

Further criteria need to be evaluated independently and differ in different applications, but often include a more detailed assessment of the costs, service delivery models and health risks.

	<p>1. About SaniChoice</p>
<p>This chapter contextualises the approach to sustainable and structured sanitation planning and introduces SaniChoice</p>	

Introduction

Sustainable Sanitation

The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease. To be sustainable, sanitation systems should also be economically viable, socially acceptable, technically and institutionally appropriate, and protect the environment and natural resources. Moreover, a sanitation system should not only consider toilets or the collection, but the entire sanitation value chain, from the user interface to the storage, transport and treatment to the reuse or disposal (Tilley et al., 2014). The five sustainability criteria for sanitation are (SuSanA, 2008):

- Protection of human health and hygiene
- Protection of the environment and natural resources
- Appropriate technology and operation and maintenance along the entire sanitation value chain
- Financial and economic viability
- Socio-cultural and institutional acceptance

Selecting a sustainable sanitation system is a complex multi-criteria decision-making problem that not only involves many criteria and multiple stakeholder preferences, but also an increasing number of technology options. Moreover, what are the best options is highly context specific and different system configurations have to coexist within one city.

Need for Decision Support for Strategic Sanitation Planning

Today, over 1.8 billion urban inhabitants do not use safely managed sanitation services (Schertenleib et al., 2021). One-size-fits-all approaches within the sewer paradigm have largely failed to meet the goals of sustainable sanitation for all. This is especially the case in rapidly developing urban areas where the growth of informal settlements far exceeds the capacities of government administrations (Lüthi et al., 2010). Improved planning practices are urgently needed to achieve safely managed sanitation that takes into account the local contexts and current challenges related to population growth, climate change, and resource depletion. To address these challenges, the Manila principles of Citywide Inclusive Sanitation (CWIS) have been introduced (Narayan and Lüthi, 2020). CWIS is (one of) the most recent urban strategic sanitation planning approaches (Gambrill et al., 2019; Lüthi and Narayan, 2018; Schrecongost et al., 2020). Although CWIS is still under development, there is already broad

agreement on a number of key principles, including safe and equitable service delivery, resource efficiency (water, nutrients, and energy), a mix of technologies and business models, and planning and accountability (Narayan and Lüthi, 2019). This highlights the need to consider a variety of sewerage and non-sewerage sanitation solutions that can coexist in the same city, depending on the local conditions. Current technological innovation provides flexible onsite sanitation and faecal sludge management solutions that are particularly appropriate for developing urban areas (Spuhler and Lüthi, 2020).

When considering different sanitation solutions, the aim is not only to find more appropriate, but also more accepted decisions. Expert-driven decisions that do not involve key stakeholders in the decision-making process are unlikely to enjoy broad-based support (Gregory et al., 2012). On the other hand, stakeholder involvement can lead to decisions that ignore important evidence available only to experts. Decision-making should, therefore, manage technical complexity, while allowing for transparency and the participation of local stakeholders at different levels. The aim of such a process should be to develop a joint vision supported by all stakeholders, which allows experts to provide sanitation systems that fit the objectives of all stakeholders, and that resolves trade-offs in the discussion and negotiations.

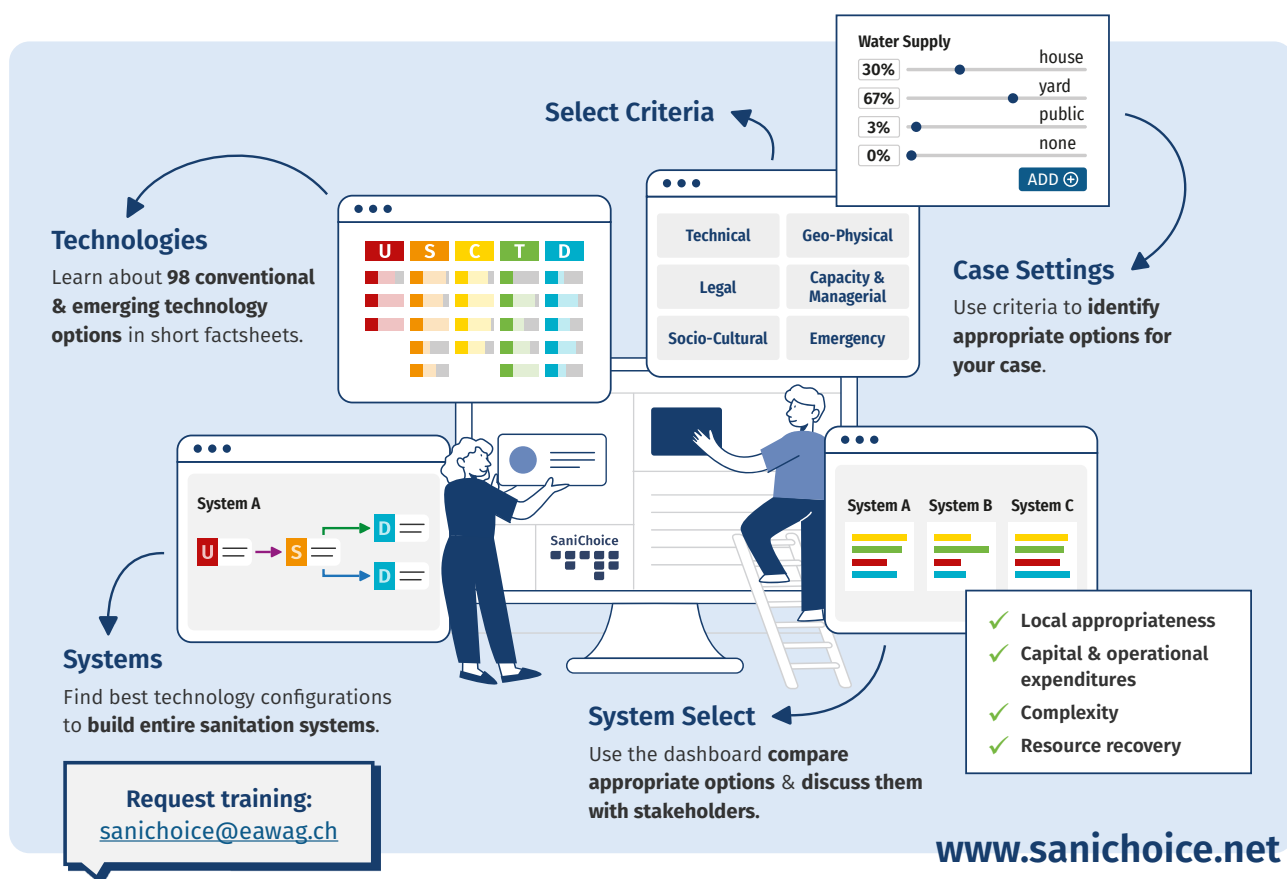


Figure 2: Overview on functionalities of sanichoice.net.

Structured Decision-Making (SDM)

Structured Decision-Making (SDM) is a way of collaboratively applying multi-objective decision-making (Gregory et al., 2012). Besides guiding how to make value-based and transparent choices based on the best available information, SDM builds capacity and makes communication of the follow-up actions to the public easier (Walther, 2016). It helps to understand complex problems and to generate and evaluate creative options in ways that help individuals and groups build a common understanding and to balance opposing preferences. SDM is defined by six basic stages generic to any decision-making process (Gregory et al., 2012) and can be applied to sanitation planning as a facilitated participatory framework:

Box 1 – Stages of Structured Decision-Making

- **Stage 1: Clarification of the Context**

This first step involves defining what sanitation problem is being addressed and why, identifying who needs to be involved and how, and establishing scope and boundaries when deciding on a certain sanitation system.

- **Stage 2: Definition of Objectives, Criteria and Stakeholder Preferences**

The objectives and criteria define “what matters”, drive the search for sanitation system options, and become the framework for comparing them, while considering the stakeholder preferences that are also identified in this step. This helps create a shared vision among all stakeholders, including the city and local communities.

- **Stage 3: Development of Decision Options**

In this step, a range of sanitation system options to address the objectives is developed. Options should include substantially different sanitation systems that prioritise different objectives to make trade-offs visible for later negotiations.

- **Stage 4: Evaluation of Decision Consequences**

Drawing from environmental science and engineering, the performance of each sanitation system option is estimated in terms of the evaluation criteria developed in Step 2.

- **Stage 5: Selection of Preferred Options**

Based on the results from the previous step, methods like Multi-Criteria Decision Analysis (MCDA) can be used to include stakeholder’s values and preferences to select the preferred sanitation system, while considering trade-offs and opposing interests.

- **Stage 6: Implementation and Monitoring**

This last step entails identifying mechanisms for monitoring and research to improve the information base for future decisions regarding sanitation system selection.

SDM in Sanitation Practice

Several frameworks have been published to promote the adoption of structured and participatory sanitation planning as described in (Schertenleib et al., 2021) and (Spuhler and Lüthi, 2020). Three examples that are important for this Guide are:

- *Community-Led Urban Environmental Sanitation Planning (CLUES)* is a multi-sector and multi-actor approach emphasising the participation of all stakeholders from an early stage of the planning process. It emphasises the importance of the enabling environment and provides specific steps and tools that help to put the methodology into practice (Lüthi et al., 2011a).
- *Sanitation 21* is a planning framework to help stakeholders develop appropriate and affordable sanitation solutions from a city-wide perspective. The framework promotes non-standardised planning procedures and emphasises the importance of stakeholder involvement and institutional partnerships in the incremental improvement of sanitation (Parkinson et al., 2014).
- *City Sanitation Planning (CSP)* is a citywide planning and decision-making framework, aiming to implement locally appropriate sanitation system solutions. Aspects, such as water supply, wastewater, solid waste, and drainage, are covered. Many different CSP concepts have been developed. In this publication, the definition of CSP by the Government of India is used (GoI, 2008).

To facilitate the adoption of SDM in sanitation planning, recent research has focused on developing tools to operationalise the different steps of the SDM process. The most recent and prominent examples include Excreta or Shit Flow Diagrams (EFD/SFD), Quantity and Quality (Q&Q) of Faecal Sludge (Strande et al., 2018), Sanitation Safety Planning (WHO, 2015), SaniPath (Robb et al., 2017), City Service Delivery Assessment (CSDA) and Political Economy Analysis (Scott et al., 2019). Most of them focus on *Stage 1: Clarification of the Context*. In this Guide, we provide support for *Stage 3: Development of Decision Options* and *Stage 4: Evaluation of Decision Consequences* to address several challenges:

- To consider a growing set of very diverse conventional and novel technologies and system configurations for which local experts often lack knowledge, data and the time to do a systematic consideration.
- A transparent evaluation framework is required that can consider the multiple dimensions of sustainable sanitation, including health and hygiene, protection of natural resources, technical and institutional appropriateness, and financial viability.
- Cities are often heterogenic in terms of physical, environmental, socio-cultural, and demographic conditions and operation and maintenance capacity; the appropriateness and sustainability of different sanitation solutions, therefore, requires considering the specific local conditions and coming up with a mix of technologies and systems.
- The evaluation framework needs to be flexible to accommodate different stakeholders' specific preferences and to showcase trade-offs and conflicts of interest.

- Moreover, strategic sanitation planning takes place in a context of high uncertainty arising from fast-changing socio-demographic and environmental conditions, as well as from technology innovations. Thus, any decision support tool must be able to deal with those uncertainties.

SaniChoice Explained

What Is SaniChoice?

SaniChoice is an open-source web-based interactive tool for informed sanitation technology and system choice for strategic planning. The tool aims to operationalise *Stage 3: Development of Decision Options* and **Stage 4: Evaluation of Decision Consequences** of the Structured Decision-Making (SDM) process and enable comprehensive, systematic, and flexible development of sanitation system options by combining international knowledge and data on technologies and system configurations with local conditions and preferences. Geophysical, technical, socio-cultural, legal, financial and capacity and management appropriateness criteria can be used to determine local appropriateness. Additionally, resource recovery and loss potentials can be quantified to compare different systems.

SaniChoice is primarily targeted to WASH practitioners, including (future) **engineering and planning consultants** or **community-based or non-governmental organisations** dealing with sanitation technology and system choices. However, it might also be used by **trainers and students, planners and decision makers** or any other **individual** interested in exploring the diversity of currently available sanitation technologies and systems and how they might perform in each context or regarding resource recovery efficiency. To accommodate for such a broad audience, SaniChoice integrates a multi-layer user interaction design and addresses different levels of initial skills and knowledge and different levels of planning process complexity.

The methods behind SaniChoice were developed in a project at Eawag and ETH using a design thinking approach with important partners and case studies in Nepal¹ and Ethiopia². SaniChoice has then been implemented by Eawag in 2021 with the financial support of the Eawag Directorate, the Swiss Innovation Agency (Innosuisse), the Swiss National Science Foundation (SNSF) and the Swiss Development and Cooperation Agency (SDC) and in collaboration with the Sustainable Sanitation Alliance (SuSanA).

¹ Environmental and Public Health Organisation (ENPHO) and 500B Solutions.

² Arba Minch University (AMU)

SaniChoice is the simplified, facilitated and public implementation of the *SANitation sysTem Alternative GeneratOr (Santiago)*. While SaniChoice is an easy-to-use webpage, *Santiago* can be used in expert applications, e.g. if technologies need to be added or modified, or if criteria and/or substances that differ from those used in SaniChoice need to be implemented. *Santiago* and a Wiki manual are available here: <https://github.com/santiago-sanitation-systems/Santiago.jl>.

The Sanitation technology database is an updated and more flexible version of the Compendium of Sanitation Systems and Technologies (Tilley et al., 2014) and also integrates technologies from other resources (Gensch et al., 2018; McConville, 2010).

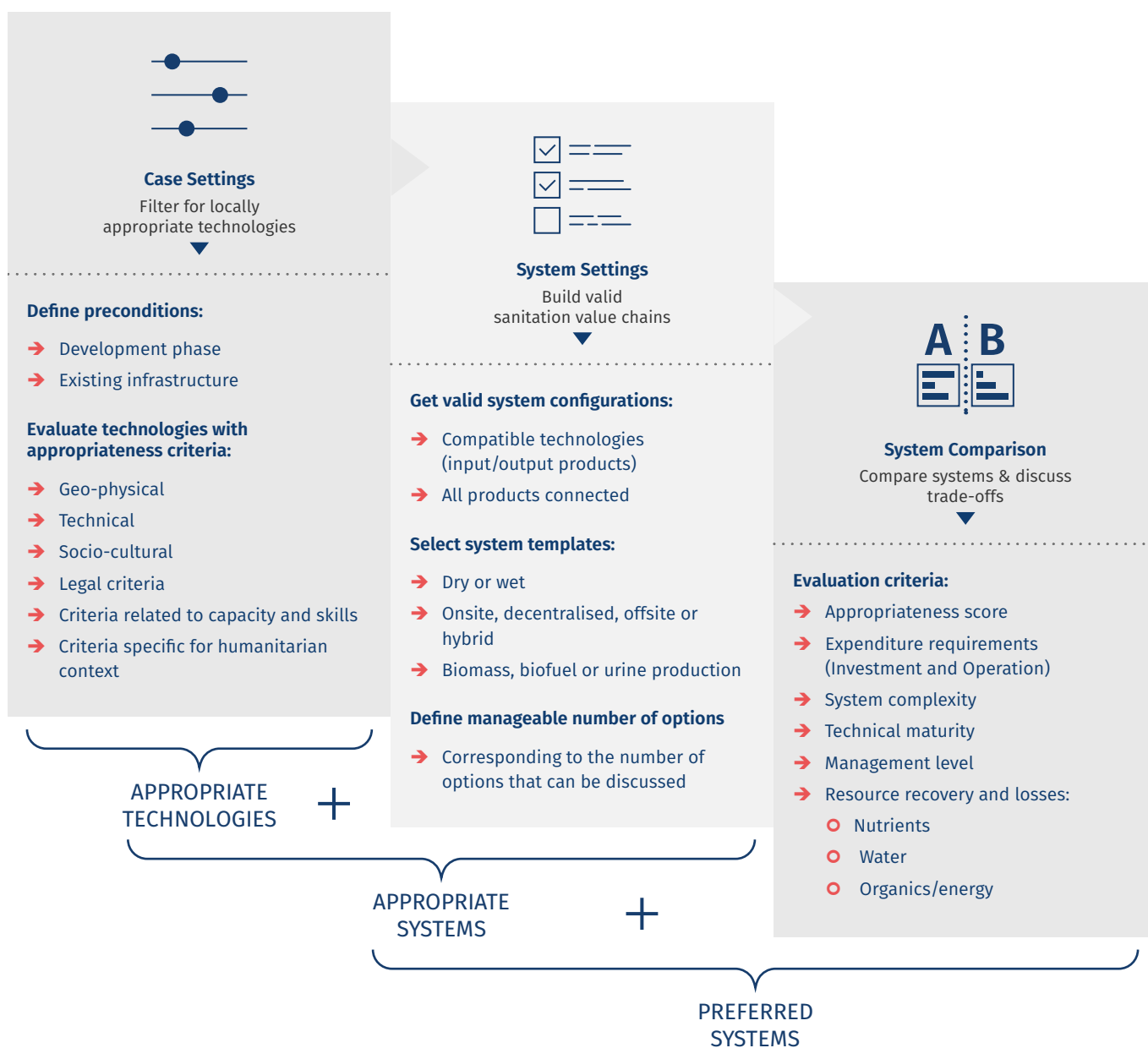


Figure 3: Detailed overview on the three main steps to use SaniChoice.

Why Should You Use SaniChoice

In line with [Community-Led Urban Environmental Sanitation Planning \(CLUES\)](#) brought forward by Lüthi et al. (2011a), SaniChoice should be put in practice using a people-centred multi-stakeholder approach. The *Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide* will help you to implement SaniChoice with such an approach, as well as to understand some of the underlying principles of SaniChoice.

Appropriateness depends on the context. For example, how well a technology works in each case depends on how its water requirements correspond to the local availability of water. But in cases where water is abundant, this might not be a relevant appropriateness criterion, while others, such as land or space requirements, are more relevant.

The SaniChoice Practitioners' Guide allows to make sure that the criteria used for SaniChoice are in line with the overall decision or planning objectives defined by the planning process. SaniChoice web-tool provides the data required to systematically consider the criteria and to transparently make evidence-based decisions.

Performance depends on technology interaction. For example, while a technology itself might have worked well in a given case, it has to be combined with other technologies in a system that also have to perform in order to provide safe sanitation. The same is true for resource recovery, if a resource is lost at the beginning of a sanitation system, recovering the rest of it at the end will not be very valuable. Therefore, selecting an appropriate technology is not enough for the appropriateness of the entire system with all the required technology elements must also be considered. Unfortunately, the number of possible sanitation system configurations can be very large. For instance, for five technology options for five functional groups along the sanitation chain, we would already end up with five to the power of five, thus several thousand possible configurations.

SaniChoice allows for generating all valid configurations and evaluating their performance at a system level and then selects only the most appropriate combinations to be evaluated in more detail.

Sustainability depends on priorities. For example, some stakeholders might give higher importance to resource recovery, others to costs. Therefore, it is important to illustrate these trade-offs to enable the negotiation of conflicts of interest.

SaniChoice provides a manageable number, but diverse set of sanitation systems, which then can be compared regarding relevant decision and/or planning criteria.

Further Application of SaniChoice

SaniChoice can also be used a training tool to enable individuals to:

- Learn about different sanitation technologies and system options.
- Understand what matters when looking for a suitable option for a given problem.
- Understand different evaluation criteria and what trade-offs might occur.

A training package is available online.

SaniChoice can also contribute to awareness raising. It:

- Allows for a more differentiated understanding of what types of technologies and system configurations might really fit different application cases and their advantages and disadvantages.
- Provides quantitative evidence about the locally appropriate and potential resource recovery of nutrients, organic material, and water from sanitation.
- Raises awareness about how much the system performance depends on the local context and the technology interaction within a system configuration.

What Advantages Does SaniChoice Bring?

The SaniChoice web tool brings several advantages:

- SaniChoice allows for consideration of a **large and diverse** set of both conventional and novel technology and system options, thereby enlarging the option space, and for finding more appropriate and sustainable solutions.
- SaniChoice makes an enormous amount of data and expert knowledge available to the local context for more **evidence-based decisions**.
- SaniChoice allows for finding the most appropriate **system configuration, and** ensures that all sanitation products are transformed, transferred, treated, safely disposed or reused.

- Technology and systems are selected based on a **systematic** and data-driven method, enhancing reproducibility and transparency.
- SaniChoice can easily be expanded with future technologies or new data.
- SaniChoice can also work with different levels of data availability at a very early planning stage, while transparently communicating **uncertainties** related to the results.
- SaniChoice helps to streamline the planning process by helping in prioritising appropriate and sustainable solutions at an early planning stage.

If SaniChoice is embedded in a facilitated planning process, it allows for combining these advantages with participatory aspects of SDM. Stakeholder involvement brings several additional advantages:

- The definition of decision objectives at a city level can (if adequately moderated and attended) lead to the creation of a **joint vision** for sanitation planning shared by all stakeholders.
- Stakeholders can provide their priorities for evaluation, leading to **more accepted decisions**.
- **Trade-offs** are made visible, thereby enabling negotiations.
- Citywide objectives can be separately evaluated for different neighbourhood (zones) to find contextualised solutions, thereby **contributing to CWIS**.

What Cannot Be Done with SaniChoice

SaniChoice provides the most appropriate system options based on the information given by the user. However, the systems always require a plausibility and reality check and might need to be fine-tuned. Also, the current version of SaniChoice does not allow for building systems manually, which could help limit that less appropriate options are selected.

SaniChoice allows for pre-selecting appropriate “hardware” for sanitation systems, such as toilets, transport and treatment technologies, or reuse practices. SaniChoice does not provide a detailed feasibility evaluation and implementation plan or the consideration of non-technical aspects, such as service delivery and financing and monitoring models. This detailed evaluation and implementation plan would need to be developed after the application of SaniChoice.

SaniChoice results are only as good as the provided input data obtained through the planning process. It does not replace the participatory process and facilitation skills required to obtain these inputs and for presenting and discussing the results with stakeholders. However, this SaniChoice Practitioners’ Guide helps to integrate SaniChoice in the planning process and to share results with stakeholders.

	<p data-bbox="523 416 592 483">2.</p> <h2 data-bbox="703 421 1310 577">Step-by-Step Practitioners' Guide</h2> <p data-bbox="678 1167 1437 1447">This section provides a detailed explanation of the five steps to embed SaniChoice into a SDM process.</p>

Goal of this Guide

The goal of the SaniChoice Practitioners' Guide is to support **engineering and planning consultants (referred to as experts)** in finding a set of sanitation technologies and systems that best matches the local context; these options can then be used as inputs for workshops. It helps to make sanitation technology and system choice more transparent and evidence-based because it enables more appropriate and accepted decisions. This Guide serves as a support for users of the SaniChoice training tool to integrate the application in any strategic planning process.



Figure 4: Focus group discussions when piloting SaniChoice in Changuaryan Municipality, Nepal, in June 2022. Picture: Basile Weber.

Five Steps to Apply SaniChoice

The five steps and the integration of SaniChoice and the planning process are shown in Figure 5.

Box 2 – Summary of the Five Steps

The five steps can be described as followed:

- **Step 1 – Identifying Decision Objectives**

What Matters to the Stakeholders? In this first step, you understand what matters to relevant stakeholders and define decision objectives which provides the basis to make transparent decisions in later steps.

- **Step 2 – Identifying SaniChoice Criteria**

How Can the Decision Objectives Be Evaluated? In this step, you cooperate with experts to first validate the decision objectives from Step 1 and identify based on the decision objectives, criteria for technology assessment and system evaluation. Non-negotiable criteria that are contextually relevant are translated into technology appropriateness criteria to pre-select appropriate technologies and later systems. Evaluation criteria are used to compare systems and enable stakeholders to discuss trade-offs later in Step 5. Moreover, the preconditions (development phase, existing infrastructure) are set and you decide if you should consider distinct zones within the case. If the demarcation of zones is required, you also define demarcation criteria.

- **Step 3 – Identifying Appropriate Technologies**

What are the Technology Appropriateness Scores? In this step, you demarcate the zone. You then create an application case profile for each zone by quantifying the appropriateness criteria from Step 2 for the respective zone (e.g. availability of water supply) using the SaniChoice webtool.

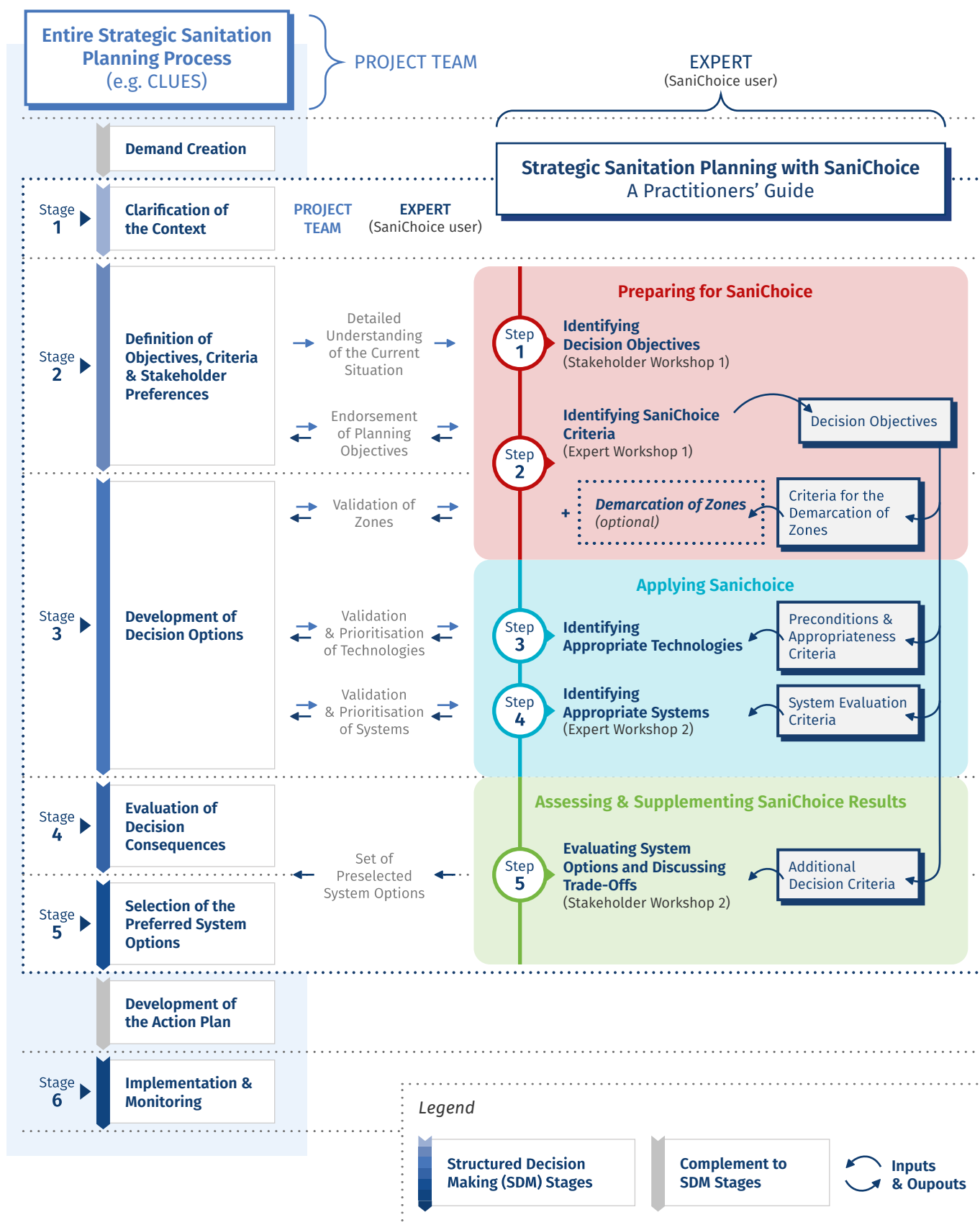
- **Step 4 – Identifying Appropriate Systems**

Which Sanitation Systems Should Be Considered? In this step, you use the SaniChoice webtool to find the most appropriate sanitation system configurations from the templates you are interested in. You have also to define the number of systems you want to consider. This depends on your own capacity and the one's of the stakeholders to handle different options.

- **Step 5 – Evaluating System Options and Discussing Trade-Offs**

Which Systems Should Be Implemented? In this last step, you evaluate the sanitation system options identified in Step 4 based on a set of further evaluation criteria identified in Step 2 and prepare for a discussion and participatory refinement of options with stakeholders.

Figure 5: Overview of how the Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide (middle) fits into structured decision-making (left) and how it interacts with functionalities provided by SaniChoice (right).

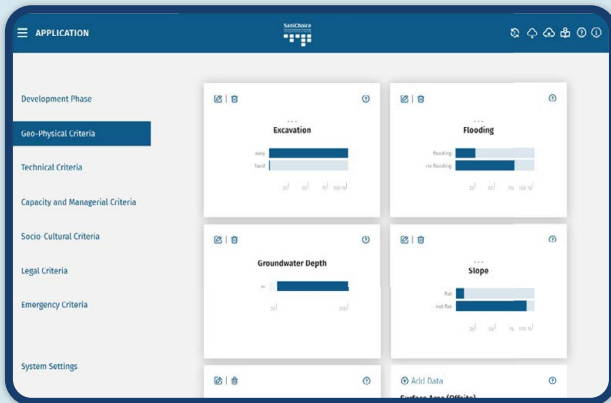


Working with SaniChoice

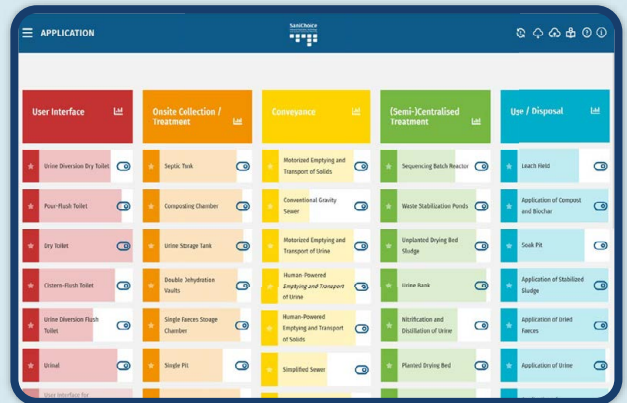


Applying SaniChoice: Step 3

Define Case Settings

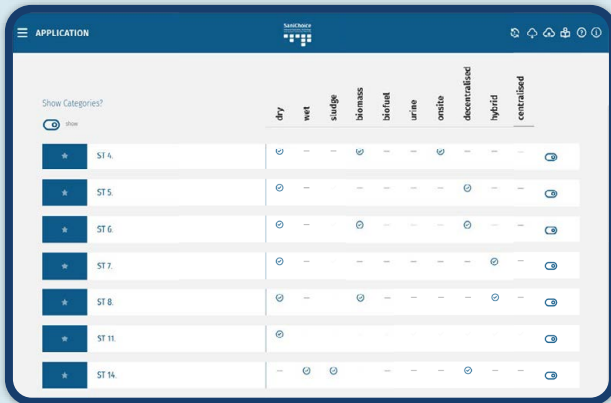


View/Select Appropriate Technologies

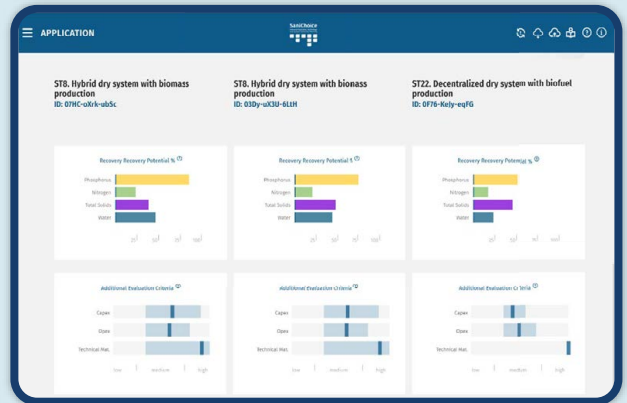


Applying SaniChoice: Step 4

View/Select Templates



View/Compare Systems



What Is Required to Apply the Five Steps

SaniChoice helps to streamline the process of sanitation technology and system selection. It, therefore, reduces the time experts might require to do analysis and make choices and allows them to focus on the planning process. This facilitation needs to include three workshops to obtain the required inputs for the SaniChoice web tool and one workshop to share the results. We estimate a minimum of **five weeks** of time and manpower are necessary to apply this Guide. If time and resources are limited, the inputs required for the application of SaniChoice (Steps 1 and 2 in Figure 5) might be obtained based on a single workshop and desk study. Enough time, however, needs to be allocated for Step 5, where the results of SaniChoice are presented to different stakeholders, and where they get the information needed to evaluate trade-offs and to negotiate the preferred option.

Integration with Existing Planning Frameworks

Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide is not a Guide for the entire sanitation planning process. It is most efficiently used in connection with four of Eawag's most widely disseminated publications in strategic sanitation planning:

- [The Guidelines for Community-Led Urban Environmental Sanitation Planning \(CLUES\)](#) (Lüthi et al., 2011a).
- [The Compendium of Sanitation Systems and Technologies](#) (Tilley et al., 2014).
- [Sanitation 21](#) (Parkinson et al., 2014).
- [Faecal Sludge Management: Systems Approach for Implementation and Operation](#) (Strande et al., 2014).

A visualisation of how SaniChoice can be used in different strategic sanitation planning frameworks is provided in Figure 7.

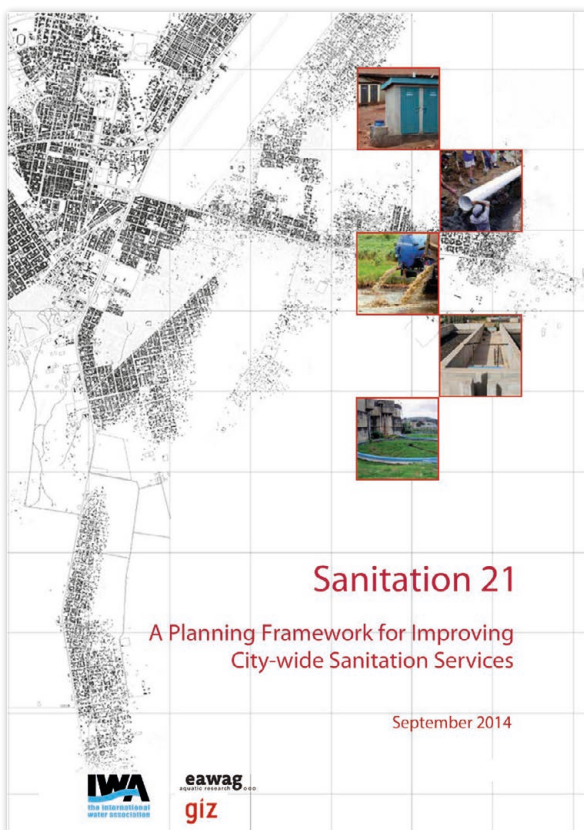
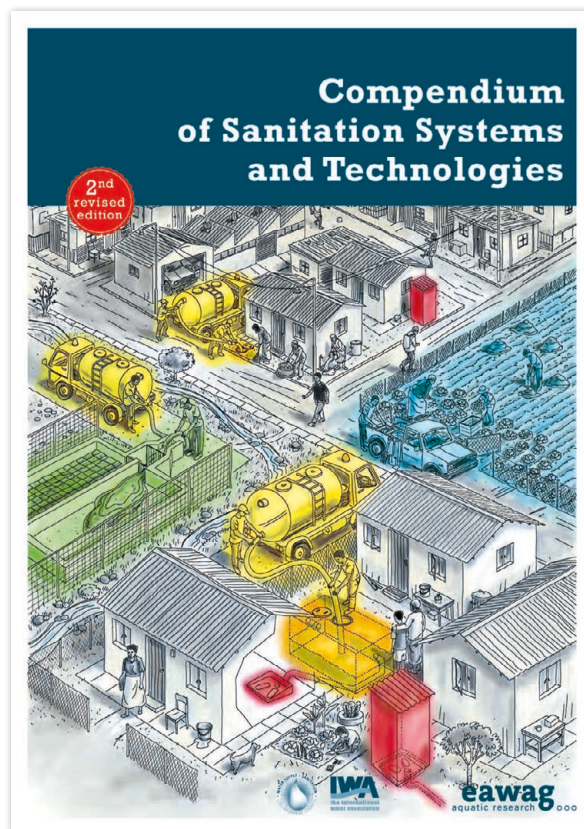
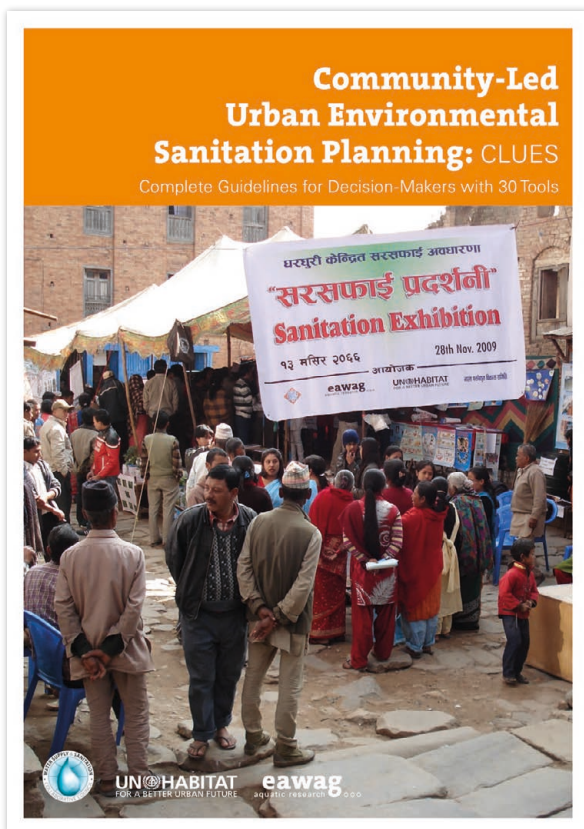
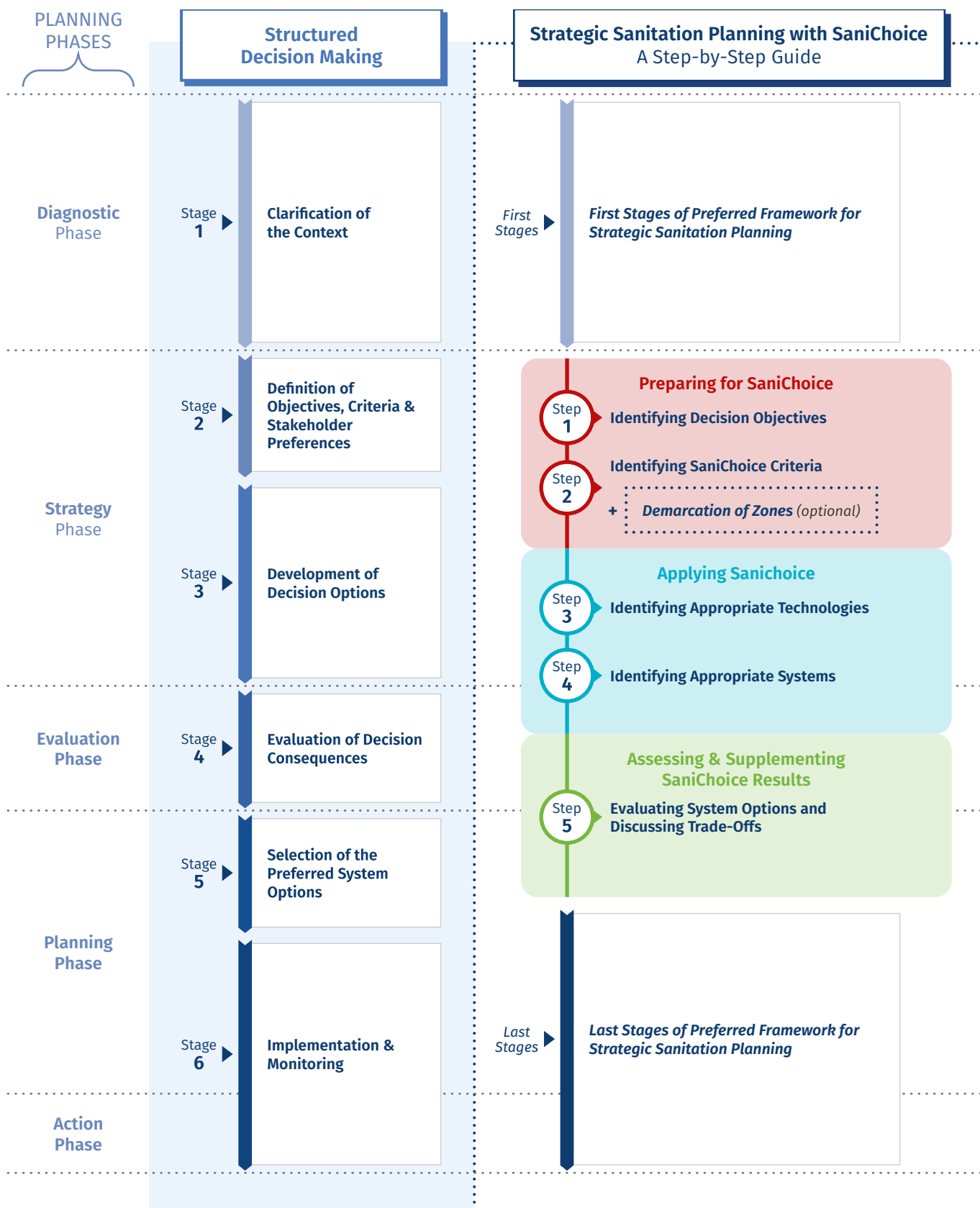


Figure 6: Four of Eawag's most widely disseminated publications in strategic sanitation planning.

Figure 7: Visualisation of how SaniChoice fits into existing SDM frameworks for strategic sanitation planning. The planning phases in this figure are taken from Schertenleib et al. (2021) and the structured decision-making stages are taken from (Gregory et al., 2012).



FRAMEWORKS FOR STRATEGIC SANITATION PLANNING

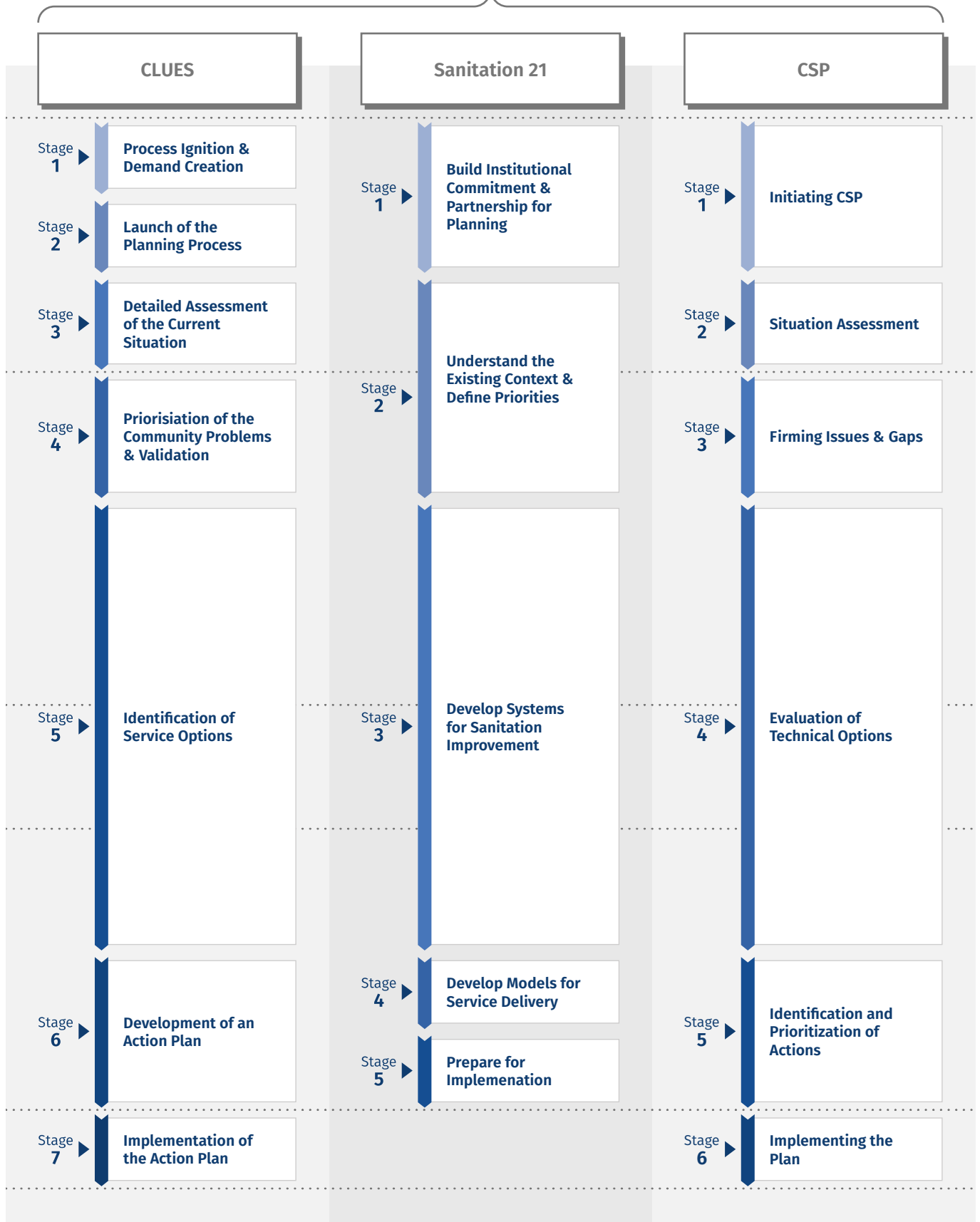




Figure 8: Changunarayan Municipality is very typical for an urbanising areas with a high heterogeneity including densely constructed pockets, scattered urbanisation, and agriculture and a clear lack of urban planning. Picture: Basile Weber.

Whom to Involve

A strategic sanitation planning process involves a wide array of actors. The people who should directly participate (see also Table 1) are:

- **Project managers and task team leaders (planners)** overseeing the planning process, working for a utility, non-governmental organisation, a funding agency or a community-based organisation.
- **Community-based experts** who understand the local context. They will provide the data required for determining the appropriateness of sanitation systems with SaniChoice (e.g. on the availability of several resources, such as water, energy and labour).
- **Stakeholders** who have to jointly define the decision objectives and agree on the most relevant appropriateness and evaluation criteria. This includes policy makers and decision makers (public health officers or municipal authorities), representatives from utilities and the private sector, the designated users of the proposed sanitation system, potential users of possible sanitation products, as well actors from community-based organisations. A complete list can be found in CLUES (Lüthi et al., 2011a). Ideally, the experts and relevant stakeholders should not be the same. However, sometimes it will be unavoidable to involve the same people in both roles.

A useful introduction to stakeholder analysis and engagement is provided in *Chapter 15 and 16* of the book *Faecal Sludge Management: Systems Approach for Implementation and Operation* (Strande et al., 2014).

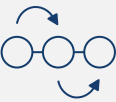
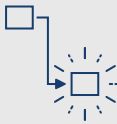
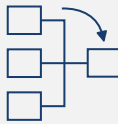
Table 1: Overview of the involvement of different actors in Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide. A yellow field indicates that the participation of this actor at this step is important in this step.

ACTORS	Preparing for SaniChoice		Applying SaniChoice		Assessing & Supplementing SaniChoice Results
	Step 1 Decision Objectives	Step 2 Identifying SaniChoice Criteria	Step 3 Appropriate Technologies	Step 4 Appropriate Systems	Step 5 Detailed Evaluation
Planning Expert (Engineer, Planner)	✓	✓	✓	✓	✓
Community-Based Expert	✓	✓	—	✓	✓
Stakeholders	✓	—	—	—	✓

Summary of SaniChoice Practitioners' Guide

The application of SaniChoice requires 5 steps. Table 2 summaries the goals, inputs, activities, resources and outputs for all these steps.

Table 2: Summary of the different steps of Strategic Sanitation Planning with SaniChoice.

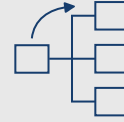
 Steps	 Goals	 Inputs
<p>Preparing for SaniChoice</p> <p>Step 1 Identifying Decision Objectives</p>	<ul style="list-style-type: none"> → Understand what matters to relevant stakeholders → Define decision objectives 	<ul style="list-style-type: none"> → Study area → Stakeholder analysis → Task force → Assessment of the current situation
<p>Step 2 Identifying SaniChoice Criteria</p>	<ul style="list-style-type: none"> → Validate and complete decision objectives → Decide on a potential demarcation of zones → Identify SaniChoice criteria 	<ul style="list-style-type: none"> → Locally relevant decision objectives → Draft set of appropriateness and evaluation criteria
<p>Applying Sanichoice</p> <p>Step 3 Identifying Appropriate Technologies</p>	<ul style="list-style-type: none"> → Optional: Demarcate zones → Identify appropriate sanitation technologies 	<ul style="list-style-type: none"> → Preconditions, demarcation, and appropriateness criteria → Data on application case regarding the criteria
<p>Step 4 Identifying Appropriate Systems</p>	<ul style="list-style-type: none"> → Conduct a plausibility check of the systems → Identify appropriate sanitation systems 	<ul style="list-style-type: none"> → Technology Appropriateness Scores (TAS)
<p>Assessing & Supplementing SaniChoice Results</p> <p>Step 5 Evaluating System Options & Discussing Trade-Offs</p>	<ul style="list-style-type: none"> → Evaluate the performance of pre-selected sanitation systems → Compile a decision matrix → Discuss results with stakeholders and identify a preferred option 	<ul style="list-style-type: none"> → Pre-selected sanitation system options with SAS → System evaluation criteria



Activities



Supporting Resources



Outputs



- **A1.1** Stakeholder **Workshop 1**: Consultation on decision objectives
- **A1.2** Defining decision objectives

- **R1.1** Agenda for Stakeholder **Workshop 1**
- **R1.2** Decision objective hierarchy

- **O1.1** Locally relevant decision objectives
- **O1.2** Draft set of appropriateness and evaluation criteria

- **A2.1** Expert **Workshop 1**: Validation of objectives and definition of criteria
- **A2.2** Consolidation of criteria and decision on demarcation of zones

- **R2.1** Agenda for Expert **Workshop 1**
- **R2.2** Master list of criteria

- **O2.1** Decision objective hierarchy
- **O2.2** Set of SaniChoice criteria

- **A3.1** Demarcation of the zones (optional)
- **A3.2** Identify appropriate technologies (per zones)

- **R3** Technology appropriateness assessment (SaniChoice)

- **O3.1** Demarcation of the zones (optional)
- **O3.2** Appropriate technologies (per zones)

- **A4.1** Pre-selecting sanitation systems
- **A4.2** Expert **Workshop 2**: Consolidate selection and plausibility check

- **R4.1** Agenda for Expert **Workshop 2**
- **R4.2** System option generation service provided by SaniChoice

- **O4.1** Pre-selected sanitation systems
- **O4.2** System evaluation criteria provided by SaniChoice

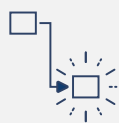
- **A5.1** Detailed evaluation of pre-selected systems
- **A5.2** Stakeholder **Workshop 2**: System evaluation

- **R5.1** Evaluation and comparison of systems (SaniChoice)
- **R5.2** Agenda for Stakeholder **Workshop 2**
- **R5.3** Links to other evaluation tools than SaniChoice

- **O5.1** Detailed comparison of system options
- **O5.2** Report for project team
- **O5.3** Simplified presentation for stakeholders
- **(O5.4)** Preferred option for different zones)

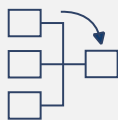
Step 1: Identifying Decision Objectives

What Matters to the Stakeholders?



Goals

- Understand what matters to relevant stakeholders
- Define decision objectives



Inputs

- Study area (system boundaries)
- Stakeholder analysis
- Task force to coordinate with (project team)
- Assessment of the current situation (baseline survey)



Activities

- A1.1 Stakeholder Workshop 1: Consultation on decision objectives
- A1.2 Defining decision objectives



Available resources

- R1.1 Agenda for Stakeholder Workshop 1
- R1.2 Decision objective hierarchy for sustainable sanitation to validate the workshop outcomes and as a source of inspiration for facilitators.



Outputs

- O1.1 Locally relevant decision objectives: a joint vision of what to achieve and where the main deficits exist as a draft list of objectives for sustainable sanitation.
- O1.2 Draft set of appropriateness and evaluation criteria

A1.1 Stakeholder Workshop 1: Consultation on Decision Objectives

Stakeholder consultations are important to trigger political will and public support. It can also help clarify the responsibilities and resources to support structured sanitation planning (Evans and Saywell, 2005; Kennedy-Walker et al., 2016; Tayler and Parkinson, 2005).

The first step of *Strategic Sanitation Planning with SaniChoice – A Step-by-Step Guide* aims to build up knowledge and understanding, and thereby creates local momentum and fosters ownership by all relevant actors. This is achieved through a stakeholder consultation workshop. For larger cities or city-wide projects, several workshops are required: one at the city level and one in each sub-district or zone. This makes sure that at the end of the

decision-making process, appropriate sanitation system options are presented for each sub-district, according to the local conditions, but in line with the city-wide objectives.

A possible workshop agenda, including different group work exercises to be conducted during the stakeholder consultation workshop, can be found in Supporting Resources R1.1 – Agenda for the Stakeholder Workshop 1: Brainstorming What Matters. Before the workshop, it is important to prepare a structured presentation of the current situation: problems, issues, gaps and priorities that can be used at the beginning of the workshop to orientate participants.



Best practice

Dealing with Different Priorities

Different stakeholders have different priorities and, therefore, weigh decision objectives differently. How controversial a decision objective is can give you a hint about its importance. You should keep in mind that the decision objectives derived in the stakeholder consultation workshop only provide a snapshot of the participants' opinions, not those of all the stakeholders. Some effort might be needed to ensure that a representative group participates (e.g. by encouraging members of low-income households or women to participate) (Lüthi et al., 2011a).



Obstacles & Challenges

Other Priorities than Sanitation

Experience has shown that stakeholders will also prioritise other problems, such as bad roads, poor access to municipal health services or urban crime. Even when the focus of the project is clearly on sanitation, such issues should not be strictly excluded from the discussion. In some cases, there might be overlaps between sanitation and other problems that can be used as opportunities. For example, road improvements could be tackled together with the construction of sanitation infrastructure. If better environmental sanitation services are not a priority in light of other problems, the motivation to participate in the project will not be high among certain stakeholders, which represents a threat to the project (Lüthi et al., 2011a). Such threats should be identified and it must be emphasized that these issues are not addressed in Strategic Sanitation Planning with SaniChoice – A Step-by-Step Guide.

A1.2 Defining Decision Objectives

After the workshop, it will be necessary to clean up the results and come up with a concise and well-structured final presentation of decision objectives. This is desk-based work with the experts in the driving seats. They apply SaniChoice and/or determine the planning process.

Try to cluster the workshop's outcomes and group the similar characteristics by identifying specific categories, such as: (1) Protection of health and hygiene, (2) Appropriate technology, (3) Financial and economic viability, (4) Institutional and socio-cultural acceptance, and (5) Protection of the environment and natural resources.

The cleaned-up decision objective hierarchy, including a draft set of locally relevant demarcation, appropriateness and evaluation criteria, can then be shared, completed and validated with some key stakeholders in an expert workshop in Step 2. In parallel, the draft set of appropriateness criteria should be integrated in the data collection campaign (e.g., household survey) to ensure the availability of data for their quantification in Step 3.



Best practice

Decision objectives for sustainable sanitation

Decision objectives are defined as desirable outcomes of an intervention in the sanitation sector. Clear (an agreed upon) decision objectives provide the basis for informed decision-making among different alternatives. For sustainable sanitation, decision objectives generally include health, technical, economic, institutional, social and environmental aspects based on the SuSanA sustainability criteria.

Decision objective hierarchies

Decision objective hierarchies are hierarchical structures that organise decision objectives into higher-level decision objectives, and lower-level decision objectives. This format helps the communication better with different stakeholders and to validate the completeness and lack of redundancies in the system of decision objectives. It can also be used to inform the way of aggregating different performance indicators.



Recognizing suitable decision objectives

Decision objectives are not targets. Targets are specific and quantify levels of performance to be made towards an objective for benchmarking. For instance, a target would be that the bacterial emissions from a certain technology into the environment must not exceed a certain level. Objectives state what matters to the stakeholders and provide direction and a framework for comparing different strategies (Gregory et al., 2012). For example, the performance of the decision objective 'Protection of human health' could be quantified by showing the % of the population that would gain access to safe toilets.

How to deal with conflicting interests

Tensions and disagreements between different stakeholders may become apparent during the stakeholder consultation workshop. Instead of concealing these differences, detailed assessment should pay particular attention to making these transparent and to present all sides of conflicts and disagreements in an objective way. This will be valuable when evaluating trade-offs and finding common ground in later steps of the process. Examples of tensions are differences between women's and men's priorities or different expectations about service levels between higher and lower income households (Lüthi et al., 2011a).



Example case: Thirty Springs

Foreword

The different steps of this Guide are illustrated with a didactic case-study-example: the fictional town of Thirty Springs. The example is based on a case study in Ethiopia that took place between 2015 and 2019 in collaboration with the Arba Minch University and Town Municipality.

Thirty Springs is very typical of a continuously and rather uncontrolled growing town characterised by a weak institutional setting, and a lack of human and financial resources. Basic sanitation elements, such as toilet infrastructure, are present, but full sanitation systems are mostly absent. SaniChoice was used for a part of the town with about 1000 inhabitants. The planning process is inspired by CLUES.

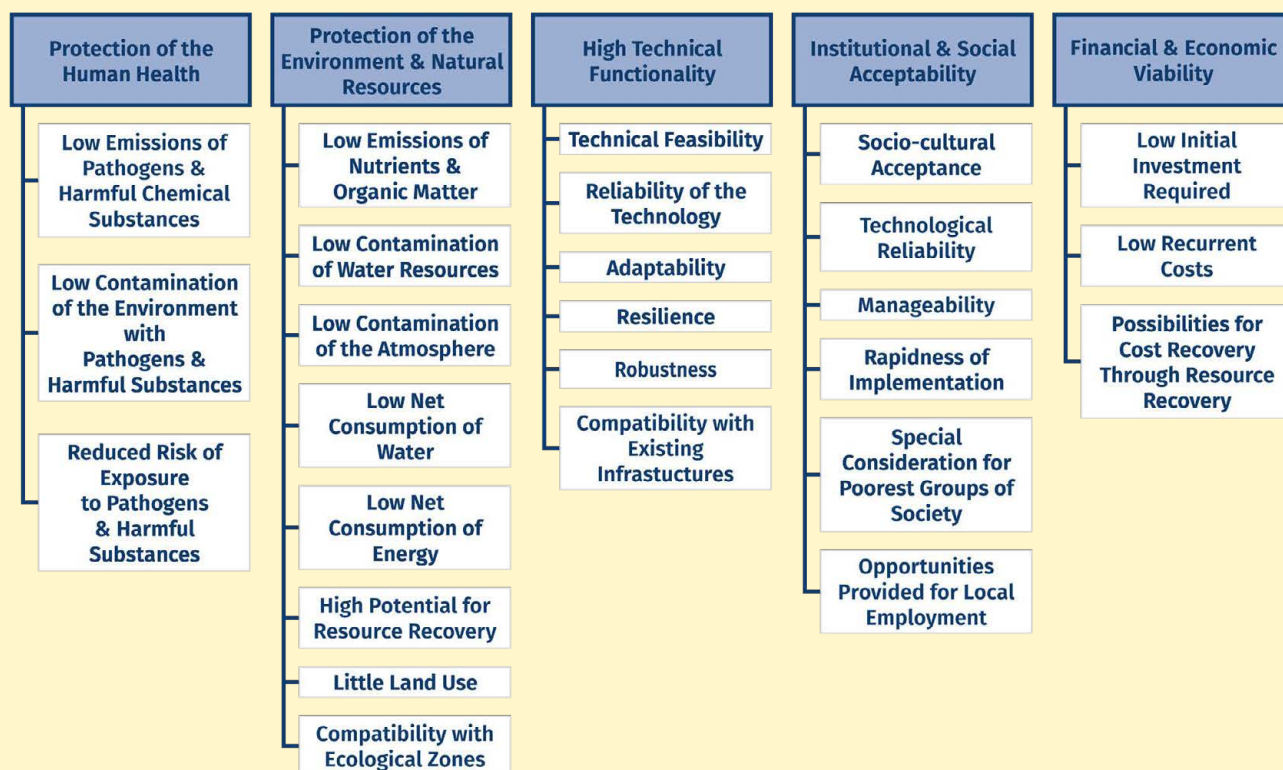
Step 1 of SaniChoice Practitioners' Guide

Sanitation and health experts from the local university, the municipality, and the community came together to discuss the main problems and priorities for sanitation in Thirty Springs in a stakeholder consultation workshop. The priorities can be summarised as:

- Enhance sanitation coverage to protect the environment and human health
- Enhance involvement of communities and the private sector in sanitation service provision
- Enhance operation and maintenance by matching technological choices with resource availability

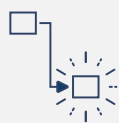
In several brainstorming sessions, decision objectives that put these priorities in concrete terms were identified. The resulting list of decision objectives was then structured in line with the hierarchy of objectives for sustainable sanitation provided in Supporting Resources R1.2 – Decision Objective Hierarchy.

The following table shows the objective hierarchy from the workshop after it was restructured and validated by a sub-set of key stakeholders a few weeks after the workshop:



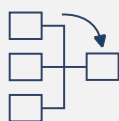
Step 2: Identifying SaniChoice Criteria

How Can the Decision Objectives Be Evaluated?



Goals

- Validate and complete decision objectives
- Identify SaniChoice criteria: preconditions, demarcation criteria, and 10-15 appropriateness criteria and other criteria (negotiable ones) to be used as evaluation criteria, but only some of them are quantified by SaniChoice
- Decide on a potential demarcation of zones



Inputs

- Locally relevant decision objectives
- Draft set of appropriateness and evaluation criteria



Activities

- A2.1 Expert workshop 1: validation of decision objectives and making some of them preconditions; demarcation or appropriateness criteria can be used to select sanitation technologies and systems.
- A2.2 Consolidation of criteria and decisions on the demarcation of zones.



Available resources

- R2.1 Agenda for Expert Workshop 1
- R2.2 Master List of appropriateness criteria as a source of inspiration for the facilitator and for validation purposes.



Outputs

- O2.1 Decision objective hierarchy
- O2.2 Set of SaniChoice criteria (preconditions, demarcation criteria, and appropriateness and evaluation criteria); either one list for the entire city or different lists for different zones.

A2.1 Expert Workshop 1: Validation of Objectives and Definition of Criteria

After consulting with the stakeholders on what matters to them in terms of sanitation, it is now time to call up the experts and prepare for using SaniChoice.

First, the decision objectives collected from the stakeholders have to be presented. SaniChoice aligns the sanitation technology and system selection with the main decision objectives that have been defined in the local decision process. Experts have to come up with a validated hierarchy of decision objectives. Then, the decision objectives identified in Step 1 are separated into two types of objectives:

- Non-negotiable decision objectives (exogenously given or agreed upon by all stakeholders as fixed and independent from preferences)
- Negotiable decision objectives that involve stakeholder preferences and require trade-offs to be discussed

Next, the experts are instructed to define the criteria for the objectives. The non-negotiable criteria are translated into preconditions, demarcation criteria and appropriateness criteria. The negotiable objectives are translated into system evaluation criteria.

A possible workshop agenda, including different group work exercises to be conducted during the expert consultation workshop, can be found in Supporting Resources R2.1 – Agenda for the Expert Workshop 1: Validation of Objectives and Definition of Criteria.

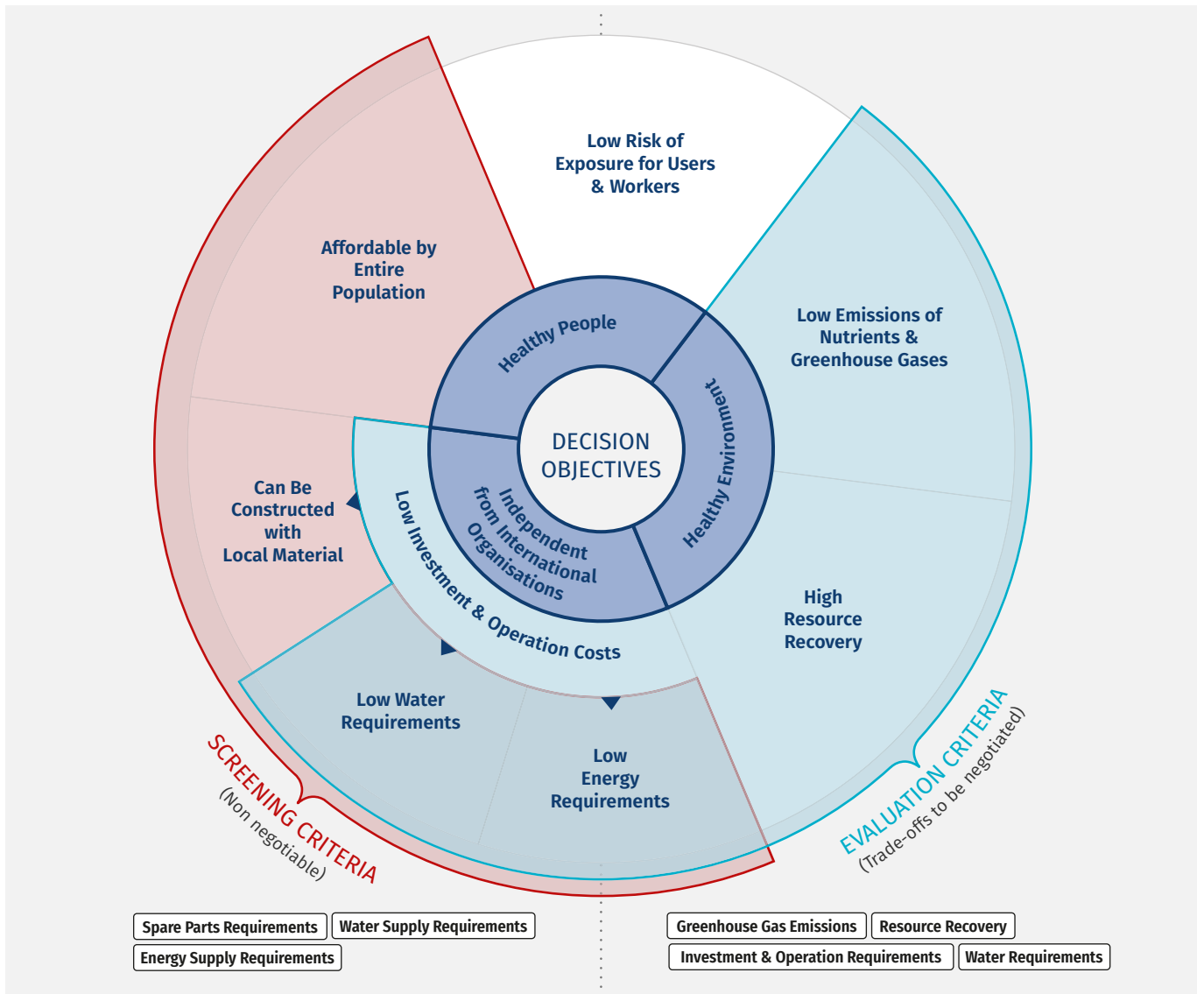


Figure 9: Schematic to illustrate the decision framework. It illustrates how non-negotiable objectives can be translated into appropriateness criteria to filter for appropriate options and how negotiable criteria must be looked at in more depth and discussed with stakeholders for a smaller set of previously identified appropriate options.



Best practice

What are good criteria?

Appropriateness criteria report, either qualitatively or quantitatively, how well a technological option performs. Criteria that can be used for pre-selection are:

- Neutral:
 - Non-negotiable: Independent from stakeholder preferences
 - Objective: Given by externally defined circumstances
- Measurable: Data is available at the structuring phase
- Generic: Applicable to a broad range of technologies

With SaniChoice, you will use preconditions, demarcation criteria and appropriateness criteria to pre-select sanitation technologies and systems that are appropriate. Negotiable criteria will be used as system evaluation criteria.



Obstacles & Challenges

Non-negotiable and negotiable criteria

What is non-negotiable depends on the local context. While, e.g. vehicular access can be perceived as exogenously given, it might also change or could be changed over time. The same is true, e.g. for legal requirements, which might be adapted over time. Therefore, this step should be carried out in a facilitated participatory format.

The importance of costs

Note that even though costs are very important to assess the appropriateness of the technology, they are not used as an appropriateness criterion as it is difficult to quantify costs without looking at the sanitation system options in detail and in combination with possible service delivery and financial models.

A2.2 Consolidation of Criteria and Decision on Demarcation of Zones

After the expert workshop, you will need to reconsolidate the results and share them with experts to make sure the workshop results were interpreted correctly and that there is no strong reason to not move forward with the cleaned-up set of appropriateness criteria.

In the same workshop, the experts should decide whether different zones have to be treated separately because they might show very different characteristics regarding the appropriateness criteria (e.g. vehicular access).



Best practice

Relevant appropriateness criteria

There is no obvious set of appropriateness criteria that is applicable for all contexts. For example, the vulnerability of technology to flooding is only relevant in areas where flooding is a problem. However, based on previous SaniChoice applications, the following appropriateness criteria seem to be the most relevant:

- Water and Electricity Requirements
- Operation and Maintenance (frequency and skills)
- Vehicular Access
- Flooding
- Soil Type
- Space Requirements
- Design Skills
- Socio-cultural Requirements

What is important in all applications is that the list of appropriateness criteria contains approximately 10 to 15 criteria in order to obtain robust results.

Why less is more when selecting appropriateness criteria for SaniChoice

In Step 3, you will derive the Technology Appropriateness Score (TAS) to compare how different technologies perform in a previously defined context. The TAS is calculated using a geometric mean; therefore, involving too many criteria will result in all technologies having similar TAS. This hampers the comprehensibility of the results generated by SaniChoice and the identification of appropriate technologies.

An analogy from painting might help to understand this: when you mix two different colours, you will be able to differentiate it from other mixtures of two colours. Even with a few more colours in your mixture, your colour is still unique. However, if you continue to add more colours, at some point every combination will appear brownish.

The same applies to the TAS. In order to keep the score from being “brownish”, you should use only a few appropriateness criteria backed by robust evidence and omit uncertain data, even though using as many appropriateness criteria as possible might appear to be more scientifically robust.



Obstacles & Challenges

The necessity of stakeholder and expert consultation workshops

The generic decision objective hierarchy and the master list of appropriateness criteria provided in the Supporting Resources R1.2 and R2.20 bear the risk of becoming a vehicle for imposing foreign values and, thus, negatively impacting ownership. Translating problems into decision objectives and corresponding appropriateness criteria for use in SaniChoice should, therefore, always be done in carefully facilitated workshops.



Example Case: Thirty Springs

Step 2 of SaniChoice Practitioners' Guide

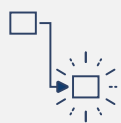
A workshop with 34 experts allowed for the identification of locally relevant non-negotiable appropriateness criteria that can be used in SaniChoice. There was very little disagreement between the locally brainstormed list and the provided master list available in Supporting Resources R2.2 – Master List of Appropriateness Criteria. However, some of the criteria were removed because they were either not relevant in the local context or did not fulfil all the requirements (mainly because no data was available). The 15 criteria were arranged according to five different categories. Thirty Springs was then separated into three sectors to compare the potential technologies to the specific conditions of each sector.

The following table shows the 15 appropriateness criteria agreed on in the case of Thirty Springs:

Category	Technical	Geo-physical	Legal	Socio-Cultural	Capacity and managerial
Appropriateness Criteria	<ul style="list-style-type: none">• Water supply• Electricity supply• Frequency of O&M	<ul style="list-style-type: none">• Temperature• Flooding• Vehicular access• Slope• Soil type• Groundwater depth	<ul style="list-style-type: none">• Drinking water exposure	<ul style="list-style-type: none">• Cleansing method	<ul style="list-style-type: none">• Construction skills• Design skills• O&M skills

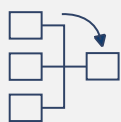
Step 3: Identifying Appropriate Technologies per Zone

Which Technologies Should Be Considered?



Goals

- Demarcate the zones and define their typology (optional)
- Identify appropriate sanitation technologies for the given application case.



Inputs

- Demarcation criteria.
- Preconditions to limit the set of potential technologies in SaniChoice.
- A consolidated list of 10 to 15 appropriateness criteria to assess technology appropriateness in SaniChoice.
- Data for quantifying appropriateness criteria for the application case (either one case for an entire city or several cases for each zone).



Activities

- A3.1 Demarcation of the zones and definition of the typology of the settlement (optional).
- A3.2 Identification of appropriate technologies (per zone)



Available resources

- R3.1 The technology appropriateness assessment provided by SaniChoice.



Outputs

- O3.1 Demarcation of the zones and their typology (optional).
- O3.2 Technology appropriateness (per zone).

A3.1 Demarcation of the Zones (Optional)

Depending on the size and heterogeneity of the characteristics within a town, it makes sense to conduct several SaniChoice applications for different zones in parallel.

If you decide to work with different zones, the appropriateness criteria to use have been identified in the previous step. These are the appropriateness criteria which show the most heterogeneity within the area. Typical criteria for the demarcation of zones are: the vehicular access, density, slope, soil type, as well as the existing infrastructure.

Additionally, political boundaries or financial aspects, such as the household income level, might also be important. For the demarcation of zones, collect and review all available information: sanitation report, any type of plans, socio-demographic data and especially GIS data.

According to your set of demarcation criteria, you have to quantify or qualify them for the different pocket areas within your case. Try to consistently allot a type of zone to each pocket area. Once the demarcation criteria have been quantified for the entire area, types of zones might be identified by gathering the pocket areas with similar characteristics. In this way, SaniChoice has only to be applied to the different zones and not individually to all the pocket areas.

The demarcation of zones is often an iterative process of refining or removing/adding demarcation criteria. Moreover, not all the appropriateness criteria need then to be applied in all zones and for all types. For instance, if flooding is only an issue in one zone or type of zone, it is only to be considered there.



Best practice

CWIS and Diverse Local Priorities and Conditions

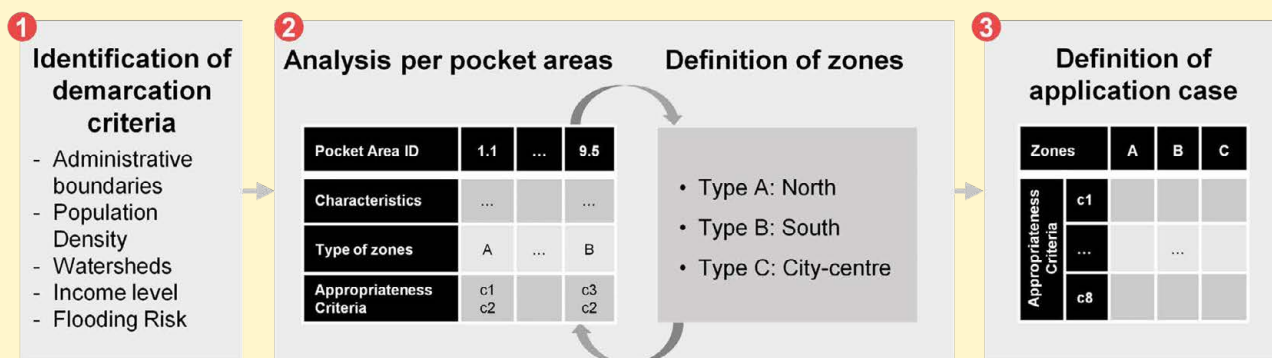
Along with safety and sustainability, equity is a major component of the Citywide Inclusive Sanitation (CWIS), which puts inclusion at the centre of the planning process. Inclusive means to fit equally everyone's needs, whether it is gender, disability, age, religion, caste or income level, by potentially providing several sanitation systems (e.g. sewered and non-sewered) within the same city (Narayan and Lüthi, 2020). SaniChoice can help to bridge different local priorities with citywide objectives and to find a mix of different sanitation systems appropriate to different conditions within the area to end up with more locally appropriate sanitation alternatives.



Example Case: Thirty Springs

Demarcation of the Zones

The demarcation of zones was conducted according to: (1) administrative boundaries for implementation, (2) population density affecting mostly the on-site space availability and drinking water exposure, (3) main watersheds for potential decentralised systems and slope gradient affecting the type of conveyance technologies (e.g. sewer, stormwater drain, etc.), (4) income level, which can affect different types of business models, and (5) flooding risk affecting containment and storage technologies.



The definition of the type of zone, combined with the analysis per zone, leads to the creation of three zones according to small administrative units (kebeles): (A) North: low-income residential flat area with ample space availability and limited water supply; (B) South: medium- to high-income area with many hotels and government institutions inducing a high water consumption and located in flood-prone area; and (C) City-centre: medium-income and densely populated area with commercial centres, residential buildings, hotels and hospitals inducing a very high water consumption.

The application profiles are then ready to be defined in Step 3. SaniChoice is then applied in parallel for each zone.

A3.2 Identifying Appropriate Technologies

After the stakeholder and expert consultation workshops conducted in Steps 1 and 2, it is now time to start working with SaniChoice. In this third step, you will first limit the technologies to the potential technologies and then quantify a *technology appropriateness score (TAS)* for them. The appropriateness score, depending on the criteria, should give you an estimate of how well a technology fits the local conditions.

The first step consists in narrowing down the set of technologies to the potential ones. This is done using the preconditions. Possible preconditions are:

- The development phase: define whether you are in a development or one of the humanitarian phases (acute, stabilisation, or recovery phase).
- Existing infrastructure: mark certain technologies as given.

For the most of the cases, you will be either in a development phase or in an acute humanitarian context. Existing infrastructure refers to an existing technology, e.g. a widely adopted user interface, such as a pour-flush toilet. SaniChoice then looks only for compatible technologies downstream of the sanitation system value chain.

You will now start working with the appropriateness criteria you have identified in Step 2. SaniChoice will guide you through the process of adding data on your application case for each of the criteria. In most cases, the data to be entered in SaniChoice is available at early stages of the planning process (e.g. based on household surveys and baseline studies), but sometimes additional reports or experts might need to be consulted.

The data of your application case is then compared to the SaniChoice database of technologies. This allows for the evaluation of how well a technology fits the local conditions. The match is given in percentages ranging from 0 (not appropriate at all) to 100% (fully appropriate). The overall match, which is obtained by aggregating all criteria scores, is again a value between 0 and 100% and tells you how appropriate the technology is given the case data provided. You can now compare the technology appropriateness scores (TAS) and refine the data you provided or save the results.



Best practice

Technology Appropriateness Scores (TAS) in a nutshell

SaniChoice allows for calculating an appropriateness score for each technology and appropriateness criteria based on the data provided to describe the local case. The Technology Appropriateness Score (TAS) is a number between 0 and 100% that expresses how well this technology fits the local conditions.

Using SaniChoice to explore different scenarios

As the technology appropriateness is based on probability functions, the results consider a certain variability; for instance, you do not define a type of electricity supply for the case, but you add a proportion of population having certain types of energy supply. However, in some cases you might expect more significant changes in the future, such as climate change vulnerability (e.g. higher temperatures or more flooding) or infrastructure improvement (e.g. regarding power supply or road access).

To take these uncertainties into account, you can try to define different case data sets, one for the current situation, and others for possible future situations. Then, you can compare if there are some technologies that are appropriate for both the current and future scenarios, which would, thus, be more robust to use in the face of any expected future changes.



Why you should not eliminate technologies too early

Even though the appropriateness of an individual technology might be low, this technology can be part of a sanitation system with a high system appropriateness score. Only technologies with an appropriateness score close to 0% should be excluded at this stage.

The necessity to consider zones sufficiently different from each other

When you do consider different zones or types, make sure that the estimates for the appropriateness criteria are significantly different, otherwise you will end up with very similar results for all zones. Although the zones seem to be different, some appropriateness criteria probably do not vary within your city (e.g., temperature, pipe supply, concrete supply, etc.) and, therefore, will show similar appropriateness scores for all zones. The two following recommendations can help you avoid having results that are too similar:

- Using different appropriateness criteria for each application case
- Using the same appropriateness criteria for all application cases, but only the ones which are sufficiently varying among the application cases. This requires having a very critical look at how different technologies perform regarding each criterion.



Example Case: Thirty Springs

Step 3.2 of SaniChoice Practitioners' Guide

After the workshop, the expert used SaniChoice to first pre-filter potential technologies. Only technologies for development (not for humanitarian response) were included.

The expert then entered data on the 15 appropriateness criteria for each of the three sectors. The main differences between the zones were related to the slope, the vehicular access, and the water supply. To collect the data, the expert used a set of questions and categories provided by SaniChoice for each criteria.

Because of the differences in the characteristics of the three sectors, some technologies like the flush toilet (requires water) or the constructed wetland (requires land) were eliminated in some of the sectors, but not in all.

This shows how four of the 15 criteria for the three sectors in Thirty Springs were implemented in SaniChoice:



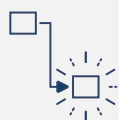
The technology appropriateness scores varied between 0 % and 100 % with a few scores equal to 0%. For example, the cistern flush toilet being appropriate only in one sector scored 0%. A more detailed analysis of the scores for each criterion showed that slope, vehicular access, water supply, construction skills and temperature were the criteria for which the appropriateness scores varied the most. Because the scores were quite close in the first step, only these five most relevant criteria were retained for a second assessment.

The following table shows the results for the first round of assessment for the sector 1 of Thirty Springs:

User Interface	Onsite Collection / Treatment	Conveyance	(Semi-)Centralised Treatment	Use / Disposal
★ Urine Diversion Dry Toilet	★ Septic Tank	★ Motorized Emptying and Transport of Solids	★ Sequencing Batch Reactor	★ Leach Field
★ Pour-Flush Toilet	★ Composting Chamber	★ Conventional Gravity Sewer	★ Waste Stabilization Ponds	★ Application of Compost and Biochar
★ Dry Toilet	★ Urine Storage Tank	★ Motorized Emptying and Transport of Urine	★ Unplanted Drying Bed Sludge	★ Soak Pit
★ Cistern-Flush Toilet	★ Double Dehydration Vaults	★ Human-Powered Emptying and Transport of Urine	★ Urine Bank	★ Application of Stabilized Sludge
★ Urine Diversion Flush Toilet	★ Single Faeces Storage Chamber	★ Human-Powered Emptying and Transport of Solids	★ Nitrification and Distillation of Urine	★ Application of Dried Faeces
★ Urinal	★ Single Pit	★ Simplified Sewer	★ Planted Drying Bed	★ Application of Urine
★ User Interface for Controlled Open Defecation	★ Container-based Toilet	★ Solids-free Sewer	★ Unplanted Drying Bed Dry	★ Application of Concentrated Urine
	★ Single Ventilated Improved Pit	★ Stormwater Drainage	★ Sedimentation / Thickening Ponds	★ Application of Straw or Dried Urine
	★ Double Ventilated Improved Pit		★ Co-Composting	★ Biogas Combustion
	★ Fossa Alterna		★ Offsite Vermi-Composting	★ Fill and Cover
	★ Twin Pits for Pour-Flush Toilets		★ Black Soldier Fly Composting	★ Briquettes as Fuel
	★ Raised Latrine		★ Upflow Anaerobic Sludge Blanket Reactor	★ Co-Combustion

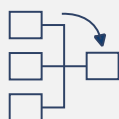
Step 4: Identifying Appropriate Systems

Which Systems Should Be Considered?



Goals

- Conduct a plausibility check of the systems pre-selected with SaniChoice.
- Identify appropriate sanitation systems



Inputs

- Sanitation technologies with corresponding technology appropriateness scores (TAS) developed in Step 3.



Activities

- A4.1 Pre-selecting sanitation systems.
- A4.2 Expert workshop 2: Consolidate selection and plausibility check.



Available resources

- R4.1 Agenda for Expert Workshop 2
- R4.2 The system option generation service provided by SaniChoice.



Outputs

- O4.1 A list of locally appropriate sanitation system options (per zone)
- O4.2 System evaluation criteria provided by SaniChoice

A4.1 Pre-selecting Sanitation Systems Using SaniChoice

While a technology itself might have a larger appropriateness score, it could possibly be only used in combination with technologies with far lower scores. Therefore, the appropriateness of the entire sanitation value chain needs to be judged. In this fourth step, SaniChoice is used to build valid sanitation system configurations from the appropriate technologies and to pre-select a set of most appropriate sanitation systems to be evaluated further in Step 5.

A sanitation system is defined as a set of technologies, which manage sanitation products from the point of generation to the final reuse or disposal. A valid sanitation system is one in which every product is either

transferred, recovered, or safely managed. SaniChoice allows for generating all valid system configurations from the appropriate technologies previously defined. The challenge is that the number of possible configurations can be very high and sometimes range up to several hundred thousand depending on the appropriate technologies. However, in a participatory decision-making process, only about three to twelve options can really be discussed with the stakeholders.

SaniChoice can find the most appropriate system configuration for different system templates. A system template defines different categories of systems based on different characteristics: dry/wet, onsite, decentralised, hybrid, centralised, or producing sludge or biomass, or recovering urine. Like this, SaniChoice provides a manageable number of options while the set of options is still diverse enough to make trade-offs regarding the final decision as required for the workshop in Step 5.

The system appropriateness scores (SAS) is evaluated based on the aggregation of the technology appropriateness scores of the technologies contained in a system. If no template is selected, then SaniChoice simply considers all the templates and looks for the most appropriate combination in each of them.



Best practice

System Appropriateness Score (SAS)

The System Appropriateness Score (SAS) is an aggregated value combining the appropriateness scores (TAS) of all the technologies contained in one system.

Preferred Template

The generated sanitation systems are sorted into different types of templates. These include 'simple' systems that allow for onsite treatment, 'urine diverting' systems, which have separate urine and faeces treatment, systems that produce a type of 'biofuel', such as briquettes or biogas and systems with flush toilets that produce blackwater. Within each of these groups, systems are further divided into onsite, decentralised, hybrid or centralised systems.

These templates help to organise the overwhelming number of system combinations to help you find your way through. By prioritising some templates, you can already provide a direction in terms of the type of solutions provided by SaniChoice. However, it is important to allow for a diverse set of templates to be included so that trade-offs regarding evaluation criteria can be effectively highlighted and discussed during the final workshop.



Obstacles & Challenges

Why do you pre-select a diverse set of systems and not just the single one that has the highest SAS?

The system appropriateness score (SAS) depends on which criteria are considered in the appropriateness assessment. For instance, if water supply is an issue, but you do not consider this criterion, you might end up with systems that have a high appropriateness score, but are nevertheless not feasible.

It is, therefore, important to have a critical look at the generated systems again. Moreover, and even more importantly, the most critical decision objectives are those for which stakeholder preferences occur and where trade-offs can be expected. Examples include costs and level of treatment. Only if you compare a certain number of systems in a later step will you be able to evaluate which of all these systems is the best fit, considering the trade-offs and preferences of stakeholders.

The main purpose of SaniChoice, and that is why it is designed to provide several possible system options, is to trigger informed discussions to enable negotiations and finding agreement.

SaniChoice does not make decisions; it just gives choices. Decisions have to be supported and implemented by all the stakeholders.

A4.2 Expert Workshop 2: Consolidate Selection and Plausibility Check

After you have generated a set of sanitation system options with SaniChoice, it is recommended to undergo a quick plausibility check. SaniChoice generates all systems, but it can occasionally result in some systems which are not very promising from an engineering point of view (e.g. treating faeces alone in a biogas reactor). Therefore, it is recommended that you have a close look again at the suggested systems and that you make sure that they all make sense from your experts' point of view. You can also always come back to the technologies again, include some previously excluded, or exclude some that were previously included or adjust the prioritisation of system templates.

This step can also be carried out in an Expert Workshop and an agenda of the latter is suggested in Supporting Resources R4.1 – Agenda for the Expert Workshop 2: Consolidate Selection and Plausibility Check.



Obstacles & Challenges

How to deal with a higher number of systems when demarcating the city into distinct zones

Demarcating different zones within a city will obviously result in the generation and pre-selection of more sanitation systems, and this might be overwhelming for the stakeholders. Ensure first that the local stakeholders and decision-makers understand the typology of settlement you defined. For each of the zones, you can present the two to three most appropriate systems to structure the presentation.



Example Case: Thirty Springs

Step 4 of SaniChoice Practitioners' Guide

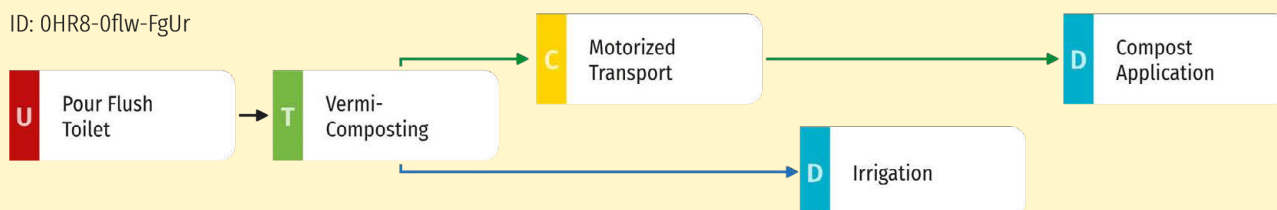
Based on the 88 technologies, SaniChoice found more than 200'000 possible system configurations from 37 templates.

The following table shows all the SAS from the 12 systems pre-selected with SaniChoice for zone A in Thirty Springs:

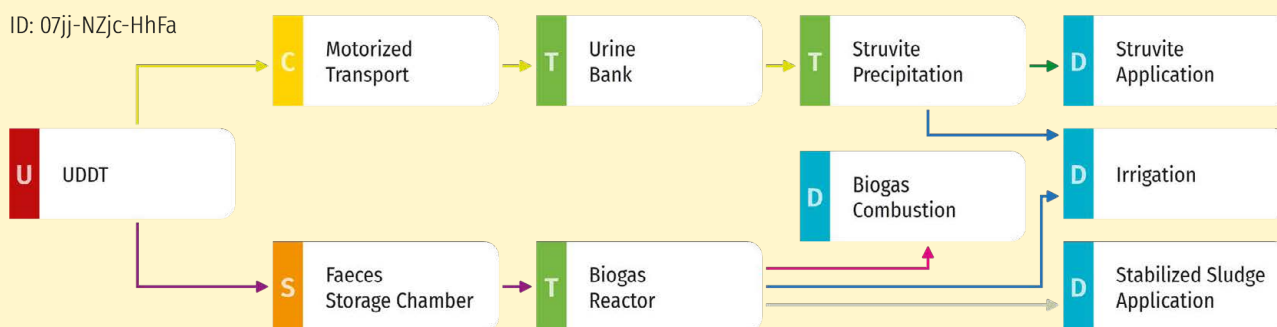
System ID	Source	Template	SAS
0Fy9-84Xk-3f5R	Urinal	ST37. Urinal	87 %
03r3-mnSD-lA0x	UDFT	ST31. Decentralized blackwater system with urine diversion	80 %
0HR8-0flw-FgUr	Pour-flush	ST13. Onsite blackwater without sludge and without effluent transport	88 %
0JnI-dKH7-7xc8	UDDT	S11. Container-based system	82 %
07jj-NZjc-HhFa	UDDT	ST28. Onsite dry system with urine diversion without effluent transport	85 %
0Lu7-if2Q-6w6c	Dry toilet	ST22. Decentralized dry system with biofuel production	85 %
03Zh-jgZy-VKKq	Dry toilet	ST3. Onsite dry system without sludge production	87%
07C8-N3s0-AwdP	Dry toilet	ST6. Decentralized dry system with biomass production	87 %
0G99-o5RM-Dh6M	Dry toilet	ST4. Onsite dry system without sludge production and with biomass production	85 %
0Biy-DMTl-DiQ8	Dry toilet	ST24. Hybrid dry system with biofuel production	85 %
09HF-ULfj-c2Vw	Dry toilet	ST7. Hybrid dry system without biomass production	85 %
07JD-wDMg-mnpQ	UDDT	ST30. Decentralized dry system with urine diversion & without effluent transport	81 %

In a second round, the prioritisation of templates and the plausibility check allowed for further narrowing down the pre-selected systems to three systems (highlighted in table above):

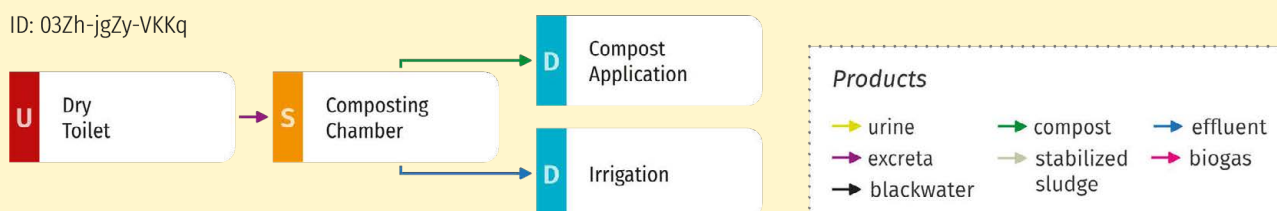
ID: 0HR8-0flw-FgUr



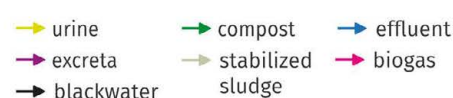
ID: 07jj-NZjc-HhFa



ID: 03Zh-jgZy-VKKq



Products





Example Case: Thirty Springs

Step 5: Interpreting the results obtained with SaniChoice

These are the final outputs obtained for Thirty Springs. They provide an overview for each preselected system and allow for comparisons. All results are obtained ex-ante and, thereby have to be interpreted carefully.

The local appropriateness score presents how well each appropriateness criteria performs for the entire system. Thank to this overview, you are able to define which criteria could be a limiting one, such as the frequency of operation and maintenance for system 07jj-NZjc-HhFa.

The resource recovery potential indicates what fraction of the four substances may be recovered within the system. System 07jj-NZjc-HhFa shows the highest potential due to the biogas generated from total solids, the application of struvite precipitation for most of the phosphorus, the application of stabilised sludge contributing for nitrogen, phosphorus and total solids, and irrigation recovering the water.

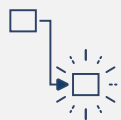
SaniChoice also provides additional evaluation criteria, such as the capital and operational expenditure (Capex and Opex) requirements and the technical maturity. Capex and Opex are defined qualitatively for each technology considering three required resources: material, labour and land (and energy for Opex)

Last but not least, you can consider as much additional evaluation criteria as you want and supplement this first assessment. Some of them can be directly extracted from SaniChoice, such as approximation of the land surface needed, by summing the required area of each technology (available in the criteria tab of the technology information sheet).



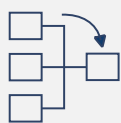
Step 5: Evaluating Pre-Selected Systems and Discussing Trade-Offs

Which Systems Should Be Implemented?



Goals

- Evaluate the performance of the sanitation systems pre-selected by SaniChoice regarding different evaluation criteria.
- Compile a decision matrix to be discussed in a final evaluation workshop with experts and stakeholders.
- Discuss results with stakeholders and identify a preferred option to be considered in the sanitation plan.



Inputs

- Pre-selected sanitation systems and their appropriateness.
- System evaluation criteria and their score for the system options.



Activities

- A5.1 Detailed assessment of pre-selected systems
- A5.2 Stakeholder Workshop 2 to discuss trade-offs and to find stakeholders' agreement on a preferred sanitation system.



Available resources

- R5.1 Evaluation and comparison of systems (SaniChoice)
- R5.2 Suggested workshop agenda for the system evaluation workshop.
- R5.3 Links to tools to quantify evaluation criteria not covered by SaniChoice.



Outputs

- O5.1 An in-depth understanding of the performance of the locally most appropriate sanitation system options regarding key decision objectives and trade-offs arising therefrom.
- O5.2 Report for the Project Team
- O5.3 Simplified presentation for stakeholders
- O5.4 The preferred system options for each city sector to be included in the strategic sanitation plan.

This is the last step of the SaniChoice Practitioners' Guide application, but not the last step of the planning process. You will compare the pre-selected systems regarding different evaluation criteria and discuss these results with stakeholders to find agreement on what type of sanitation systems to include in the strategic sanitation plan.

A5.1 Detailed Evaluation of Pre-Selected Systems

After you have developed a set of sanitation system options, you can compare the system regarding different aspects, using evaluation criteria provided by SaniChoice. Expenditure requirements and resource recovery are typical evaluation criteria that can involve trade-offs and are subject to negotiation with the stakeholders. However, it is important to note that the evaluation criteria provided by SaniChoice are often not sufficient to make a final decision. Further criteria need to be independently evaluated and differ in different applications, often including a more detailed assessment of the costs or possible financing or service delivery models.



Figure 10: Workshop discussion on the criteria to be used for selecting the preferred systems when piloting SaniChoice in Changunaryan Municipality, Nepal, in June 2022. Picture: Basile Weber.



What are system evaluation criteria?

The evaluation criteria are used to assess the performance of the pre-selected (appropriate) sanitation system options. They are based on the most relevant decision objectives that require negotiations because they often involve conflicts of interests. The evaluation criteria included in SaniChoice are:

- System Appropriateness Score (SAS)
- System complexity from a technical point of view
- Technical maturity
- Capital and operation expenditure requirements
- Resource recovery and loss potentials

Further criteria need to be evaluated independently and differ in different applications, but often include a more detailed assessment of the costs, service delivery models and health risks. Helpful tools are:

- City Service Delivery Assessment (CSDA) for institutional acceptance
- SaniPath and Sanitation Safety Planning for hygiene and health
- The CWIS costing tool for finances

In Supporting Resources R5.3, you find a complete overview of helpful tools.

Defining additional evaluation criteria

Finding out what criteria need to be included in the final evaluation is defined by the decision objectives agreed on by the stakeholders in Step 1. Normally, the most controversial are the most important decision objectives and, therefore, critical for the detailed evaluation and selection of the preferred systems. Here are some examples how you could identify the evaluation criteria that need to be considered:

- If people are mainly concerned about aspects related to the service delivery models and costs, try to get more information about the possible financial and contractual arrangements, as well as a more detailed analysis of operation and maintenance requirements and capital and operation costs. The CWIS costing tool¹ might be a good place to start to get a more nuanced picture of the financial requirements.
- If health or environmental risks during operation and maintenance seem to be decisive, try to get more information on the associated risks of the different pre-selected systems. Useful tools are SaniPath (Robb et al., 2017) and Sanitation Safety Planning (WHO, 2015).
- If resource recovery or emissions to the environment are of concern, then SaniChoice provides you with the recovery ratio (%) and volumes (Kgye⁻¹person⁻¹) for nutrients (phosphorus and nitrogen), total solids (as an indicator for organics and energy) and water. It also provides ratio and volumes of these substances lost to air, soil and groundwater, or surface water.

Once you have collected all important information, then you can create the decision matrix. In the rows, you list the evaluation criteria and in the columns the sanitation system options (see the example below). Characterise (if possible, quantify) all the criteria for each option and fill in the matrix. Thereby, the attributes will be specified in different units (e.g. %, Kgye⁻¹person⁻¹; high/medium/low; etc). The resulting table pulls together the critical pieces of information and provides a good overview of the pros and cons of different systems. In some cases, this matrix might already be sufficient to dismiss clearly inferior systems prior to conducting a deeper analysis.

However, the main advantage of a decision matrix is that it provides an analytic approach that inspires self-reflection and can facilitate a discussion focused on the performance of systems rather than intuitive responses. Synthesise your results and findings into a report for the project team you are working with and create a simplified presentation for the Stakeholder Workshop 2.

A5.2 Stakeholder Workshop 2: System Evaluation

The decision matrix is the basis for the Stakeholder Workshop 2. In case you applied SaniChoice for several separate zones, a workshop for each zone might be required.

During the workshop, you will:

- Present the decision matrix and allow stakeholders to ask questions.
- Allow stakeholders to adjust criteria performances if required.
- Rank the options regarding the criteria performances together with the stakeholders
- Optionally, weight different criteria
- Score the options considering all criteria
- Agree on the preferred options to be included in the strategic sanitation plan or decide to reiterate the process by adjusting appropriateness and evaluation criteria (this will require further analytical work and another workshop).

Again, you might be able to eliminate some clearly inferior options by defining so called “killer criteria” before you proceed to the ranking. Killer criteria are criteria with a minimal threshold to be achieved (e.g. operation investment requirements must be below a certain value).



Ranking options

Ranks are assigned for each criterion and according to how they perform regarding the criteria. For instance, if you have no options, and water requirements is the criteria, the one with lower requirements would get rank “1” and the other rank “2”. Although the advantage of ranking is that it is simple and intuitive, it implies a linear evaluation for something that is not linear. For instance, if you have three options that require 10, 9, 1 litres of water respectively, option two with 9 litres will still receive rank “2”, although it performs similarly good to option one when compared to option three. To overcome this, scoring can also be used. But again, scoring requires a good understanding of the implications of the options. When doing scoring, the main challenges are that the absolute minimum and maximum are not known.

With good facilitation, the ranking or scoring process should be feasible in the plenary. If many stakeholders have very different opinions, you might decide to let each participant do the scoring individually or to form groups. The ranking or scoring will finally result in a second table (see example below), which brings the criteria into a comparable scale.

Weighting (optional)

For weighting, a total of 100 points are distributed among the different criteria, according to their relative importance. It is easier to first define the most and least important criteria and then to distribute the rest in between the remaining criteria. While the previous steps should ideally be carried out in an objective plenary discussion, this step can be done by each participant separately to reflect individual perspectives, preferences and opinions. Alternatively, participants representing the same stakeholder should work together.

The next step consists in combining the weights and scores to derive the overall value of each option. This can be done by multiplying scores by weights for each attribute and summing up the products for each option.

The final step consists in presenting the final ranking of the options. If stakeholders worked in different groups, and the results are fundamentally different, the discussion should allow for finding out why and to see if a compromise (e.g. through a joint weighting) can be obtained.

As a final step, you might want to get relevant stakeholders to agree on a preferred option. If this is not possible, it is useful to get the level of agreement regarding different sanitation system options pre-selected with SaniChoice. This approach is further elaborated in the workshop agenda for the system evaluation workshop in Supporting Resources R5.2 – Agenda for the Stakeholder Workshop 2: System Evaluation.

Levels, such as “Endorse” (= Enthusiastic support), “Accept” (= Support), and “Oppose” (= No support), are a great summary when trying to identify the preferred sanitation system option. Even if the results from this exercise reveal too much disagreement, then, the last part of the workshop should focus on discussions on how to reiterate the process by adjusting appropriateness criteria, template prioritisation, and evaluation criteria.

You will also need to be prepared for skilled facilitation. Thereby, it is important to stick to facts and figures, and to avoid emotional discussions based on individual assumptions. The decision matrix provides a transparent overview on the data for each sanitation system and should help when making sensible trade-offs.



Obstacles & Challenges

What is Multi Criteria Decision Analysis (MCDA)

The steps above are based on a simple application of methods from Multi-Criteria Decision Analysis (MCDA). If people are not willing to change their stance based on the decision matrix alone, and further insight is needed to identify sanitation systems that should be prioritised, a more sophisticated MCDA method can be used ([link](#)). However, MCDA methods should be used mainly to stimulate discussions (Gregory et al., 2012).



Best practice

How does SaniChoice obtain resource recovery potentials?

Resource recovery and loss potentials have become more relevant in strategic sanitation planning in recent years. To provide quantitative information on resource recovery for a diverse and large range of sanitation systems at an early planning phase, SaniChoice uses a simplified substance flow model and transfer coefficients for each technology and four substances. The substances are phosphorus and nitrogen (as the most important macro-nutrients), total solids (as an indicator for organics and energy) and water.

SaniChoice allows for determination of each system estimations on how much resources can either be recovered or lost to soil and groundwater, air, or surface water.

How to consider different service delivery model options in the decision matrix

SaniChoice only provides the sanitation system options from an infrastructure point of view. In some cases, it might be relevant to also discuss the different service delivery and financial schemes to be able to provide a detailed evaluation (e.g. of costs) during the final workshop.

To do so, the initial system options can be used to compile a strategy matrix in which each system is multiplied by the number of service delivery and financing models, such as:

- Public services and water tariffs
- Fully privatised
- Public Private Partnerships
- Community-led

Thereby, the four options initially pre-selected are combined with different service delivery models and offer 16 possible scenarios that can be compared in more detail.



Example Case: Thirty Springs

Step 5 of the Practitioners' Guide

The pre-selected sanitation systems from Step 4 serve as a basis for discussions with stakeholders to identify the most preferred system. First a decision matrix is established using the data from SaniChoice.

System ID	System Appropriateness	Technical complexity	Capex requirements	Opex requirements	Health risks	Water requirements (litres per year & person)	Phosphorus recovery	Nitrogen recovery	Water recovery	Total solids recovery	Emissions
0HR8-0flw-FgUr	87%	low	low	low	high	4923	98%	65%	72%	37%	medium
07jj-NZjc-HhFa	85%	high	high	high	low	4923	98%	76%	77%	73%	low
03Zh-jgZy-VKKq	88%	medium	medium	medium	medium	31428	96%	66%	51%	51%	medium

Multi-Criteria Decision Analysis (MCDA) can help to deal with trade-offs that arise during this process. Below, you find the weighted evaluation criteria according to their preference. Then, the options are ranked according to their performance per criteria.

	System Appropriateness	Technical complexity	Capex requirements	Opex requirements	Health risks	Water requirements (litres per year & person)	Phosphorus recovery	Nitrogen recovery	Water recovery	Total solids recovery	Emissions	Ranking	Score
Weights (%)	5	10	20	20	10	10	5	5	5	5	5		
System ID													
0HR8-0flw-FgUr	2	1	1	1	3	1	1	2	1	3	2	1.45	1
07jj-NZjc-HhFa	3	3	3	3	1	1	1	1	1	1	1	2.1	4
03Zh-jgZy-VKKq	1	2	2	1	2	3	2	2	2	2	2	1.85	3

In this example, System *0HR8-0flw-FgUr* 66138, a simple dry onsite composting toilet would be the most preferred. However, in other sectors of Thirty Springs, different systems were identified to be most preferred, such as in the area around the university, a urine diversion system (similar to *07jj-NZjc-HhFa*) with local urine reuse and motorised collection of faeces for offsite drying and disposal. In the city centre, where drainage was already existing and heavily polluted through uncontrolled faecal sludge disposal, investments were made in a scheduled emptying service financed by taxes that brought the sludge to a biodigester producing biogas and soil amendment at a nearby banana plantation.

What's Next?

After completing the five steps of the Practitioner's Guide, you should have decided on the sanitation system(s) that you are considering for implementation and that, therefore, will be included in the strategic sanitation plan. However, the planning process is not yet finished, and you might not yet have enough information to prepare the strategic plan document.

Firstly, the non-technical aspects must also be looked at, such as the service delivery and financing options, as already mentioned in Step 5. Typically, you will need to do more detailed feasibility analyses for the selected systems and some cost calculations, as well as suggest some financing and service delivery models that consider operation and maintenance.

Secondly, it is also time to develop an action plan to move from planning to implementation. The form of the action plan is different from case to case. For instance, it can be an official document that makes a request for public funding at ministerial level. It could also be a report laying out a community-based solution to be funded by an NGO with contributions by the users. The best solution will become apparent through the information gathered throughout this process. The action plan does not have to address every single detail and should not be a huge document that nobody reads. Rather, it should be clear and concise, such as a roadmap or a cooking recipe, a self-explanatory Guide for the main stakeholders that demonstrates how to move forward with implementation (Lüthi et al., 2011a). Whatever it is, it has to include clear targets, planned activities, responsibilities, human and financial resources required, and timelines. And, of course, it also should not only deal with the implementation of infrastructure, but also provide a sound and locally appropriate plan for future service delivery including operation and maintenance.

	<p>3. Annexes</p>
<p>This section provides a glossary, supporting resources to apply the five steps and further reading and training material to equip you with the knowledge to effectively use this Guide</p>	

Glossary

Terms and Definitions

Unless noted differently, the content of this glossary is predominantly taken from (Tilley et al., 2014) and (Spuhler, 2020).

Sanitation refers to the safe management of excreta and liquid wastes for the protection of public health and the environment. This involves the technical and non-technical aspects of four required sub-systems: excreta management, wastewater management, solid waste management, and stormwater management.

Sanitation products are the material that enter or are generated by sanitation technologies. Some sanitation products are generated directly by humans (urine or faeces), others are required in the functioning of technologies (flush water to move excreta through sewers, etc.) and some are generated as a function of storage or treatment (sludge, effluent, etc.).

A **sanitation technology** is defined as any process, infrastructure, method or service that is designed to contain, transform or transport sanitation products. It is characterized by its name, the input and output products and how they relate to each other (e.g. blackwater or greywater -> septic tank -> sludge and effluent). Additionally, technologies can be further described by using appropriateness attributes such as water, energy, or space requirements.

An **appropriate sanitation technology** is one that provides a socially and environmentally acceptable level of service at affordable cost. This can be translated into geo-physical, technical, socio-cultural, legal, financial as well as criteria concerning capacity and management. An appropriate or contextualized sanitation system is one that is composed of appropriate technologies.

A **sanitation system** is defined as a set of sanitation technologies which, in the given configuration, manage sanitation products from its point of generation to the final point of reuse or disposal. A sanitation system is **valid** if it contains only compatible technologies and every sanitation product either finds its way into a subsequent technology or a sink. Two sanitation technologies are **compatible** if the output product of one can be the input product of the other or vice versa. A sanitation system can also be defined as the **sanitation value chain** comprising of five **functional groups** that include technologies with similar functions: The user interface (U), the onsite collection and/or storage (S), the conveyance (C), the decentralized or centralized treatment (T), and the reuse or disposal (D).

A [sustainable sanitation system](#) is one that not only provides appropriate technologies that protect human health and the environment but are also economically viable, socially acceptable, and institutionally applicable (SuSanA, 2008). This definition can be translated into five main objectives for sustainable sanitation: protection of health, protection of the environment and natural resources, economic viability, technological and institutional appropriateness, socio-cultural acceptance. The definition of sustainable sanitation largely overlaps with appropriate sanitation but includes a few more aspects such as the resource efficiency. The sustainability of entire sanitation systems depends on each of the technology, how they fit to the local conditions and how they are combined (hardware aspects). Additionally how the other aspects such as the service delivery model and the enabling environment (favourable legal, political, and socio-economic conditions) are as much important (software aspects).

A [sanitation system template](#) defines a class of sanitation systems with similar conceptual characteristics. It can be defined by using different technical characteristics such as if the system is dry, wet, produces biofuel or uses urine diversion or based on the systems' level of decentralisation (onsite, decentralized, centralized or hybrid). Each sanitation system can be assigned to one unique template.

[Application cases](#) are the cases or context to which a given sanitation technology or system is to be applied. This could be a village, a municipality or a district inside a bigger city. They can be defined according to physical, socio-demographic or political boundaries. If the application case is very heterogeneous regarding appropriateness criteria, it is best to **define** distinct zones within in a case and to apply SaniChoice to each zone separately to find zone-specific appropriate sanitation solutions. This can be done using demarcation criteria.

[Decision objectives](#) or planning objectives describe the desired result that is intended to be achieved by the strategic sanitation plan – the joint vision of all stakeholders. The joint definition of decision objectives is crucial to align different actors' perspectives, define a common vision and thus a joint story line. Decision objectives inform the selection and evaluation of decision options, sanitation system options in the case of SaniChoice.

[Objective hierarchies](#) are hierarchical structures that organize decision objectives into higher-level and lower-level decision objectives (Eisenführ et al., 2010). Decision objective hierarchies help organize and thus to communicate better with different stakeholders and to validate the completeness and lack of redundancies in the system of decision objectives. However, how different objectives are hierarchies also influences how much important they take in the evaluation of decision options.

[Decision options](#), also called **planning options** or **decision alternatives**, are possible courses of actions in the planning process. In this Guide, the decision options represent either different sanitation technologies or sanitation systems. The number of options in sanitation system selection is however too large to be considered

in its entirety. Local conditions can be used to pre-select locally appropriate technology and system options from which the final option can be derived while carefully balancing for trade-offs and stakeholder preferences.

Decision criteria are used to assess and compare different decision options. Their corresponding **attributes** are the variables that are identified for each criterion to measure and to report, either qualitatively or quantitatively, how well an option performs with respect to the criteria (Eisenführ et al., 2010). Together, objectives, criteria and attributes do two critical things: they drive the search for creative decision options and they form a consistent and transparent framework for comparing them (Gregory et al., 2012). All the attributes corresponding to a certain technology or an application case are called a **technology profile** resp. an **application case profile**.

SaniChoice criteria are criteria derived from the overall decision criteria in order to apply SaniChoice. They include **demarcation criteria, preconditions, appropriateness criteria and evaluation criteria**.

- **Demarcation criteria** are used for defining distinct zones within an application case to account for different local conditions (e.g. city centre and a peri-urban area). Typical demarcation criteria are: density, slope, vehicular access, flooding.
- **Preconditions** are used to narrow down the potential technologies to be considered in SaniChoice. Typical preconditions are the existing infrastructure (that is set) or the humanitarian or development phase.
- **Appropriateness criteria** are used to identify locally appropriate technologies and systems. Appropriateness criteria are: (1) objective and/or fixed (non-negotiable), (2) measurable at an early planning phase; and (3) generic (applicable to a broad range of technologies). Per case, no more than 10 to 15 criteria should be used. They can be grouped into the following categories: geo-physical, technical, socio-cultural, legal, financial, and capacity and management. A master list of appropriateness criteria is provided in Supporting Resources R2.2 – Master List of Appropriateness Criteria.
- **Evaluation criteria** are used to compare systems and enable stakeholders to discuss trade-offs. Unlike appropriateness criteria, evaluation criteria often involve stakeholder preferences and require trade-offs to be discussed. Typical trade-offs are related to investments costs and treatment level, or risk of exposure and resource recovery. Examples of evaluation criteria from SaniChoice are the resource recovery and loss potentials, the system complexity, or the capital and operational expenditures requirements. SaniChoice does not allow for quantifying all relevant evaluation criteria. Further criteria need to be evaluated independently and differ in different applications, but often include a more detailed assessment of the costs, service delivery models and health risks.

The **Technology Appropriateness Score (TAS)** expresses the determination of how appropriate a technology is for a given application case. It is obtained by comparing a technology profile with the application case profile previously defined by a number of criteria and corresponding attributes. Each attribute is compared individually, resulting in an attribute score. The aggregation of all attribute appropriateness scores via a geometric mean results in the TAS for the given case. The TAS can take values from 0 % to 100 % with 0 % being totally inappropriate and 100 % being totally appropriate.

The **System Appropriateness Score (SAS)** expresses the confidence in how appropriate a system is for a given application case. It is obtained by aggregating the Technology Appropriateness Scores (TAS) of the technologies used in the system (using a compromise between the geometric mean and the product of all scores). The SAS can take values from 0 % to 100 % with 0 % being totally inappropriate and 100 % being perfectly appropriate.

Abbreviations

CLUES Community-Led Urban Environmental Sanitation Planning

CSP City Sanitation Plans

CWIS Citywide Inclusive Sanitation

MCDA Multi-Criteria Decision Analysis

SDM Structured Decision-Making

SuSanA Sustainable Sanitation Alliance

SAS System Appropriateness Score

TAF Technology Appropriateness Filter

TAS Technology Appropriateness Score

Supporting Resources

R1.1 – Agenda for the Stakeholder Workshop 1: Brainstorming What Matters

- **Introduction**
- **Group work 1: Defining priorities**

Participants are asked to draw their area, and to highlight on the map where problems with sanitation occur. Give them ample opportunity to discuss; this is a warm-up exercise. Collect the mentioned problems on coloured cards and display them on the wall. Try to cluster them according to sanitation sectors (e.g. solid wastewater, faecal sludge, etc.).
- **Group work 2: Linking problems to decision objectives**

Participants are asked to reflect on why certain problems occur and how they can be addressed. To start the discussion, the following questions can be asked:

 - *What are the current sanitation problems? Why do you want to improve sanitation in your area?*
 - *How would your area look like with the perfect sanitation solutions? What would be the beneficial social, environmental, and economical aspects?*
 - *What type of sanitation system would solve the problems? What characteristics should the proposed system have in order to solve the present sanitation realities? And what issues would you expect to be addressed by the proposed option?*

You might also ask the participants to role play and imagine themselves as a different stakeholder:

- *What would they be concerned about?*

People often come up with the solution rather than a better understanding of the underlying problems and objectives to achieve. If they have anchored on a particular solution (one specific technology), ask them to list what is so good about it. This list may contain great ideas for objectives. Conversely, if participants strongly oppose a proposed alternative, ask them why. What would they most want to avoid? The answers to these questions will yield information about objectives that have not yet been stated.

Participants are asked to reflect on why certain problems occur and what objectives would allow for addressing them. To start the discussion, the questions in the following table can be asked. The table summarises how to link questions to a first draft of the decision objective hierarchy. You can use colour-coded meta-cards to help you categorise the outcomes.

Type of outcomes	Suggested questions
<p>Fundamental objectives</p> <p>Higher level objective: basic outcomes that matter regardless of how they are achieved. A verb indicates the direction of change.</p> <p>To move from means to fundamental objectives: <i>Why is that important?</i></p>	<ul style="list-style-type: none"> ● <i>What are the current sanitation problems? Why do you want to improve sanitation in your area?</i> ● <i>How would your area look like with the perfect sanitation solutions? What would be the beneficial social, environmental, and economical aspects?</i> ● <i>What concerns are we trying to address? What is your vision for appropriate sanitation solution (e.g. energy recovery)?</i>
<p>Means objectives</p> <p>Lower lever objective: specific methods for meeting the fundamental objective regardless of the technologies that can be derived as SaniChoice criteria in Step 2.</p>	<ul style="list-style-type: none"> ● <i>What type of sanitation system would solve the problems? What characteristics should the proposed system have in order to solve the present sanitation realities? And what issues would you expect to be addressed by the proposed option?</i>
<p>Specific technology with (dis)advantages</p> <p>This list may contain great ideas for objectives to use in Step 2.</p>	<ul style="list-style-type: none"> ● <i>What type of sanitation system would solve the problems?</i> + : <i>What is so good with this specific technology?</i> - : <i>What would they most want to avoid with this solution?</i>

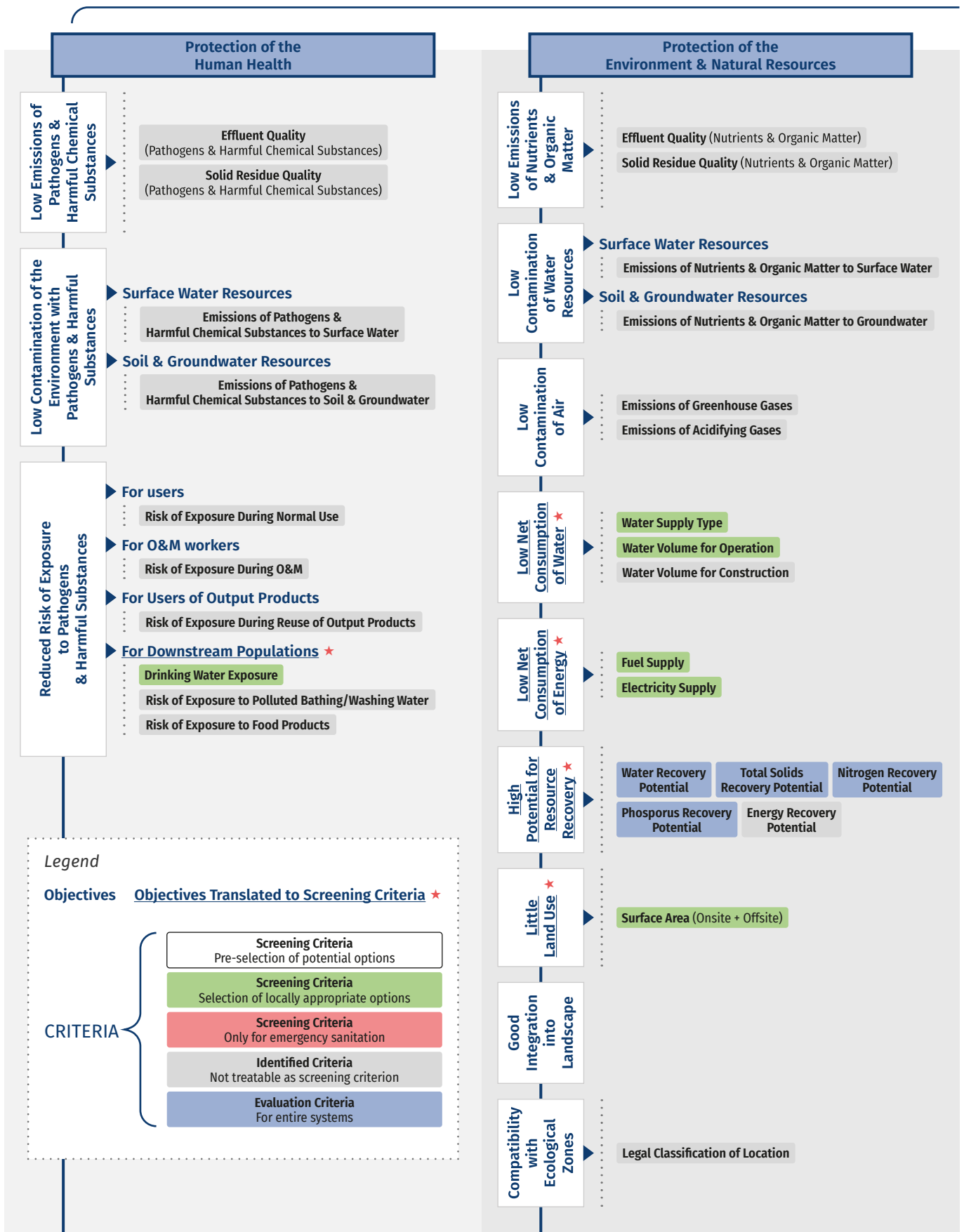
- **Whole group session: Clustering decision objectives**

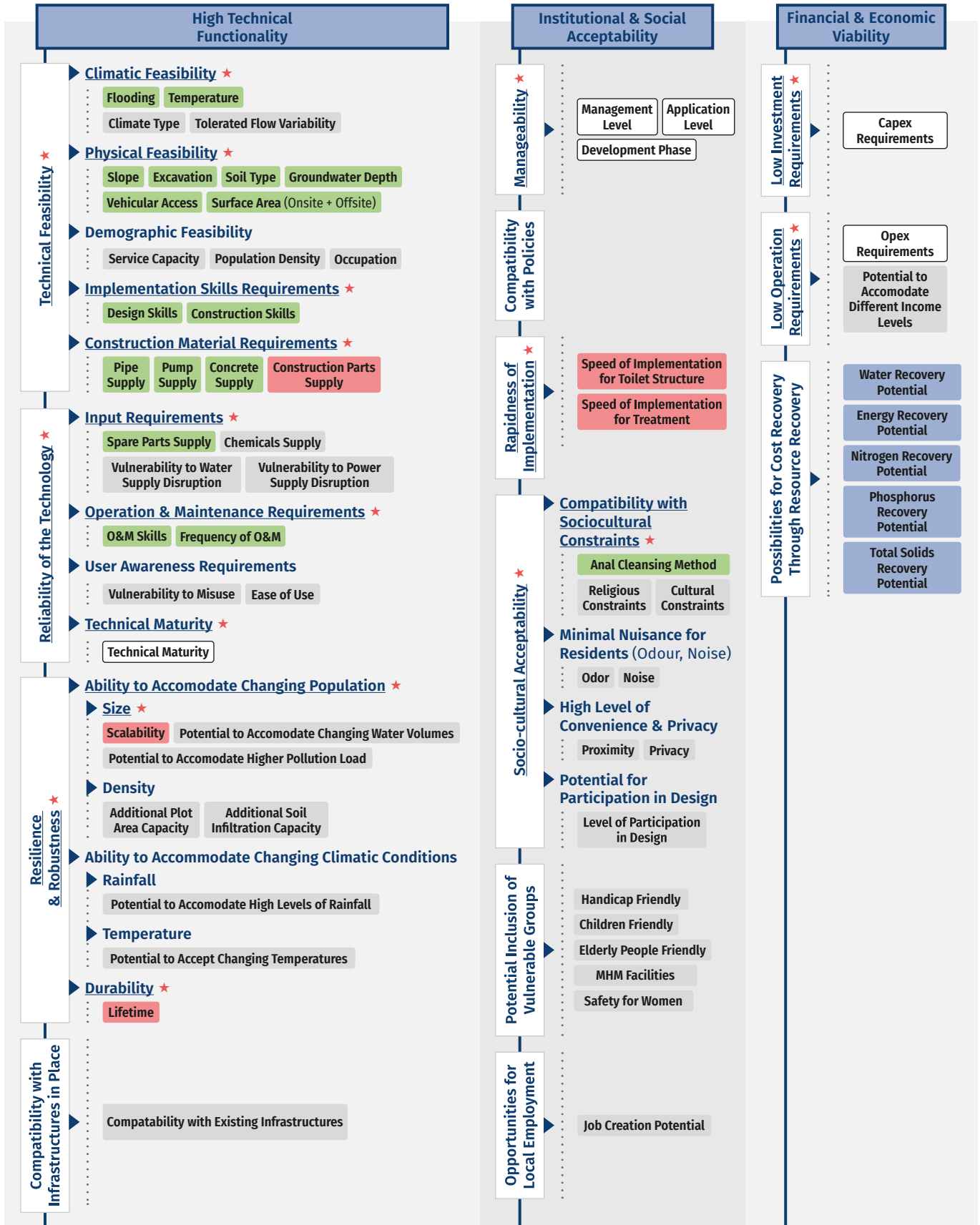
Try to collect as many as possible qualities and characteristics that are expected from sanitation systems and write them continuously on meta-cards, which you display on a wall. Cluster and group the characteristics if they are similar. Try to identify specific categories, such as:

- ➔ Protection of health and hygiene
- ➔ Appropriate technology
- ➔ Financial and economic viability
- ➔ Institutional acceptance
- ➔ Socio-cultural acceptance
- ➔ Protection of the environment and natural resources

- **Closure**

R1.2 – Decision Objective Hierarchy





R2.1 – Agenda for the Expert Workshop 1: Validation of Objectives and Definition of Criteria

- Introduction
- Whole group session: Structuring decision objectives

The goal of this session is to structure the objectives identified in the stakeholder workshop and complete them from an expert's point of view. An interactive way to share them is to first display the upper level objectives (e.g. SuSanA objectives of sustainable sanitation) on the wall or on the table. Then, distribute the draft objectives written on metacards to the participants and ask them to sort them according to the main displayed objectives. The outcome might be different from the one you imagined. Discuss the differences and ensure that the hierarchy remains manageable in size and that objectives do not overlap. However, it will not be possible to come up with objectives that are all fully independent. Alternatively, the generic decision objective hierarchy provided in Supporting Resources R1.2 – Decision Objective Hierarchy **Erreur ! Source du renvoi introuvable.** can also be shared with the experts to make sure that all sustainability dimensions are being considered. Structure can be obtained by e.g. clustering similar objectives and providing them with cluster names similar to the generic decision objective hierarchy. The group can brainstorm further decision objectives for sustainable sanitation by looking at the main problems identified by the stakeholders. To do so, defining the opportunities and threats related to each identified problem often ends up with powerful insights for the decision objectives identification.

- Group work 1: Brainstorming appropriateness criteria

In this session, participants brainstorm what evaluation criteria can be used to measure the decision objectives. This also involves identifying which criteria are non-negotiable or negotiable to identify potential appropriateness criteria for SaniChoice. The non-negotiable criteria are translated into preconditions, demarcation criteria and appropriateness criteria. The negotiable objectives are translated into system evaluation criteria. In smaller groups, ideally with a moderator, participants further develop the appropriateness criteria. Groups might be split according to the highest-level objectives (e.g. health, finance/economic issues, institutional issues and governance, technology, socio-cultural issues, and environmental issues).

- Group work 2: Identifying appropriateness criteria which can be used in SaniChoice

In the same groups, test the identified appropriateness criteria for the fulfilment of the basic requirements for screening with SaniChoice:

- Neutral:
 - Non-negotiable: Independent from stakeholder preferences and not-involving trade-offs. This is required to avoid biasing the final decision; or
 - Objective: Given by externally defined circumstances
- Measurable: Data is available at the structuring phase
- Generic: Applicable to a broad range of technologies (although not all appropriateness criteria must apply to all technologies)

- **Whole group session 1: Aligning criteria with master list**

In this session, participants are asked to work individually. They receive a copy of the master list provided in Supporting Resources R2.2 – Master List of Appropriateness Criteria. Participants are then asked to check the boxes left to all the attributes:

- Column A: tick if relevant, leave empty if not
- Column B: tick if identified previously, leave empty if not

Participants can also add additional criteria at the end of the list. Last but not least, ask them to circle the 10 most relevant criteria.

- **Whole group session 2: Decision on the demarcation of the zones**

If your town is heterogeneous in terms of typology of settlements, SaniChoice could be applied several times for different sectors of the city. This might result in more locally appropriate sanitation options. Discuss with the local experts if a demarcation of distinct zones to apply SaniChoice is relevant for the local case and what could be the demarcation criteria. Try to answer the following questions:

- *Does the types of settlement vary in your application case? If yes, what aspects are relevant to consider for the demarcation (demarcation criteria)?*

Aspects, such as space availability, income-level, existing infrastructures, natural hazards, surrounding economic activities, local priorities, etc., can be discussed.

At the end of this session, you should have decided to consider the demarcation or not and what would be the main demarcation criteria to use in A3.1. Additionally, you might discuss alternative scenarios to consider with different SaniChoice applications (e.g., climate change, urbanisation, etc.).

- **Whole group session 2: Final decision on appropriateness criteria for SaniChoice**

The final task, which could be done with a smaller task force after the workshop, creates a merged list of appropriateness criteria to be supplied to SaniChoice. In order to obtain a satisfying result, the list should not exceed more than 15 criteria. If too many criteria are selected, it will be too difficult to gather data and the appropriateness scores will be less significantly different.

- **Closure**

R2.2 – Master List of Appropriateness Criteria

Table 3: Master list of appropriateness criteria for the validation of the appropriateness criteria derived in the expert consultation workshop.

Type	Appropriateness criteria	Technology Attribute	Application Case Attribute	A	B
Technical	Water Supply	Required water supply type for toilet	Existing water supply types		
	Water Volume	Required water volume for technology	Available water volume for sanitary use		
	Electricity Supply	Required reliability of electricity for technology	Availability and reliability of electricity supply		
	Fuel Supply	Fuel dependence of technology	Availability of fuel		
	Frequency of Operation and Maintenance (O&M)	Required frequency of labour to operate and maintain technology	Capacity for O&M		
	Pipe Supply	Requirement of pipes	Availability of pipes		
	Pump Supply	Requirement of pumps	Availability of pumps		
	Concrete Supply	Requirement of concrete	Availability of concrete		
	Spare Parts Supply	Required spare parts (types)	Availability of different types of spare parts		
	Physical	Temperature	Temperature requirements	Temperature range	
Flooding		Flooding tolerance	Flooding occurrence		
Vehicular Access		Required vehicle access for technology.	Accessibility of households		
Slope		Required slope for sewers	Slope distribution		
Soil Type		Required soil type and permeability for soil absorption	Soil type occurrence		
Groundwater Depth		Required groundwater depth to avoid groundwater pollution	Groundwater depth		
Excavation		Excavation requirements	Ease of excavation		
Surface Area (Onsite)		Required area for onsite toilet infrastructure	Availability of area onsite		
Surface Area (Offsite)		Required area for treatment technologies	Availability of area offsite		
Drinking Water Exposure		Risk of technology polluting a nearby water source	Distance to drinking water sources		
Capacity and managerial	Construction Skills	Required construction skills	Level of construction skills in local workforce		
	Design Skills	Required design skills	Level of design skills in local workforce		
	Operation and Maintenance (O&M) Skills	Required O&M skills	Level of O&M skills in local workforce		
Socio-cultural	Cleansing Method	Acceptability of anal cleansing materials for technology	Population distribution of anal cleansing methods		
Emergency	Lifetime	Possible lifetime of technology	Expected lifetime		
	Speed of Implementation for Toilet Structure	Required time to finish toilet infrastructure	Expected speed of implementation		
	Speed of Implementation for Treatment	Required time to implement functional technology	Expected speed of implementation		
	Scalability	Degree of difficulty to up-scale technology capacity	Importance of Scalability		
	Construction Parts Supply	Required types of parts for construction of technology	Availability of different types of construction parts		
Other					

R4.1 – Agenda for the Expert Workshop 2: Consolidate Selection and Plausibility Check

This workshop does not have to involve all the experts who participated to the first workshop, but can be done in smaller group (e.g. project team).

- **Introduction**
- **Presentation of preselected sanitation systems (per zones) and discussion**

Share the results you have so far: optional demarcation of zones and the preselected sanitation systems (per zone) explaining how you obtained them, for instance, which system template have been prioritised and why.

Ensure that everyone understands and agrees on the choices you made:

- ➔ *Does the system template refinement make sense according to the demarcation of zones and the decision objective?*
- ➔ *Are the preselected system options considered to be appropriate? Why (not)?*
- ➔ *How likely can the technologies included in the systems be implemented? List the threats and discuss how they can be overcome (if possible).*

Sometimes, the system only requires small changes, such as replacing one single technology with another. If needed, refine the preselection by including (resp. excluding) technologies previously excluded (resp. included) or by adjusting the prioritisation of system templates.

- **Decide on a set of preselected system options (per zones)**

Once the systems are all promising from an engineering point of view, decide on which systems you will evaluate in detail and present in the stakeholder workshop 2 in Step 5. Highlight the synergies between them (e.g. if the same faecal sludge treatment can be used for two different systems) and with other sectors (e.g. solid waste management).

- **Closure**

R5.2 – Agenda for the Stakeholder Workshop 2: System Evaluation

Disclaimer: This workshop has not yet been systematically tested in the field. However, the underlying approach (Lüthi et al., 2011b) is based on well-established methods from the field of MCDA.

- Present the decision matrix and allow stakeholders to ask questions.
- Weight different criteria further to identify preferred options.
- Allow stakeholders to rank the options regarding the weights and criteria performances.
- Agree on a preferred option to be included in the strategic sanitation plan or decide to reiterate the process by adjusting the appropriateness and evaluation criteria (this will require further analytical work and another workshop).

- **Introduction**

- **Whole group session: Presenting the decision matrix**

The different pre-selected sanitation systems are presented in detail and their advantages and disadvantages regarding the different appropriateness criteria are explained.

Then, the decision matrix is presented to show an overview on how the options perform regarding the overall appropriateness, resource recovery, expenditure requirements, and other relevant decision objectives.

- **Group work: Weighting**

Next, each stakeholder group distributes 100 points in total among the different decision criteria. The stakeholders directly decide what are the most important and least important criteria and how many points they each receive, and then distribute the remaining points. If this is challenging, the criterion considered the most important is assigned the weight 100. Then, the stakeholders decide which criterion they think is the least important and judge how much less important it is (compared to the most important one). For the other evaluation criteria, the weighting is chosen in between, according to their relative importance. In the end, the weights are scaled down so that their sum equals 100%.

This step is done by either each stakeholder separately, by groups representing the same stakeholder, or by the entire group if the preferences are similar.

- **Whole group session 1: Ranking or Scoring**

This session aims to bring different evaluation criteria into a comparable form. For each criterion, the sanitation systems are ranked according to their performance. The system with the best performance receives rank 1. Alternatively, scoring can be used to account for the relative difference between options. In this case an estimate in a scale ranging from most preferred to least preferred sanitation system (e.g. from *** to * or from 100 to 0 points) is assigned for each option per criterion.

With good facilitation, the ranking or scoring process should be feasible in the plenary. If different stakeholders' opinions differ too much, you might decide to let each participant do the scoring individually.

- **Group work: Calculating the total weighted score and ranking**

Next, participants can combine the weights and ranks/scores to derive the overall value for each sanitation system. This can be done by multiplying ranks scores by weights for each evaluation criterion and summing up the products for each sanitation system.

Then, the participants rank the sanitation systems according to their total values. In the case of the ranking, the lowest value corresponds to the best options. In the case of scoring, the highest value corresponds to the best sanitation system.

- **Whole group session 2: Review and discussion**

Different stakeholders may generate different rankings. Compare and discuss them. Analyse how sensitive the rankings are to scores and weights assigned to each of the evaluation criteria. Examine the extent to which vagueness about the outcomes or disagreements between stakeholders make any difference to the final overall results. This way, conducting a MCDA acts as a further “local check” of your sanitation system options and will eventually lead to a more accepted and appropriate decision.

Ideally, the discussion results in a final ranking agreed on by all stakeholders. If this is not possible, several options could be retained for the further process or it could be decided to reiterate Steps 1 to 5 of the Practitioners’ Guide.

If several options are retained, then it is possible to define several levels of agreement, such as:

- Endorse = Enthusiastic Support (“This is a great solution.”)
- Accept = Support (“Maybe not the best solution in my mind, but it is one I can support.”)
- Oppose = No support (“I cannot support this solution”)

These levels of support, along with a concise rationale for the respective choices of different groups of stakeholders, are a great summary. Finally, participants can be asked to suggest ways to reach agreement. The stakeholders opposed to a particular sanitation system should provide ideas on how it could be made acceptable to them, and supporters of certain systems should suggest modifications that might make it acceptable to others. This process will be unique for each case and there is no need here to provide much guidance.

- **Closure**

R5.3 – Further Reading and Training Material

Box 3 – Overview of this section

This section provides further reading and training material to equip you with the knowledge to effectively use the SaniChoice Step-by-Step Practitioner’s Guide in strategic sanitation planning. To get an overview on urban sanitation’s current status and future directions, one could read “A Sanitation Journey”, a joint publication by the Sustainable Sanitation Alliance (SuSanA), the GIZ Sector Programme “Sustainable Sanitation” and Eawag (Schertenleib et al., 2021).

Below, the reading and training material is provided according to the planning phases introduced in “A Sanitation Journey”:

- Diagnostic Phase
- Strategy Phase
- Evaluation Phase
- Planning Phase
- Action Phase

For each planning phase, the reading and training material is divided in:

- *Frameworks* (pointing to specific steps of planning frameworks);
- *Tools* (pointing to instruments operationalising the approaches);
- *Digital Learning* (pointing to online courses explaining approaches and tools);
- and *Further Reading* (pointing to publications providing in-depth knowledge on specific aspects, such as the consideration of gender, demand analyses or structured decision-making).

Diagnostic Phase

Definition

- Understanding of the current situation

Step of generic SDM process:

- Stage 1 – Clarification of the Context

Steps of *Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners’ Guide*

This phase needs to be completed before you can start with Step 1 of this Guide. Many approaches and tools have been developed to support this phase of the planning process.

- Frameworks

- [Community-led Urban Environmental Sanitation Planning \(CLUES\) \(Steps 1-4\)](#)

A multi-sector and multi-actor planning approach emphasizing the participation of all stakeholders from an early stage in the planning process.

- [Sanitation 21 \(Stages 1-2\)](#)

Key principles and planning guideline to help city stakeholders develop appropriate and affordable solutions to sanitation problems.

- [City Sanitation Planning \(Stages 1-3\)](#)

Citywide planning and decision-making framework that includes stakeholders to plan citywide sanitation by prioritising investments and selecting viable projects.

- [Towards more sustainable sanitation](#)

This Sustainable Sanitation Alliance document outlines the five sustainability criteria for sanitation.

- Tools

- [Shit or Excreta Flow Diagrams \(SFDs\)](#)

Show the proportion of faecal waste that is managed and where the unmanaged proportion ends up, thereby making the need for effective management visible.

- [City Service Delivery Assessment \(CSDA\)](#)

Shows why the situation is as shown in an SFD by assessing the enabling environment for citywide inclusive sanitation, and present the results in a simple and accessible way.

- [FSM Toolbox](#)

Web-platform with a suite of tools (including SFDs & SCDA) and resources designed to assist and guide assessments and planning of FSM infrastructure improvements.

- [SSWM Toolbox](#)

Compiles a variety of tools, from technologies and methodologies to behavioural change approaches and planning tools, in an accessible yet comprehensive way.

- [CLUES Toolbox](#)

Contains 30 “how-to-do-it” tools which support planners aiming to implement CLUES, ranging from bidding documents to operation and maintenance schemes.

- [Faecal Waste Flow Calculator](#)

Tool to determine faecal waste volumes along the entire sanitation service chain for the identification of the biggest losses and targeting locations of interventions.

- [Urban Sanitation Status Index \(USSI\)](#)

Tool for the GIS-based mapping of the sanitation status, allowing for prioritisation of the identified sanitation issues.

- [SaniPath](#)

Assessment of risks related to poor sanitation for the prioritisation of sanitation investments based on the exposures that have the greatest public health impact.

- Digital Learning

- [Consultant Capacity Development \(ConCaD\) - Part 1: Key concept & tools for urban diagnostics](#)

Builds capacity in consulting to conceptualise, plan, design and supervise the implementation of city-wide inclusive urban sanitation services.

- **Further Reading**

- [Faecal Sludge Management: Systems Approach for Implementation and Operation \(Chapter 14 - Initial Assessment, Chapter 15 - Stakeholder Analysis, Chapter 16 - Stakeholder Engagement\)](#)
Compiles the current state of knowledge of faecal sludge management, and presents an integrated approach that includes technology, management and planning.
- [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#)
(Stage 1 – Clarifying the Decision Context)
A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.
- [Gender and the Sanitation Value Chain: A Review of Evidence](#)
Provides a review of the current evidence available on gender in sanitation and concludes with key learnings to help advance research and understanding.
- [Methods to Reliably Estimate Faecal Sludge Quantities and Qualities for the Design of Treatment Technologies and Management Solutions](#)
Provides a data collection method to estimate quantities and qualities of sludge. This is an important input for the identification of sanitation systems in later steps.
- [How to analyse the demand of current and future users for water and sanitation services in town and cities in Africa](#)
Provides decision-makers and development stakeholders with the key concepts and tools of intervention required to carry out robust and usable demand analyses.
- [How to create a regional dynamic to improve local water supply and sanitation services in small towns in Africa](#)
Contains a methodology for developing a regional strategy for water and sanitation and the courses of action to be followed to facilitate access to finance and expertise.

Strategy Phase

Definition

- Definition of planning and decision objectives
- Identification of non-technical and technical options

Steps of generic SDM process

- Stage 2 – Definition of Objectives, Evaluation Criteria and Stakeholder Preferences
- Stage 3 – Development of Decision or Planning Options

Steps of Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide

This phase has been described extensively in this Guide. Alternative ways of approaching this phase can be found in the publications listed here.

- **Frameworks**

- [Community-led Urban Environmental Sanitation Planning \(CLUES\) \(Stage 5\)](#)

A multi-sector and multi-actor planning approach emphasising the participation of all stakeholders from an early stage in the planning process.

- [Sanitation 21 \(Stage 3\)](#)

Key principles and process guidelines to help city stakeholders develop appropriate and affordable solutions to sanitation problems.

- [City Sanitation Planning \(Stage 4\)](#)

Citywide planning and decision-making framework that includes stakeholders to plan citywide sanitation by prioritising investments and selecting viable projects.

- **Tools**

- [Compendium of Sanitation Systems and Technologies](#)

Presents a variety of sanitation technologies on one concise document, providing the reader with a useful planning tool for making more informed decisions.

- [How to select appropriate technical solutions for sanitation](#)

Contains a planning process and assists in identifying those sanitation technologies best suited to different contexts within a town.

- [Faecal Sludge and Septage Treatment: A Guide for Low- and Middle-Income Countries](#)

Provides straightforward guidance on the options for faecal sludge treatment and the choices between those options with a focus on low- and middle-income countries.

- **Digital Learning**

- [Consultant Capacity Development \(ConCaD\) – Part 3 – Selecting the right technologies](#)

Builds capacity in consulting to conceptualise, plan, design and supervise the implementation of citywide inclusive urban sanitation services.

- [Planning & Design of Sanitation Systems and Technologies – Week 2: Sanitation Systems and Technologies \(I\)](#)

Gives an introduction to plan for urban sanitation in a city and on community levels, based on different sanitation systems and technology configurations.

- [Planning & Design of Sanitation Systems and Technologies – Week 3: Sanitation Systems and Technologies \(II\)](#)

Part II of the course on planning for urban sanitation in a city and on community levels, based on different sanitation systems and technology configurations.

- **Further Reading**

- [Criteria for the evaluation and classification of conventional and innovative low cost sanitation technologies](#)

Provides a list of non-context specific criteria for the evaluation of different sanitation technologies which can supplement specific locally relevant criteria.

- [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#)

(Stage 2 – Defining Objectives and Evaluation Criteria and Step 3 – Developing Alternatives)

A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.

Evaluation Phase

Definition

- Detailed evaluation of options, finetuning, and comparison

Step of generic SDM process

- Stage 4 – Evaluation of Decision Consequences

Steps of *Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide*:

This phase has also been described extensively in this Guide. In the listed publications, you will find ways to gather information on additional criteria that are not sufficiently covered by SaniChoice.

● Frameworks

→ [Community-led Urban Environmental Sanitation Planning \(CLUES\) \(Step 5\)](#)

A multi-sector and multi-actor planning approach emphasising the participation of all stakeholders from an early stage in the planning process.

→ [Sanitation 21 \(Stage 3\)](#)

Key principles and process guidelines to help city stakeholders develop appropriate and affordable solutions to sanitation problems.

→ [City Sanitation Planning \(Stage 4\)](#)

Citywide planning and decision-making framework that includes stakeholders to plan citywide sanitation by prioritising investments and selecting viable projects.
ADD five sustainability criteria (SuSanA).

● Tools

→ [Sanitation Safety Planning: Manual for Safe Use and Disposal of Wastewater, Greywater and Excreta](#)

Step-by-step, risk-based approach to assist in the implementation of local risk assessment and management for the sanitation service chain.

→ [CLUES TOOL T17: Procedure for the Pre-Selection of Sanitation Systems](#)

Aims to facilitate the decision-making process by introducing a simple multi-criteria decision analysis for the pre-selection of suitable sanitation systems (MCDA).

→ [Life-cycle costs approach: Costing sustainable services](#)

Enables the consideration of a wide range of costs. The approach effectively compares the different WASH delivery systems within a district, country or region.

→ [Applying the life-cycle costs approach to sanitation](#)

Presents an application of the life-cycle costs approach to sanitation in rural and peri-urban areas in four different countries.

- **Digital Learning**

- [Planning & Design of Sanitation Systems and Technologies – Week 5: Urban sanitation tools and overarching themes](#)

- Gives an introduction to plan for urban sanitation in a city and on community levels, based on different sanitation systems and technology configurations.

- **Further Reading**

- [Faecal Sludge Management: Systems Approach for Implementation and Operation \(Chapter 13 - Financial Flows\)](#)

- Compiles the current state of knowledge of faecal sludge management, and presents an integrated approach that includes technology, management and planning.

- [Assessing the Costs of on-Site Sanitation Facilities](#)

- Provides an overview of the reasons for cost differences of sanitation facilities in different countries and gives recommendations on how high costs can be addressed.

- [Mapping of Water, Sanitation, and Hygiene Sustainability Tools](#)

- Assesses the current state of the market of tools for understanding, measuring and predicting sustainability in sanitation and identifies existing gaps.

- [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#)

- (Stage 4 – Estimating Consequences)

- A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.

Planning Phase

Definition

- Selection of preferred option
- Action planning

Step of generic SDM process:

- Stage 5 – Selection of Preferred Options

Steps of *Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide*:

This phase follows after the five steps introduced in this Guide. You find information on ways to go forward in the listed publications.

- **Frameworks**

- [Community-led Urban Environmental Sanitation Planning \(CLUES\) \(Step 6\)](#)

A multi-sector and multi-actor planning approach emphasising the participation of all stakeholders from an early stage in the planning process.

- [Sanitation 21](#) (Stages 4-5)

Key principles and process guidelines to help city stakeholders develop appropriate and affordable solutions to sanitation problems.

- [City Sanitation Planning](#) (Stage 5)

Citywide planning and decision-making framework that includes stakeholders to plan citywide sanitation by prioritising investments and selecting viable projects.

- **Digital Learning**

- [Consultant Capacity Development \(ConCaD\) – Part 2: Implementing CWIS in practice](#)

Builds capacity in consulting to conceptualise, plan, design and supervise the implementation of citywide inclusive urban sanitation services.

- **Further Reading**

- [Service Level Agreements for Inclusive Urban Sanitation Services: Lessons from a Global Review](#)

Provides insights on public-private partnerships for non-sewered sanitation services and shows how private actors can play a major role in providing sanitation services.

- [Business Models for Faecal Sludge Management](#)

Shows opportunities and bottlenecks that service delivery for FSM is facing from institutional and entrepreneurial perspectives.

- [Female-Friendly Public and Community Toilets: A Guide for Planners and Decision Makers](#)

Shows how to address the requirements of women and girls using public and community toilets in city planning and local-level implementation.

- [Shared and Public Toilets: Championing Models That Work](#)

Provides an overview of shared toilet models and informs planning and policy decision makers on whether and how to pursue shared toilet models.

- [How to manage public toilets and showers](#)

Introduces a demand analysis that helps decision makers allocate financial resources for the promotion of equity between users public sanitation services.

- [How to finance sanitation in Sub-Saharan Africa](#)

Provides a detailed list of all costs to be recovered in the sanitation value chain and introduces various potential sources of finance.

- [Hygiene and Sanitation Software: An Overview of Approaches](#)

A review of the state of the art in methods and techniques for sanitation and hygiene behaviour change, and other non-hardware aspects of sanitation programming.

- [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#)

(Stage 5 – Evaluating Trade-offs)

A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.

Action Phase

Definition

- Implementation
- Ensuring sustainable operation and maintenance

Step of generic SDM process

- Stage 6 – Implementation and Monitoring

Strategic Sanitation Planning with SaniChoice – A Step-by-Step Practitioners' Guide

This phase is also not addressed in this Guide. You find information about it in the listed publications.

● Frameworks

→ [Community-led Urban Environmental Sanitation Planning \(CLUES\) \(Steps 7\)](#)

A multi-sector and multi-actor planning approach emphasising the participation of all stakeholders from an early stage in the planning process.

→ [City Sanitation Planning](#) (Stage 6)

Citywide planning and decision-making framework that includes stakeholders to plan citywide sanitation by prioritising investments and selecting viable projects.

→ [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#) (Stage 5 – Evaluating Trade-offs)

A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.

● Further Reading

→ [Structured Decision-Making – A Practical Guide to Environmental Management Choices](#) (Stage 6 – Implementation and Monitoring)

A very accessible introduction to the process of structured decision-making (SDM). The SaniChoice methodology is based on SDM.

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SaniChoice



SaniChoice is developed by Eawag in partnership with the Sustainable Sanitation Alliance (SuSanA) and partners in Nepal and Ethiopia. The development of SaniChoice is financed by the Swiss Agency for Development and Cooperation (SDC) and Swiss National Science Foundation (SNF).

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