Sustainable Sanitation Practice

EcoSan Club

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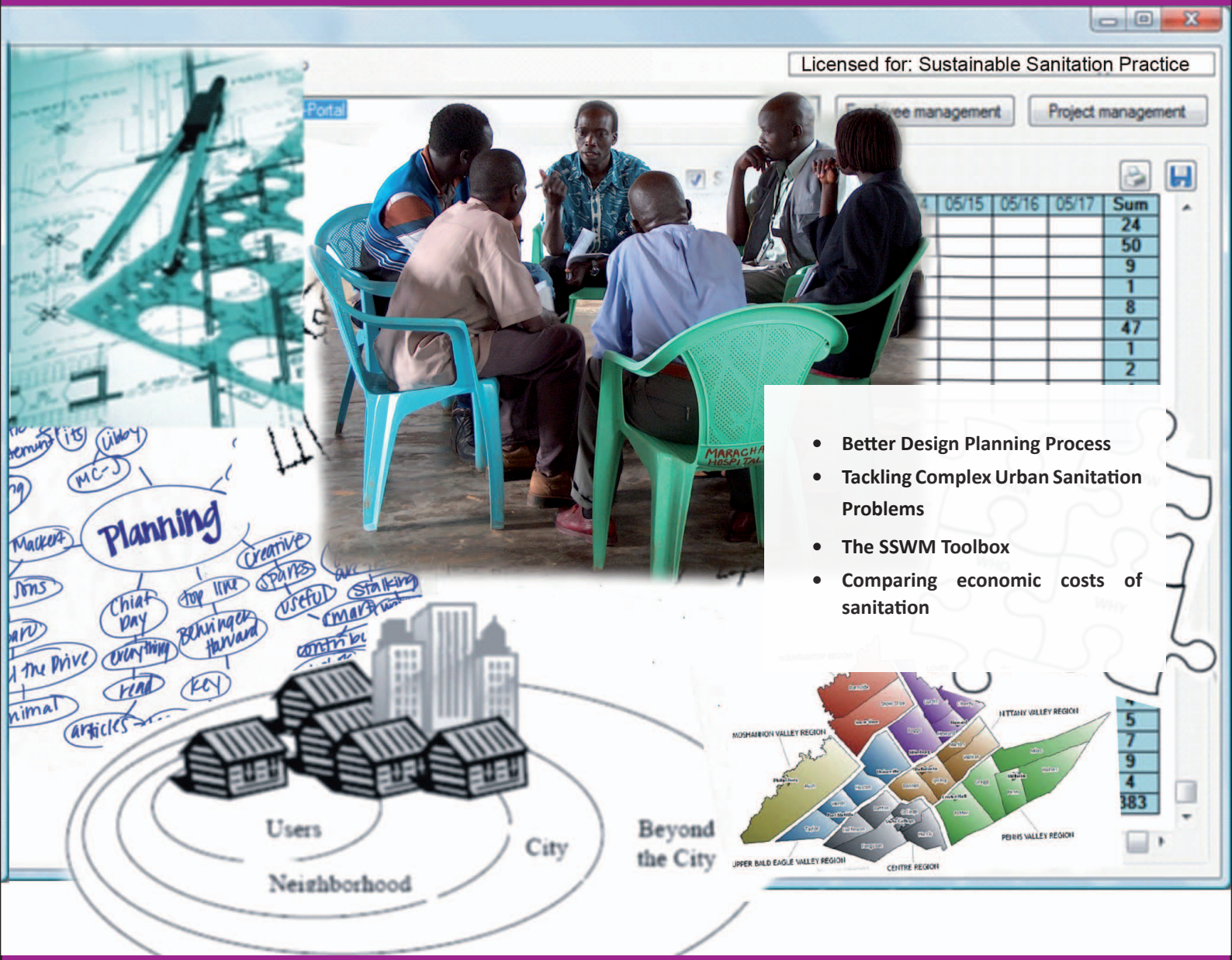

- Better Design Planning Process
- Tackling Complex Urban Sanitation Problems
- The SSWM Toolbox
- Comparing economic costs of sanitation

Planning Tools

partner of: sustainable sanitation alliance

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Sustainable Sanitation Practice (SSP) aims to make available high quality information on practical experiences with sustainable sanitation systems. For SSP a sanitation system is sustainable when it is not only economically viable, socially acceptable and technically and institutionally appropriate, but it should also protect the environment and the natural resources. SSP is therefore fully in line with SuSanA, the Sustainable Sanitation Alliance (www.susana.org). • SSP targets people that are interested in sustainable sanitation systems and the practical approach to it. • Articles are published after blind review only. • Sustainable Sanitation Practice is published quarterly. It is available for free on www.ecosan.at/ssp.

Sustainable Sanitation Practice (SSP) hat zum Ziel praxisrelevante Information in hoher Qualität im Zusammenhang mit „sustainable sanitation" bereit zu stellen. „sustainable" also nachhaltig ist ein Sanitärsystem für SSP wenn es wirtschaftlich machbar, soziokulturell akzeptiert, technisch als auch institutionell angemessen ist und die Umwelt und deren Ressourcen schützt. Diese Ansicht harmoniert mit SuSanA, the Sustainable Sanitation Alliance (www.susana.org). • SSP richtet sich an Personen, die sich für die praktische Umsetzung von „sustainable sanitation" interessieren. • Artikel werden nur nach einer Begutachtung veröffentlicht. • Sustainable Sanitation Practice erschient vierteljährlich, kostenlos unter: www.ecosan.at/ssp.

Information on the publisher / ***Offenlegung gemäß § 25 Mediengesetz***

Publisher: EcoSan Club, Schopenhauerstr. 15/8, A-1180 Vienna, Austria • chairperson: Günter Langergraber • website: http://www.ecosan.at/ • scope: EcoSan Club was funded as a non profit association in 2002 by a group of people active in research and development as well as planning and consultancy in the field of sanitation. The underlying aim is the realisation of ecological concepts to close material cycles in settlements.

Medieninhaber: EcoSan Club, Schopenhauerstr. 15/8, A-1180 Vienna, Austria • Obmann: Günter Langergraber • Gegenstand des Vereins: Der EcoSan Club wurde 2002 als gemeinnütziger Verein von einer Gruppe von Personen gegründet, die in Forschung, Entwicklung, Planung und Beratung in der Siedlungshygiene - Sammlung, Behandlung oder Beseitigung flüssiger und fester Abfälle aus Siedlungen - tätig waren und sind. Das Ziel des EcoSan Clubs ist die Umsetzung kreislauforientierter Siedlungshygienekonzepte (EcoSan Konzepte) zu fördern, um einen Beitrag zum Schutz der Umwelt zu leisten.

Cover Photo / ***Titelbild***

Editorial

It is generally assumed that an appropriate planning process is important for sustainable implementation of sanitation solutions. Therefore, a number of projects and institutions have been and are currently working on frameworks and tools for sanitation planning.
Issue 7 of Sustainable Sanitation Practice (SSP) on „Planning tools" highlights some of the on-going work (we do not have the aim to provide a complete overview). The editors define „planning tools" as tools that are used along the overall planning process/framework. However, the issue on „planning tools" also includes planning processes/frameworks.
The planning processes/frameworks/tools described in this issue include

- an analysis of the overall planning process and recommendations for improvement (McConville),
- the description of the Sanitation 21 strategic planning approach (Parkinson and Saywell),
- the description of the Planning and Process Tools section of the web-based SSWM Toolbox (Conradin et al.), and
- the description of a tool for planners to calculate economic costs of different sanitation options (Lechner)

For further information and publications on planning the editors would like refer to the SuSanA Working Group 6 on „Planning for sustainable sanitation" (www.susana.org).
The thematic topic of SSP's next issue will be „Solutions in mountain regions" (issue 8, July 2011). Information on further issues planned is available from the journal homepage (www.ecosan.at/ssp). As always we would like to encourage readers and potential contributors for further issues to suggest possible contributions and topics of high interest to the SSP editorial office (ssp@ecosan.at). Also, we would like to invite you to contact the editorial office if you volunteer to act as a reviewer for the journal.
SSP is available online from the journal homepage at the EcoSan Club website (www.ecosan.at/SSP) for free. We also invite you to visit SSP on facebook (www.facebook.com/SustainableSanitationPractice).

With best regards,
Günter Langergraber, Markus Lechner, Elke Müllegger
EcoSan Club Austria (www.ecosan.at/ssp)

Corrigendum:
SSP Issue 1 on „Greywater": Information provided on page 8 of Issue 1 has been amended based on the request from the author. The corrected files are available for download at the journal homepage.

Content

Towards Better Design of the Process of Planning for Sanitation

This paper provides a framework for improving understanding of the process of sanitation planning and recommendation for improvement of the planning process. The text is derived from Jennifer McConville's PhD thesis for Chalmers University of Technology (2010) and a policy brief written for the Stockholm Environmental Institute (2011).

Author: Jennifer McConville

Abstract

The provision of sanitation services is more than just technical solutions, but closely connected to the cultural and capacity of the society in which it is implemented. Given that the general opinion in the sanitation sector is that large-scale sustainable results are lacking on the ground, there is a need to start questioning how planning is done today and how it can be done better. This paper presents key entry points for understanding the process of sanitation planning by highlighting options for how it should be done (procedural planning theory), who to involve (participation), and criteria for decision-making. By focusing on these key aspects of planning, the process can be adapted to meet the needs of the local context. In the future sustainable urban sanitation will start with a specifically designed planning process that uses a mixture of planning modes and technical systems to meet the needs of diverse populations.

Sanitation Challenge

The world is not on track to meet the Millennium Development Goals related to sanitation, a fact which will have severe consequences on environmental and public health, poverty, and human dignity. The provision of sanitation services is more than just technical solutions, but closely connected to the cultural and capacity of the society in which it is implemented. Increasing the efficiency, scope, and longevity of sanitation investments therefore involves a process of choosing, implementing, operating and maintaining community-wide service provision. In other words, it requires proper planning.
Given that the general opinion in the sanitation sector is that large-scale sustainable results are lacking on the ground, there is a need to start questioning how planning is done today and how it can be done better.

Sanitation Planning

Planning is the process of evaluating different options for the future and deciding on how to implement them. Even if a planning process is never linear, it is useful for discussion purposes to divide the planning process into five basic steps, which are:

1. Problem identification,
2. Defining objectives,
3. Design options,
4. Select solutions, and
5. Action plan for implementation.

Each step has a specific purpose. For example, the purpose of step one is to anchor the process in the local context by identifying current problems. Recognition

Key Messages:

- More attention is needed to how the planning process itself is designed and conducted.
- The objectives for using participatory processes should be clearly defined at the beginning of the planning process and participation levels of all stakeholders adapted so as to be consistent with achieving these objectives.
- Differences between planning modes should be kept in mind when designing/adapting a planning process. Such modes should be deliberately selected to match desired outcomes in the local context.
- Recognizing criteria for sustainability is critical for achieving sustained service delivery. Locally agreed sustainability criteria need to be included in the project objectives and terms of reference, as well as indicators for monitoring and evaluation at project, program and donor levels.

of these different phases of planning is the first step towards a better design of the entire planning process; specifically noting that different approaches may be used or preferred depending on the purpose of the planning activity.

How to plan?

Procedural planning theory is a body of knowledge about how planning should or could be carried out. Theories range from expert-centered rational-comprehensive planning to empowerment-advocacy planning to consensus-driven collaborative planning. The results from a study in West Africa of how closely sanitation planning processes resemble these theories found that none of the studied guidelines and field projects followed a single planning approach throughout the whole planning process (McConville et al, submitted a). Since sanitation planning rhetoric does not specifically discuss the procedural objectives of various planning steps, this result seems to indicate a haphazard use or unconscious adaptation of different planning styles rather than a deliberate shaping of the planning process. If the planning process is to be improved, it is critical for sanitation planners to acknowledge and consider these different planning theories when designing a planning process.

A comparative study also found that sanitation planning guidelines from literature consistently recommend more communicative and participatory planning styles, especially including users, than was seen in the local cases studied (McConville et al, submitted b). This may be because it is too early yet to see evidence of a shift in planning practices from expert-driven approaches towards collaborative ones. There is some evidence from interview studies with sanitation planners and practitioner to support that this shift may be occurring, at least in individuals' thinking (McConville et al., 2010). However, there may be a number of institutional and social factors that create inertia around sanitation planning practices (Kvarnström et al., 2006), and hence may hinder the up-take of new planning modes. Advocates of innovative planning approaches should therefore seriously consider developing practical strategies for implementing more participative planning guidelines.

In addition, the process of designing technical options in the field of sanitation remains expert-led and uses a rational-comprehensive mode of planning in all of the studied guidelines and field projects. Essentially, all of the guidelines and field projects studied involve the experts coming up with a handful of possible designs that are then offered to the stakeholders, as exemplified in Box 1. This may seem to be the proper way to go about it since there is need for expert guidance to manage the complexity of sanitation systems and to assure proper containment and treatment of excreta. However, rational-comprehensive approaches have been criticized for resulting in plans that are all too simplified versions of reality and therefore impossible to implement in real world contexts (Allmendinger, 2009). In a situation where drastic change is needed to meet the needs of the un-served, it can also be argued that such technocratic approaches end up lacking critical connections with the socio-economic reality of the situation.

Box 1: Tension between advocacy planning and rational decision-making

An example of how theoretical tendencies vary during a planning process comes from a sanitation project in the small town of Tougan (pop. ca 16,000) in northwest Burkina Faso. The inter-state organization supporting the project, started with an advocacy approach to planning, attempting to empower local residents to define their own problems and visions for the future. However, technical options and solutions were then designed and selected by experts before being incrementally rolled-out in the project. This highlights a tension between the desire for advocacy and participatory planning approaches while being straight-jacketed by dominate rational-comprehensive and pragmatic mindsets. (Source: McConville et al, submitted a)

Who to involve?

In the field of sanitation, participation is often promoted as a tool for overcoming some of the major challenges to improved access to sanitation, such as low demand for sanitation infrastructure, poor hygiene habits, weak institutional structures and low capacity for operation and maintenance of built systems. Yet, preliminary explorations have found that not all forms of participation are equally influential in delivering successful urban sanitation services (Nance and Ortolano, 2007). The sector is lacking specific studies and guidelines regarding how participation should be facilitated and when it should take place in the process. To overcome this, a study was performed using tools for categorizing participation levels and decision-making domains to explain how and when participation appears in sanitation planning processes (McConville et al, submitted b). This study found that participation is generally less frequently occurring in practice than recommended in the literature (Box 2). Yet, even in planning guidelines, there is a tendency for low participation and high degrees of expert control, especially during the designing step. Community members and residents in particular are rarely given true decision-making power.

It may be the case that there is reluctance in society to participatory processes or that they are still a rather new idea and thus difficult to implement in existing social contexts. It has been noted that there is often a paradox between the theoretical desire for bottom-up, locally-developed solutions to local

problems and the traditional top-down decision-making processes that exist in many municipalities. However, this situation also puts into question whether efforts at using participatory planning are truly adding the benefits that are claimed they will provide.

So while there seems to be an underlying sense that participation is important for sanitation, it is not yet clear that participation is achieving the desired results or being implemented as envisioned in the field, nor in the most appropriate phase of the planning process. The following recommendations may improve the performance of future participatory processes:

- Objectives for a participatory process should be clearly spelled out in the beginning of the planning process and then participation events should be arranged in a way that is consistent with achieving these objectives.
- Identify which domains of stakeholders should be involved based on the level of service delivery imagined and the institutional structure that would be involved in the management of technical infrastructure.
- Once the objectives for participation of certain stakeholders are defined, and it is clear when in the process they will contribute, clear indicators for monitoring and evaluation should be developed so that future projects can actually document the evidence for (or against) participation in sanitation planning.

Box 2: Participation levels in Ouagadougou Strategic Sanitation Plan (PSAO)

The example of participation in the Ouagadougou Strategic Sanitation Plan shows how households theoretically could chose the on-site system they desired, but they nonetheless, most frequently choose the least expensive options saying it was all they could afford (McConville personal observation, 2007). In Ouagadougou, household participation and ultimately choice was also limited since many did not have the financial resources to invest in sanitation or were not properly informed of all the options by project field workers (McConville observations, 2008). These conditions raise questions about the possibilities to implement effective participatory processes. Although one of the main drivers for a participatory process is better adaptation of technology to local conditions (WSSCC/Eawag, 2005), there may be strong restrictions to innovation when decentralizing the planning process to people who lack financial, technical and information capacities to fulfill this role (Tiberghien et al., 2011). (Source: McConville et al, submitted b)

Figure 1: Field workers describing sanitation options to households (Photo: McConville).

Reasons behind decision-making

Interviews with local practitioners in West Africa revealed a different conceptualization of sustainability and emphasis on criteria than was found in sanitation literature (McConville et al, 2010). Literature on sustainable sanitation focuses on five categories of criteria: economic, socio-cultural, technical, health, and environment (Bracken et al., 2005; SuSanA, 2008). Practitioners in the field also stress the need for the first three, but do not often mention the last two criteria which are more about the functions that the system should perform. Instead of emphasizing these functional criteria, local stakeholders spoke of the need for a clear process with participation, proper planning and feedback mechanisms to keep it on track. This difference seems to emphasize two perspectives; on the one hand, the expert, engineering perspective that is concerned with the functionality of the system and designing appropriate technology and, on the other hand, the local practitioner concerned with embedding the system in the socio-economic reality so that the result will be a sustainable service.

When considering how criteria are used in studied planning processes, there are a few interesting trends to consider. Criteria for convenience do not often appear during the planning process, although it is a strong user driver (Box 3), perhaps indicating that the user perspective has been missing in the planning processes. In general, “sustainability criteria” appear in a haphazard fashion within the context of planning. This would seem to indicate that criteria are used more often as a wish-list or guiding principles than as systematic requirements that could be used in a monitoring tool that could assure a sustainable outcome.

Box 3: Drivers for sanitation from the users' perspective

A study aimed at identifying criteria that drive users to install sanitation systems and criteria for satisfaction was conducted in small towns in Ghana (McConville, 2010). The dominant drivers for constructing toilet (on-site sanitation system) were convenience, hygiene, and the availability of a subsidy. Users were satisfied when the sanitation system provided a comfortable, convenient and clean experience. They were happy that a toilet made their house more acceptable to visitors, as well as being impressed with the technical improvements that came with vent-pipes and alternating pits. It is interesting to note that while users wanted an affordable and culturally appropriate system, they also shared concerns with global sanitation experts regarding technical functionality for convenience, health and environmental hygiene.
In addition, an attempt to use sustainability criteria to evaluate this sanitation project highlighted a gap between the project objectives and sustainability criteria. The project objectives were not aimed at fulfilling sustainability criteria, even those named by program-level stakeholders. Sustainability criteria were thus not included in indicators for monitoring and evaluation, making it difficult to determine if they were achieved. Significant improvements in the sanitation situation may be possible through better linking planning and implementation objectives to achieve functional and sustainability criteria of the stakeholders.

A Mixed-Methods Approach

The main conclusion that can be drawn from the multiple studies behind this paper is that more attention is needed to how the planning process itself is designed and conducted (McConville, 2010). A number of different planning methods are already used in practice, but they often appear to be combined in a haphazard way. It is important to remember that there is a difference between coincidental ad hoc mixing of different planning modes and deliberate mixing of modes with the aim to maximize effectiveness of the process. Better design/ adaptation of the planning process should thus continue to rely on a combination of different planning modes (Luethi et al., 2009), but they would be intentionally employed at specific steps in the planning process based on a pre-defined understanding of what is needed to improve the sustainability of sanitation service interventions and of how to better adapt them to local context.
If an effective mixed-method approach is to be implemented, a clear understanding of the process and desired objectives within the different steps is needed. This work supports the development of systematically

Figure 2: Small town resident discussing what he desires from a sanitation system (Photo: McConville).

adapted sanitation planning processes, by providing a starting point for discussing and understanding the practice of sanitation planning and what implications the choice of planning mode or participation levels can have on the success of a sanitation project. There is no right or wrong answer to these questions; rather it is about choosing the right approach for the context at hand.
Any approach to addressing the heterogeneous reality of urban sanitation will need to be adaptable and diverse. In the future sustainable urban sanitation will start with a specifically designed planning process that uses a mixture of planning modes and technical systems to meet the needs of diverse populations.

Recommendations/ conclusion

- Differences between planning modes should be kept in mind when designing/adapting a planning process. Such modes should be deliberately selected to match desired outcomes in the local context, for example, by clearly defining the planning objectives and roles planners expect others and themselves to perform throughout the process.
- The objectives for using participatory processes should be clearly defined at the beginning of the planning process and participation levels of all stakeholders adapted so as to be consistent with achieving these objectives.
- The variety of perspectives regarding what is sustainable in the local context needs to be included in the planning process in order to achieve a system that offers an appropriate

technology at the right service level.

- Once local sustainability criteria are established they need to be included in the project document, terms of reference and indicators for monitoring and evaluation, at both program and donor levels. Specifically, project objectives and performance indicators should match the sustainability criteria of the stakeholders. Note that if actions to meet sustainability criteria are not spelled out in the terms of reference they will not be achieved.

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Sanitation21 – a Strategic Approach for Tackling Complex Urban Sanitation Problems

This paper focuses on the key elements of strategic planning that are required to address the complex nature of urban sanitation problems.

Authors: Jonathan Parkinson and Darren Saywell

Abstract

The paper presents a planning framework developed by the International Water Association (IWA) to be used by local authorities to systematically address the complexity of urban sanitation problems and develop a strategic response to these problems. The framework encourages the development of plans that are grounded within the context of the local environment. Evidently, sanitation technologies need to be compatible with the physical environment; but equally important is the need to ensure that proposed sanitation improvements are also compatible with the social and institutional context. The authors focus on the importance of a developing a comprehensive assessment of the capacities of the relevant institutions in terms of their organisational structures, human resources and interrelationships. They also focus on the need to develop a coherent policy for urban sanitation and the need for organisational strengthening to support the development and implementation of sanitation plans.

Introduction – the need to plan strategically

There is an increasing demographic imperative to focus attention on addressing the crisis in urban sanitation. Strategic sanitation planning is an approach that responds to local demands for improved services and identifies the most appropriate sanitation technologies and service delivery mechanisms. It builds upon the capacities of different stakeholders in order to prepare plans that have both temporal and spatial dimensions that are realistic given the limitations of existing resources. It involves a process in which stakeholders reach a collective understanding of the current situation and consensus about the way forward, where roles and responsibilities are clearly defined in the resultant plan. A key pre-condition for the development of sustainable sanitation solutions is therefore better coordination between various actors. It also involves engaging with local communities in a way that uses their resources to contribute towards the development and implementation of the plan.

Sanitation 21: a framework for strategic sanitation planning

The Sanitation21 framework produced by the International Water Association (IWA, 2006) aims to support municipal and local authorities prepare rational and realistic citywide sanitation plans; ensuring that decisions about investments to improve service delivery are embedded in the local context. The Sanitation21 framework divides the city into different 'domains' for decision-making and action from household to city level (see Figure 1). Each domain is used as the basis for analysis of stakeholder interests and factors that influence the identification of the appropriate sanitation systems (including both technology and management arrangements), which may vary according to the location within the city.

Key factors for successful strategic planning:

- Strategic sanitation plans need to take into account both spatial and temporal dimensions affecting the demand for sanitation in different parts of the city.
- Good planning involves effective engagement with the various actors in order to mobilize their support in the development and subsequent implementation of the plan.
- Successful planning is dependent on a clear understanding about the relationships between institutions and a clear definition of roles and responsibilities of the different actors.
- A lack of a planning 'culture' often constrains efforts to adopt a more strategic approach for sanitation planning.
- Strategic planning is unlikely to take root at municipal and local levels unless the policy context supports it.
- As part of the planning process, there is a need to build capacity to prepare and implement strategic plans.

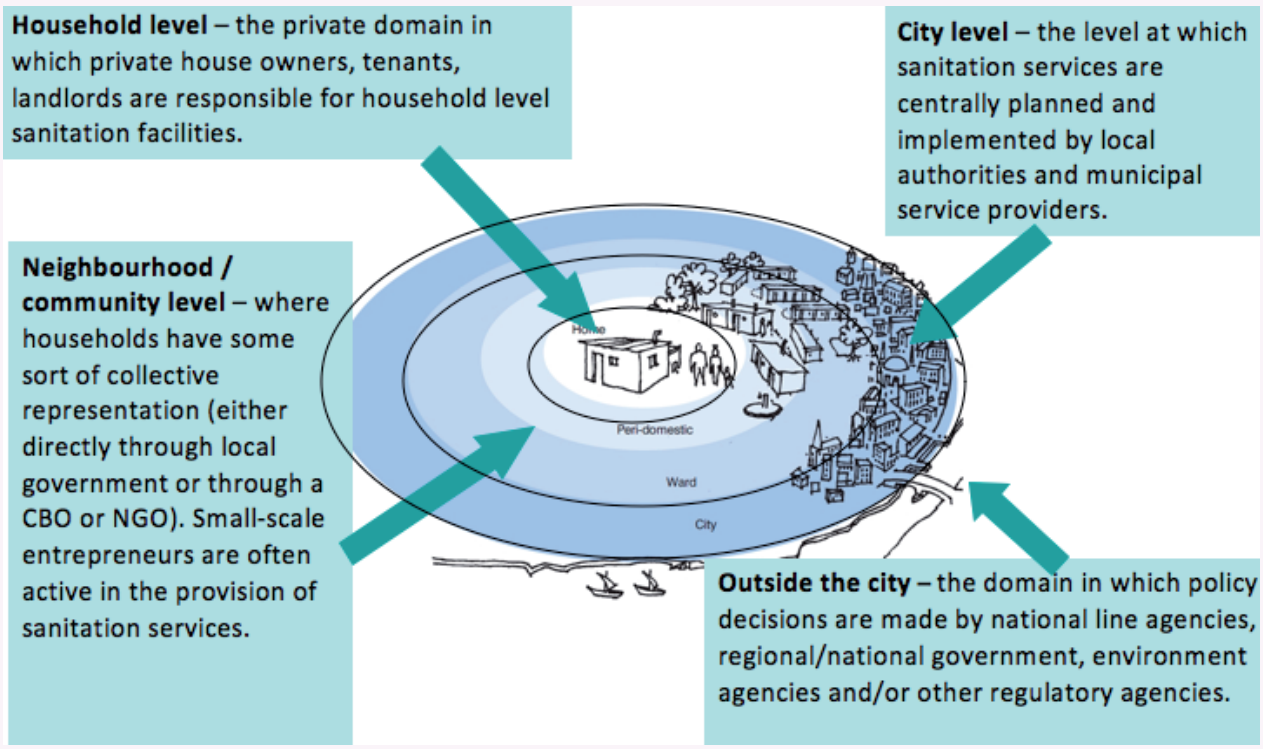

Figure 1 Stakeholders in different domains of the city and their strategic interests related to urban sanitation services

The planning process

Building upon the planning framework introduced above, this section elaborates upon the planning process in relation to the activities and outputs at different stages in the process. The ouputs should document the decisions made by the stakeholders and correspond with the three stages in the process as described below and illustrated in Figure 2:

Stage 1 - Understand the existing context and ensure commitment
Stage 2 - Review technical and management options
Stage 3 - Assessment of options and preparation of plan

These may be undertaken in the sequence of activities presented but in many instance the activities are likely to be concurrent and/or iterative and therefore one activity does not necessarily need to be fully completed before the next one is initiated.

Stage 1 - Understand the existing context and ensure commitment

1. Identify institutional stakeholders and establish level of commitment: This activity identifies the main stakeholders, their interests and priorities and the main roles that they play in the provision of urban sanitation services. The assessment should include both official political representation and non-governmental organizations representing community interests as well as private sector organizations (both formal and informal) involved in the provision of sanitation services.
2. Understand the existing context: The objective of this activity is to obtain a detailed understanding of the existing context in terms of the physical, environmental, social and institutional parameters in each domain (as shown in Figure 1). It is informed by a process of collation and sharing of information, combined with studies to assess the level of demand in relation to supply of sanitation services. This information should include spatial maps, demographic and socio-economic data, and details of existing service coverage at the household, communal and public levels, as well as extent of waste collection systems (sewerage and desludging services) and waste treatment infrastructure. Any previous planning documents related to urban sanitation should also be collected at this stage to provide a basis for reviewing the degree of success of previous initiatives.
3. Define objectives of improved sanitation and propose service levels: Based on the interests of the stakeholder groups, expectations for improvements in sanitation facilities and services are likely to be different. In order to develop a consensus about the focus of the planning activity and objectives of investments, it is necessary for stakeholders to understand each other's interests. This involves a process of consultation and reconciliation of stakeholder interests in order to agree upon the level of service in relation to the capacity and

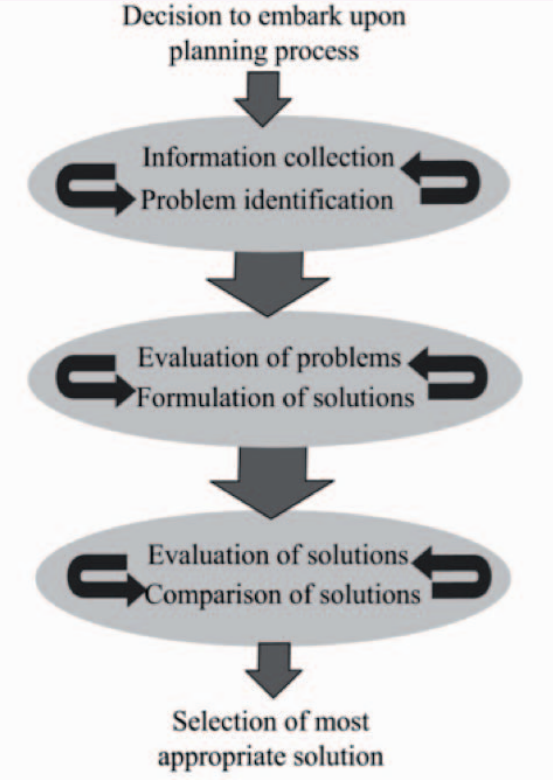

Figure 2 Stages in the planning process (Parkinson and Mark, 2005)

willingness to pay for improved services.

4. Confirm stakeholder commitment: As good planning requires a commitment to cooperate between different institutional stakeholders, there is a need to ensure that the local authority and the main organisations responsible for service delivery are in overall agreement about their roles and responsibilities related to urban sanitation. These stakeholders should be encouraged to sign a 'Sanitation Charter' as described below.

Output from Stage 1: Sanitation 'Charter':
The 'Charter' is a policy statement for the principle institutional stakeholders to agree upon common values to improve urban sanitation and show commitment to collaborate on the planning and work required to improve the delivery of urban sanitation services in their city. Referring to relevant national policy where appropriate, the charter should provide a set of fundamental principles that govern the way that service delivery is programmed. In doing so it should mitigate future disagreements about overall policy towards sanitation services in the city and to demonstrate the commitment to citizens to improve sanitation in the city.

Stage 2 – Review technical and management options

5. Identify viable sanitation technologies in relation to the physical environment: The aim of this activity is to identify feasible sanitation technologies that are considered appropriate and viable within the context of the physical environment. Factors that need to be taken into consideration include operational performance and expected levels of service, construction and operational costs and flexibility for adaptation to future urban development. Specific attention is required for those areas that are hard to serve and different technologies are likely to be more appropriate for use in different parts of the city.

6. Costing options: This activity involves a financial assessment of the relative costs of each of the proposed solutions. Technologies should be costed in terms of their capital, operational and routine maintenance, as well as capital maintenance costs. The costing should take into account costs associated with promotion and management as well as hardware costs. These costs are used as the basis for whole life-cycle assessment to calculate the Net Present Value (NPV) for each option in order and identify the most cost-effective option in the long term.

7. Assess alternative management and financing arrangements: All facilities in different domains need to be managed effectively for the system as a whole to work. This activity looks at the various management arrangements and the alternative approaches for financing sanitation improvements. Neighbourhood and city-level infrastructure may require a different type of management arrangement. The local authority does not have to be the sole player. Contracting out operation and maintenance to private sector operators may result in a better quality of service delivery. NGOs and CBOs may also have a role to play; offering specific human resources that are unavailable within government agencies and a way to more effectively engage with households and communities.

Output from Stage 2: Draft Strategic sanitation plan
The draft strategic improvement plan should build on the agreements enshrined in the Sanitation charter; providing indication of the priority areas for intervention throughout the city. The draft plan should describe the options for sanitation service delivery, including details of technologies, management arrangements and costs.

Stage 3 - Assessment of options and preparation of plan

8. Review viable technical options in relation to institutional and managerial capacity to sustain: This review involves an assessment of the proposed technologies and management arrangements in relation to the technical, managerial and regulatory capacity of the local institutions that are responsible for sanitation services or likely to be involved in the delivery of these services. Generally speaking, the

more complicated the technology, the greater the need for specialist personnel and equipment. This suggests that it is best to use simpler technology options where these are viable.

9. Check proposed service delivery option meets public expectations and willingness to pay: This activity involves consultation with local communities to ensure that the proposed approach (or approaches if different systems are proposed for different areas) towards delivery of improved sanitation services meets their expectations and is within their capacity to pay service charges. This should enable residents to engage in an informed discussion with representatives from the proposed service provider and local authority to reach consensus on the way forward. Some options may meet with a negative response due to residents' concerns over issues such as the level of service, cost sharing arrangements or operation and maintenance requirements. If the proposed improvement option is not considered to be acceptable, then it may be necessary to revert to previous stages of the decision making process and consider other technologies or service delivery and financing arrangements.

10. Reach consensus and finalise plan: The final activity in the planning process involves pulling together the various components of the plan into one coherent document and using this as the basis for final consultation with the various actors and institutional stakeholders. The feedback from this consultation should also enable the municipality to design an appropriate implementation process that encompasses not only physical works but addresses communication needs. The outcome should be consensus on the preferred option(s) in technical, financial and managerial terms and provide clear definition of the roles and responsibilities for implementation and operation and maintenance.

Output from Stage 3: Final strategic sanitation plan

The final sanitation plan identifies the priority areas for intervention and be the reference document upon which future investments are made. The plan sets goals and measurable objectives to address existing critical issues and future demands due to population expansion. It should be disseminated to all relevant stakeholders and used as the basis for discussing financing with the Ministry of Finance, development banks banks and other potential sources of international finance. The plan should provide the basis for design but does not need to include details for implementation or operation that are required at a later stage. These do not need to be elaborated until funds are made available.

Understanding the social and institutional context

The section describes the importance of increasing understanding of the social and institutional context as part of the strategic planning process.

Stakeholder analysis

In each domain, there is a need to identify and consider those factors that influence and incentivise the behaviours of different stakeholders. It is important to understand these interests as it will help to explain why some proposed solutions are likely to work better than others. The activity should involve a review of any relevant policy documents and an assessment of the key factors that influence the activities of each stakeholder. Referring to the domains in the Sanitation21 framework in Figure 1, there are a wide range of motivations for improving sanitation in the urban environment and different stakeholders may have different perspectives on the same problem. For example, the local authority's primary interest is likely to be to keep the city clean and to avoid outbreaks of infectious disease. Residents on the other hand are usually more concerned with their everyday needs for a convenient, safe and sanitary latrine to perform their basic bodily functions. Meanwhile, the mandate of environmental agencies and river basin authorities is to safeguard the quality of natural water courses. Strategic planning requires understanding and reconciling these different interests.

Assess organisations and their institutional relationships

This activity looks at the organisational set-up of the main institutions involved in service delivery and the staffing within the institutions. It should also assess information management and communication channels within the organizations and the capacities of the key actors that will influence the potential for successful implementation and sustainability. Human resource audits may be used to provide a profile of the capacities in different parts of the organization and identifies employees qualified for specific positions. The activity also assesses the effectiveness of organisations which depend upon complex behavioural factors. These behaviours may be influenced by a wide range of incentives; many of which are associated with financial gain. Power relationships between different groups that may influence decisions and actions should be analysed and understood. Micro-political mapping diagrams may be used to assess the relationships between actors in order to evaluate intra-sectoral support for new policies or ideas from the perspective of different stakeholders.

Assess the effectiveness of different initiatives

This activity reviews the effectiveness of past initiatives and programmes directly or indirectly related to sanitation and wastewater management. The factors

that are identified to determine the success or failure of these initiatives may also influence future initiatives. Problems are often attributed to technical deficiencies in service delivery, whereas in reality the primary challenge is a symptom of a larger problem related to institutional performance of relevant agencies and authorities. As a result, too much focus on technical problems may mean insufficient attention is paid to the diagnosis of institutional problems and the importance of management and leadership to address these problems. Problem tree analysis can help stakeholders identify the fundamental causes of problems, and the most important effects that they generate. The main output of a problem tree design exercise is a cause and effect diagram which creates a logical hierarchy of causes and effects and the links between them. It is crucial that there is good representation of stakeholders during problem tree design sessions – as there may be considerable difference of opinion between different stakeholders.

Concluding remarks

There are a number of areas that may undermine efforts to embark on a successful planning process. As noted above, one of these relates to broader policy issues. If national policy is not formulated in a way that enables flexibility on the ground to adopt appropriate technical and managerial solutions, then it is likely that the planning process will be continually challenged and may not be successfully completed. The signing of a 'Sanitation Charter' may overcome some of these constraints but constraints enshrined in policy may avert the process from the onset. If this is the case, then the focus of attention should be at a higher level to address more fundamental issues related to national policy before proceeding with strategic planning (Tayler and Parkinson 2005).

Institutional factors have a significant impact on the successful implementation of sanitation policies and are linked directly to the efficacy of urban management in general. It is therefore important that plans are developed in way to ensure that there are sufficient institutional capacity and managerial and technical competences to produce and implement them. Capacity building activities will vary from overall improvements in the technical and managerial capacity of staffing to the formulation of procedures that promote accountability and transparency, and to the introduction of information technologies to assist in administrative functions. The most obvious focus for efforts to improve capacity for strategic planning will be on courses designed to provide the knowledge and skills that are directly relevant to the strategic planning process. This training should ideally be linked to strategic planning activities in the field so that the trainees can see how strategic principles and processes might apply in concrete situations (Tayler et al .2003)

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Planning Water and Sanitation Interventions with the SSWM Toolbox

This article presents the Planning and Process Tools section of the Sustainable Sanitation and Water Management (SSWM) Toolbox and shows how it can be used for a more holistic understanding and application of planning approaches in water and sanitation.

Authors: Katharina Conradin, Dörte Peters, Dorothee Spuhler

Abstract

This article presents the Planning and Process Tools section of the Sustainable Sanitation and Water Management (SSWM) Toolbox and shows how it can be used for a more holistic planning and implementation of water and sanitation interventions. The Planning and Process tools section provides the reader with a thorough overview on the most important existing programming and planning frameworks and field-tested approaches, allowing him or her to find and apply the approaches fitting best to his case. At the same time, the Toolbox also describes various tools for each single planning step individually, so they can be mixed and matched together as needed for the intervention. Furthermore, the SSWM Toolbox as a whole supports users to move from the planning process to implementation by linking the Planning and Process section to an equivalent section on Software or Hardware Implementation Tools, thereby contributing to the overall awareness on sustainable sanitation approaches as well as their practical implementation.

Introduction

The world is facing a global water crisis. Worldwide, still more than 1.1 billion people live with inadequate access to safe drinking water and more than 2.5 billion people lack access to improved sanitation. These failures have dramatic consequences for the environment, public health and development and thus seriously undermine progress towards achieving the MDGs. Besides continuing population growth and urbanisation, rapid industrialisation and expanding and intensifying food and goods production are all putting pressure on water resources. Climate change exacerbates the problems. But although water is scarce, it is often used in an unsustainable way: Different stakeholders from households, agriculture or industry generally fulfil their water needs without taking into account the impact on other stakeholders. This lack of coordination leads to an overuse and waste of resources. As proper treatment and reuse of wastewater is not a norm, the contamination of aquatic ecosystems, a lack of nutrients and soil degradation in agriculture as well as negative impacts

Key Messages:

- The Sustainable Sanitation and Water Management (SSWM) Toolbox is to date the most comprehensive open source collection of tools, covering not only planning and process approaches from the water and sanitation sector, but also software and hardware implementation tools. It follows a holistic approach that tries to link sustainable sanitation, water management and agriculture.
- The Planning and Process Tools section of the toolbox helps stakeholders to develop an understanding of the importance of a sound planning process and supports them to implement a participatory planning process in the field of water management and sanitation.
- In order to make the step from planning to implementation, the user finds – in a further section – an array of hardware tools (technologies) and software (behavioural) approaches to implement water management and sanitation interventions more sustainable.
- The toolbox can be used by individual users such as NGO staff, students, planners, or members of development aid organisations – but it is also the basis for courses on sustainable sanitation and water management.
- The toolbox was developed by seecon gmbh, together with a large network of partners from all around the world, many of them members of the Sustainable Sanitation Alliance (SuSanA).

on food security arise.

Sustainable Sanitation and Water Management – SSWM – proposes to combine the notion of integrated water resource management (IWRM) and Sustainable Sanitation as an answer to this global crisis (see Figure 1). The concept of IWRM links water to other vital resources and views the whole water cycle together with human interventions as the basis for sustainable water management. The main objective of sanitation, on the other hand, is to protect and promote human health by providing a clean environment and breaking the cycle of disease. In order to be sustainable, a sanitation system does not only have to be economically viable, socially acceptable, and technically and institutionally appropriate, it should also protect the environment and natural resources. Thus, sanitation is closely linked to both issues of public health and environmental protection, and also to the management of other resources, such as water, nutrients and biofuels.

seecon international gmbh, together with many partners from the Sustainable Sanitation Alliance (SuSanA), as well as partners from the IWRM sector, has recently developed an integrative, local-level capacity development tool taking into consideration this holistic approach (the SSWM approach). The SSWM Toolbox considers the whole water cycle (from source to sea and back), including both the water and the nutrient loop and showing links between both. The Toolbox contains a guided exercise to prioritise and understand one's local problems as well as a large compilation of factsheets on Hardware, Software, or Planning and Process Tools. The Toolbox is open source and available on the web (www.sswm.info) and contains also a comprehensive collection of further readings, links, a library, glossary, ready-made PowerPoints and soon also a train-the-trainers section. The Planning and Process Tools section of the toolbox contains numerous planning frameworks and field-tested approaches, allowing a more holistic planning and implementation of water and sanitation interventions. At the same time, the SSWM Toolbox supports users to move from planning to implementation by linking the Planning and Process Tools section to an equivalent section on Implementation Tools.

What is the SSWM Toolbox?

The Sustainable Sanitation and Water Management Toolbox is a comprehensive capacity development tool linking up sustainable sanitation, integrated water resource management and agriculture on the local level in order to save and recycle water, regain resources and protect aquatic ecosystems. Figure 1 shows the fields that a sustainable and holistic water management and sanitation approach should take into consideration – namely the whole water (and nutrient) cycle from source to sea and back. Like this, it contributes to water and sanitation related interventions that are economically viable, socially acceptable, technically and institutionally appropriate, and protect the environment and natural resources.

The Toolbox is open-source and available on www.sswm.info. It is divided into six main sections, containing a guided exercise to prioritise and understand one's local problems (Understand your System), a large compilation of factsheets on hardware and software tools and approaches (Implementation Tools), the tools you need to plan for and implement solutions (Planning and Process Tools), plus a section explaining the Concept and one providing Background information – all topped with further readings, links, a library, glossary, ready-made PowerPoints and soon also a Train-the-Trainers section (see also Figure 2).

The Toolbox has been developed with the contribution of many partners form the water and sanitation sector bringing in their complementary expertise regarding planning or implementation; software or hardware aspect. It does not reinvent the wheel, but aims at making available all the existing and valuable material in a comprehensive way (i.e. 'the best of') showing also how the different activities are interlinked, and structuring this material in a way that makes it accessible also for practitioners.

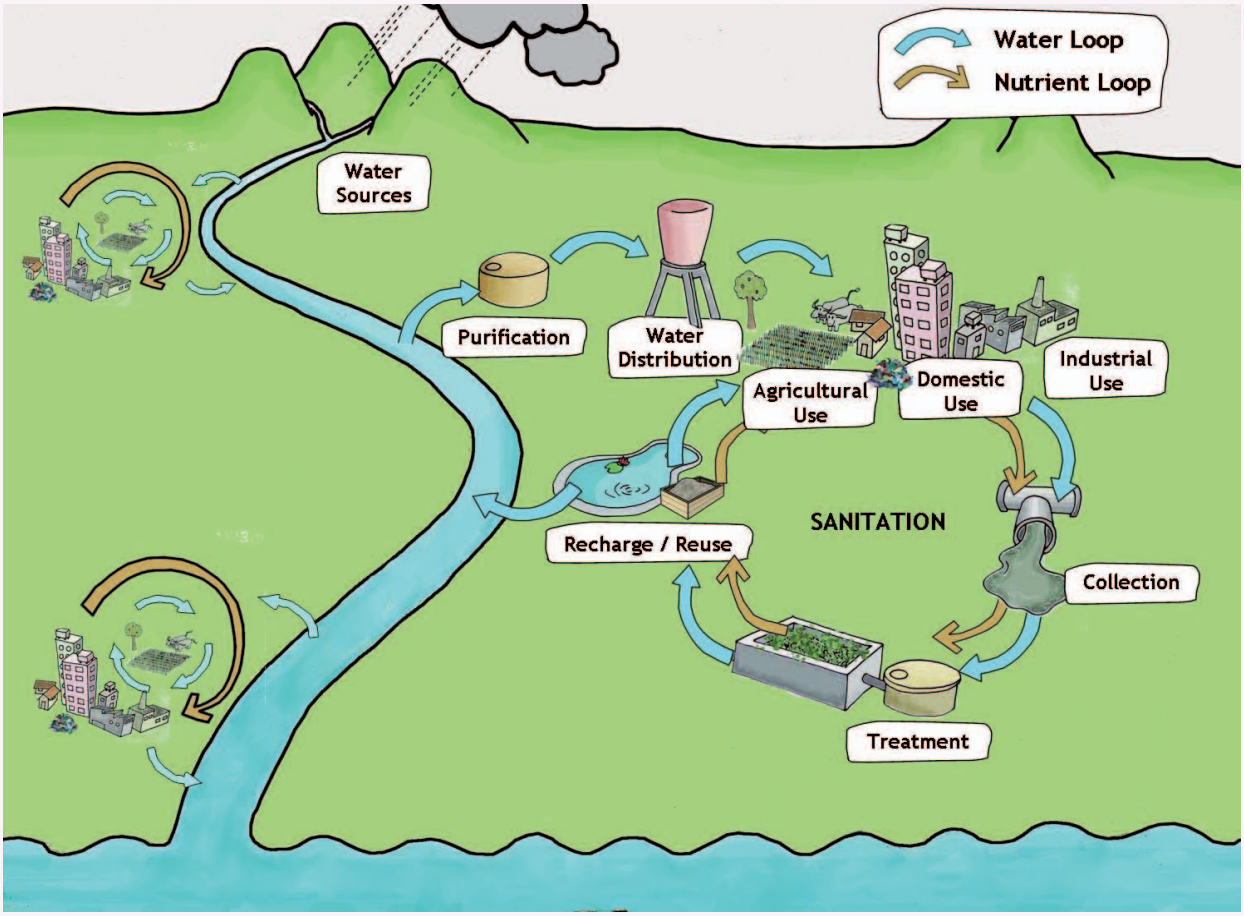

Figure 1: The Sustainable Sanitation and Water Management Loop (seecon, 2010)

Figure 2: The Sustainable Sanitation and Water Management Toolbox (www.sswm.info). contains a guided exercise to prioritise and understand one's local problems, the tools you need to plan for and implement solutions, a large compilation of factsheets on hardware and software tools and approaches, topped with further readings, links, a library, glossary, ready-made PowerPoints and soon also a Train-the-Trainers section.

The Planning and Process Tools of the SSWM Toolbox

There is surely no shortage on innovative solutions to optimise local water management and sanitation systems. However, the tricky part is often how to plan and proceed in implementing those solutions. This is where the Planning and Process Tools of the SSWM Toolbox come into play. The main benefit of the toolbox is its holistic approach: It does not just focus on the planning but on the different steps that are necessary from an idea to a working solution – it first helps to identify local problems, then supports the planning process and then also presents a range of solutions that are apt to improve the specific local situation.

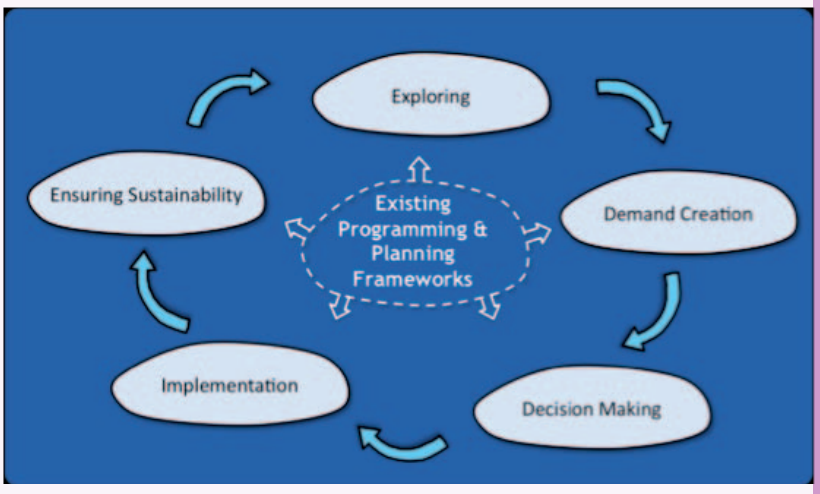

Figure 3: Planning and Process Tools – an Overview (seecon, 2010)

In the Planning and Process Tools section (see the SSWM Toolbox presents two different strategies: On the one hand, ready-to-use planning frameworks and approaches that have been tested and approved over and over again are presented (Existing Programming and Planning Frameworks). On the other hand, different approaches and technologies are presented for each of the five classic planning steps (Exploring, Demand Creation, Decision Making, Implementation and Ensuring Sustainability).
In this sense, the SSWM Toolbox helps users to:

- get an overview on existing planning frameworks and approaches
- combine the individual steps necessary to move from an idea to implementation in an own mix-and-match approach
- complement their knowledge on planning by getting to know alternatives to the commonly used accompanying interventions (Software Tools) or technologies (Hardware Tools)
- understand and practically take responsibility for a planning process in regards to sustainable sanitation or water management.

Planning approaches are normally based on the classic project cycle: Hence, many organisations developed step-by-step participatory programming and planning frameworks or approaches to help finding, selecting, and implementing solutions and ensuring the long-term sustainability of sanitation, water and hygiene interventions. All frameworks and approaches have in common that they follow the idea that all stakeholders concerned should be involved in the whole process. They do not just need to be informed but actively included in the planning, decision making, implementation and follow up process, as this ensures the long-term sustainability of projects and programmes. Though there is no consensus on the number of 'steps' or how they should be named, most approaches cover at least the five steps shown in Figure 3.

Existing Programming and Planning Frameworks

In the Existing Programming and Planning Framework section (Figure 3, centre), the SSWM Toolbox pays tribute to approaches that have shown their practicability in the past. These approaches are shortly presented. Moreover further open source resources or links to further web-based information (e.g. links to the institutions that have developed the approach) can be found so that interested readers can go into details to learn enough to implement an approach on their own.
While all approaches include steps to move from an idea to its actual implementation, some approaches focus more on behavioural change (e.g. PHAST) to initiate a process and achieve a change, and other put more weight on demand creation (e.g. the Community Led Total Sanitation (CLTS) approach). Household Centred Environmental Sanitation (HCES), as another example, guides people through an integrated ten-step multi-sector and multi-actor process for planning environmental sanitation services. Which framework or approach serves best for a specific purpose depends on the local situation, the focus of the user and his/her preferences.

Mix and Match of Participatory Planning and Processe

Many of the existing planning frameworks or approaches use common participatory planning and process tools that are also widely used in other development fields. The most well known of these 'packages' of participatory tools is Participatory Rural Appraisal (PRA), another example is SARAR. These packages differ in how they have been developed (by whom and for what purpose) and, to some extent, in how they have been applied in the field. Nevertheless, their basic steps are normally repeated in one or the other form in any planning approach. Taking this into account, the SSWM Toolbox also presents tools for each of the individual planning steps, grouped into the five sections Exploring, Demand Creation, Decision Making, Implementation and each

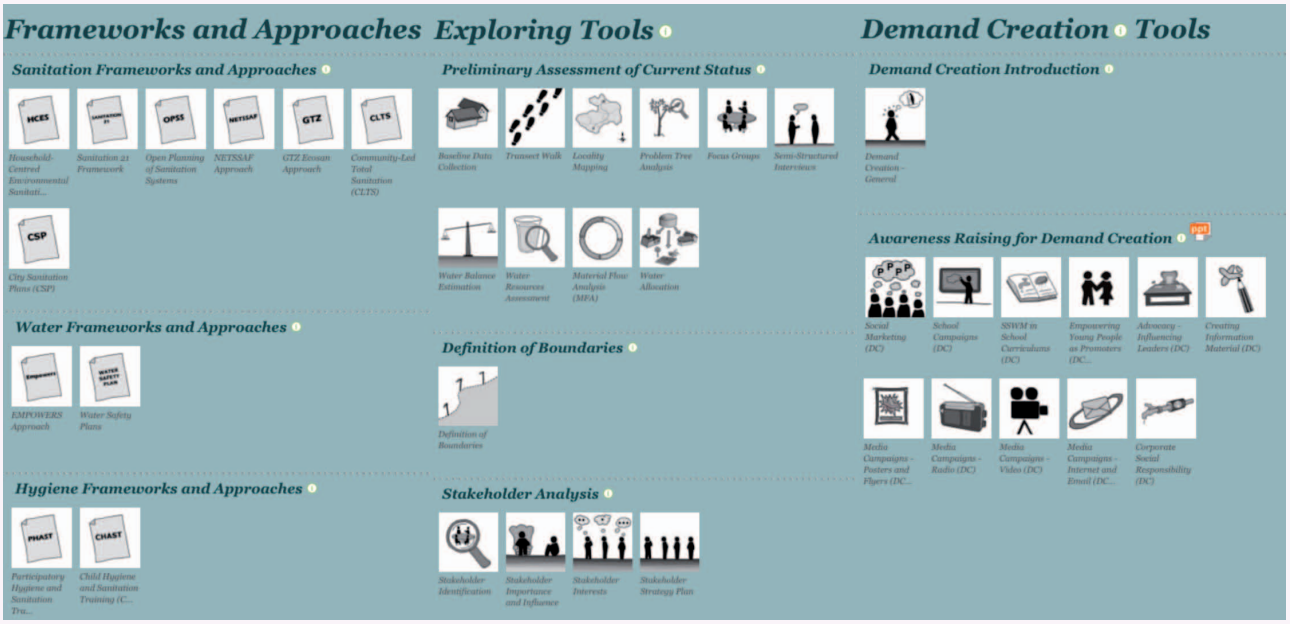

Figure 4: Close-up of three sections of the Planning and Process Tools – the Existing Programming and Planning Framework, the Exploring Tools and the Demand Creation Tools, each comprised of a number of individual tools to support the respective step of the planning process

section are often similar and complementary, and can be mixed and matched together for

any planning step. For each of these five sections, there is a concrete 'tools collection', as shown for the three sections Framework and Approaches, Exploring Tools and Demand Creation Tools (see Figure 4).

Exploring Tools

Starting any project or process, it is crucial to begin with an analysis of the situation. The tools presented in the Exploring section (see Figure 4) help to identify the current situation. The questions to be answered in this phase are: How is the current status? Which stakeholders are involved? Which problems exist? Which boundaries are there? In short, the tools in this phase summarise all relevant activities at the beginning of a planning process to allow for a smooth and deliberate start.

Demand Creation Tools

If there is no demand, many approaches (e.g. CLTS) propagate the creation of demand in the first place, so that the request for solutions comes from the people, not the implementing agencies. It is important that the concerned people really want a project or process, so that there is not just a short-term, but a long-term acceptance and success. The tools (see Figure 4) presented in the Demand Creation part show how to stimulate interest in and positive notions (e.g. via advocacy work, media and school campaigns, or social marketing) towards new approaches or technologies. It shows how to create demand in general and it indicates which awareness raising tools can be applied for this purpose.

Decision Making Tools

Decision making is a very important part of any process: In order that proposed solutions are the ones desired by the actual users, all involved stakeholders should be able to have a say in decision making. This ensures that the proposed solution gets the support it needs during implementation, and that the project is actually successfully used after termination. The Decision Making Tools (see Figure 4) help managing the participation of different stakeholders at different steps: from gathering ideas, analysing the situation together with the local population, to taking decisions and planning further actions together with the stakeholders.

Implementation Support Tools

The implementation of any project or programme again takes place in different steps, each of which requires different skills: This part of the Planning and Process Tools offers support carrying out these activities (e.g. writing concepts and proposals, financing and implementation in the field) and makes sure crucial aspects (such as a sound financing mechanism) are taken into account.

Tools to Ensure Sustainability

The activities to ensure that programmes and projects will be sustainable in the long-term are often forgotten. This is unfortunate, because time and funds invested should not reach only a short-term outcome. That is why the Sustainable Sanitation and Water Management Toolbox includes a section on crucial tools to ensure sustainability: ongoing participatory monitoring and evaluation, operation and maintenance and ongoing follow-up and support.

Link from Planning & Process Tools to Implementation Tools

As described above, the Planning and Process section of the SSWM Toolbox offers the opportunity to choose the best available tool for each stage of a project or programme cycle. But this is not all the Toolbox can offer you. Planning is just one side of the coin; or, said differently, we must know what we plan for! The SSWM Toolbox is designed in such a way that it provides support for both sides, planning and implementation. While the Planning and Process Tools section helps, as the name says, in the planning an implementation process, the Implementation Tools section actually shows countless tangible options – both technologies (Hardware) and behavioural interventions (Software) – to actually make water management and sanitation more sustainable. Both sections are closely interlinked (user of the Process and Planning Tool section can find short-cut links to related implementation topics and vice versa), making sure that planners keep in mind the different hardware options, and that technicians also think of how to plan the actual intervention sustainably.

Partners of the SSWM Toolbox

In the past, several organisations have realised the need for a more holistic capacity development support tool, which not only links up sustainable sanitation to water management (i.e. private users with the political level and the agriculture sector to the water or industry sector), but combines technologies and software approaches, and brings together people from all these fields at every step of a project cycle. Several of those organisations have been unified under the aegis of seecon international in order to compile the state-of-the-art know-how, experiences and expertise in the field of Sustainable Sanitation and Water Management all together in a Toolbox. To get them working, seecon international has benefited of the joint membership of many of them in the Sustainable Sanitation Alliance (SuSanA), showing both the importance and the 'raison d'être' of such an overarching organisation. But also the dedication of others have made the development of the SSWM Toolbox possible – for instance Sourabh Padhke, former architect, schoolteacher and well known activist for sustainable systems in the sector, who has designed all the appealing icons. The following partners have contributed to the SSWM Toolbox: Swiss Agency for Development and Cooperation (SDC); German Agency for International Cooperation (GIZ); Capacity Building for Integrated Water Resources Management (Cap-Net); Swiss Federal Institute for Aquatic Science and Technology, Department for Sanitation in Developing Countries (Sandec); Ecosan Services Foundation (ESF); Environment and Public Health Organisation (ENPHO); Global Water Partnership (GWP); International Water Association (IWA); Indian Water Works Association (IWWA); Sarar Transformación (Mexico); Stockholm Environment Institute (SEI), Ecological Sanitation Research Programme (EcoSanRes); Sustainable Sanitation Alliance (SuSanA); Norwegian University of Life Sciences (UMB); United Nations Development Programme (UNDP); Water Supply and Sanitation Collaborative Council (WSSCC); Xavier University, Philippines.

How to use the SSWM Toolbox

The entire SSWM Toolbox is open source and can thus be used by any water or sanitation practitioner. It helps decision makers, NGOs, engineers or planners in becoming active in upgrading their own sanitation and water management system by making existing knowledge available to them in a structured and accessible format. Users are supported in developing an understanding the importance of a sound planning process and aided to induce a participatory planning process in the field of water management and sanitation. In order to make the step from planning to implementation, a further section covers an array of hardware tools (technologies) and software (behavioural) approaches.

Moreover, the Toolbox can also be used as a comprehensive information pool for students and as a ready-made training tool for international organisations and all those working within the water sector. A user manual can be found on the website, but still the toolbox is easy to handle so users can just start clicking through the different sections and learning (more) about sustainable sanitation and water management. The Planning and Process Tools section in specific helps users to get an overview of existing planning frameworks and approaches and to understand each approach as a set of specific steps that can be combined to meet the requirements of a specific situation.

In addition to this toolbox, there are regular training courses that build on the SSWM Toolbox. Until now, they have been run in cooperation between Ecosan Services Foundation (ESF), India, the Environment and Public Health Organisation (ENPHO), Nepal, Xavier University, the Philippines, and seecon international gmbh, Switzerland (see Figure 5). They enable participants to fully exploit the benefits of the SSWM Toolbox, develop a thorough understanding of Sustainable Sanitation and Water Management, and to build a strong network of partnering organisations working in the same field.

The last SSWM course was jointly held by ENPHO, ESF and seecon in Nagarkot, close to Kathmandu, Nepal (see Figure 5). As mainly all such training sessions, it was organised in three main modules. The first module (Basic Training) focused on the concept of linking water management, sanitation and agriculture and the awareness on non-technical and technical options in making water management and sanitation more sustainable. In the second module (Expert Training), participants applied the theoretical knowledge from the first module to a 'business plan' for an own Sustainable Sanitation and Water Management intervention. The third module (Training-of-Trainers Workshop) addresses mainly those who want to become active in spreading the information on SSWM as a master trainer or organiser of SSWM or related trainings.

Figure 5: Participants of the SSWM Expert Course in Nagarkot, Nepal (Barreto-Dillon, 2010)

Conclusion

The SSWM toolbox is an integrated capacity development support tool, which links up sustainable sanitation, agriculture and water management and people with a technical background with others working on the behaviour to make a change (software interventions). It contains a guided exercise to prioritise and understand one's local problems, the tools you need to plan for and implement solutions, a large compilation of factsheets on hardware and software tools and approaches – topped with further readings, links, a library, glossary, ready-made PowerPoints and soon also a Train-the-Trainers section. The whole Toolbox is open-source and for free. As it is easy to handle and very comprehensive, everyone interested in sustainable sanitation and water management can use it (see Figure 2).

The Planning and Process section of the SSWM Toolbox is based on existing proven and tested frameworks and approaches. Moreover, it offers deeper information for each of the five main steps of project planning (exploring, demand creation, decision making, implementation and ensuring sustainability). Therefore, the Toolbox helps water and sanitation practitioners in improving the water and sanitation system they find in their specific location: Combining various frameworks and approaches as well as different approaches for individual planning steps, it is the first tool to give such a comprehensive overview and understanding of planning processes in water and sanitation, enabling each and every user to find the solution fitting best to his or her case.

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A tool for comparing economic costs of different sanitation options

This paper presents a standardised tool for comparing different sanitation options based on their economic costs. In Lower Austria the application of this tool is mandatory for receiving subsidies from the government for the construction of sanitation infrastructure.

Author: Markus Lechner

Abstract

A number of projects in developing countries have been or are developing planning tools based on the assumption that an appropriate planning process is vital for successful implementation of sanitation solutions. However, it should be taken into consideration that planning tools do not necessarily have to be developed from scratch. One could make use of successfully applied tools from other countries. Therefore the aim of this paper is to present a planning tool which is used by planners in Austria for the comparison of different sanitation options. The use of this tool, which is provided by the government, is mandatory to receive subsidies from the government for the construction of sanitation infrastructure. Different variants are compared based on their economic costs within a fixed set of framework conditions. Based on the principle that the solution having the lowest economic costs is the most favourable, this solution is eligible for receiving subsidies. To guarantee a standardised procedure a number of input variables, e.g. unit costs for investment and operation and maintenance, are fixed and can not be chosen freely by the planner. Strength and weaknesses of the tool towards its wider application are discussed.

Introduction

Appropriate planning is considered as crucial to improve sanitation in developing countries. Therefore different projects have been or are developing planning methodologies and tools. However, a wide range of tools exists already and is in use. Most existing tools focus on water borne sanitation and consider technical and economic aspects only. Despite it is believed that making use of existing tools as much as possible and only adapt them for different circumstances is possible, faster and more efficient.

This paper presents one tool which is used in Austria to compare different variants of solutions based on their economic costs. By adapting the cost base and extending or adapting the range of possible technical solutions this tool could be easily used within other framework conditions, i.e. in other countries. Moreover, using other criteria than costs would result in different tools, providing decision makers with additional data of different variants. Additional criteria could be e.g. energy consumption, resources-efficiency, greenhouse gas emissions, etc.

It is important to note that within specific framework conditions such tools only provide a comparison of different variants but do not anticipate a decision. Application of tools using different criteria will always require an additional multi-criteria decision support approach based during which social values for different criteria (weighting factors of the criteria) are applied. Up to a point, as will be shown later, such weighting factors can be incorporated into the tool already. While this can be done it is still not recommended as it adds to in-transparency of the entire planning process. Social values are therefore best introduced by the legal framework conditions or during the multi-criteria decision.

Key Points:

- To receive subsidies for investments in sanitation infrastructure in Austria it is mandatory to use a tool for calculating economic costs of different sanitation options.
- Technological solutions not in line with the legal requirements and the state-of-the-art can not be chosen
- A fixed cost base shall guarantee a standardised procedure and prevent misuse of the tool
- Other criteria than economic costs could be easily added to such a tool
- A comparison of options shall be objective and therefore not include „social values“ as criteria

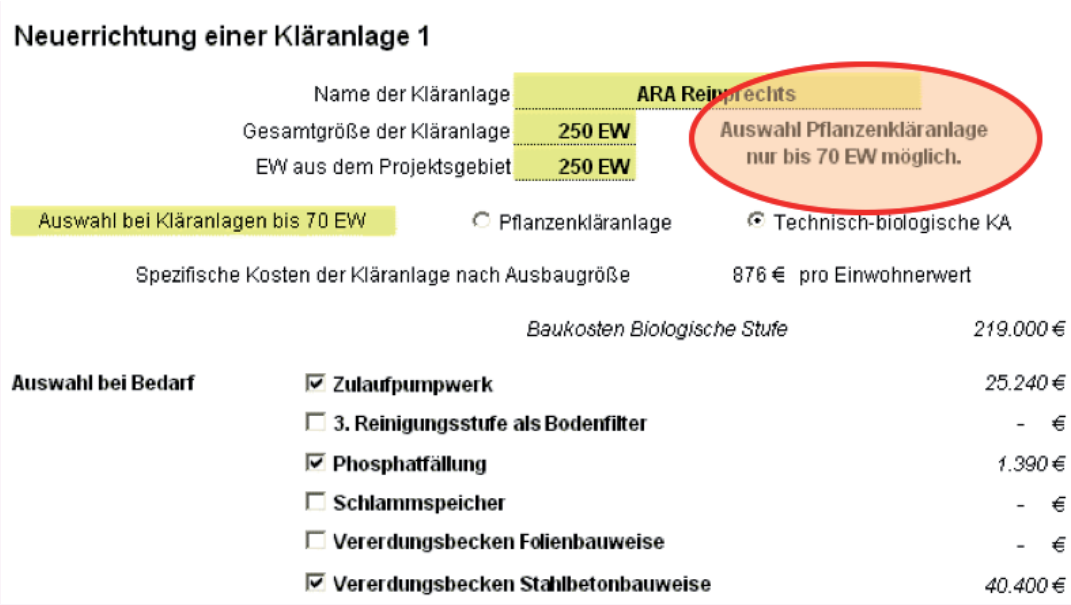

Figure 1: Screenshot – Built-in limitation of choice (in the red circle: "Choice of constructed wetlands possible only up to 70 person equivalents")

Methodology

The paper describes a tool provided by the Government of Lower Austria (Amt der NÖ Landesregierung, 2005). Using this tool is mandatory for planners for receiving subsidies for the construction of sanitation infrastructure. The tool comprises a number of MSExcel® spread sheets and the related documentation. Screenshots shown and information provided are based on the information provided in the tool.

Legal standards and state-of-the-art

The principles of the tool, the Austrian legal requirements and the state-of-the-art (which is defined by the local governments in Austria), are reflected e.g. by a limited choice of possible technological solutions. As an example, Figure 1 shows that the selection a of constructed wetland system for wastewater treatment is possible for up to 70 person equivalents only. This is based on the fact that larger constructed wetland systems are still not considered state-of-the-art by the relevant authority.

Legal Standards and even more the state-of-the-art are also reflected in the cost base of this tool. Costs of different technical units can not be chosen freely but are pre-defined. Necessarily these costs are based on average market prices, which adhere to laws and standards valid in Austria. Adherence to the standards is guaranteed by the fact that only variants can be considered for which a valid construction permit is issued by the relevant authorities.
In this way this tool incorporates legal and technical standards of the sanitation sector, eliminating the necessity to compare technological solutions from a technical point of view. Solutions which do not fulfil legal standards in a country or solutions which do not adhere to technical standards in place are not possible.
Deviations from this pre-defined framework conditions are possible but only in duly justified cases and require prior approval from the authorities.
As mentioned earlier the definition of these framework conditions in number, type and value theoretically allows the introduction of social values. This might be needed because the tool e.g. does not allow differentiation of operation cost for different types of technical wastewater treatment plants, thus neglecting the fact that some types may consume less energy thus requiring less recurring costs, thus being possibly cheaper from an economic point of view. Indirectly this fact poses disadvantages for treatment plants with actual low operational cost.

Cost Base

As mentioned before, the tool does not allow the planner to choose unit cost freely. The reason is to prevent misuse of the tool by "trimming" one variant which is socially/politically wanted to a point where it becomes the solution with the lowest economic costs. This has been possible in the past by using prices at the upper or lower end of a realistic price range for different units. Therefore the software accepts only entries of quantities for units and uses built in and non-modifiable unit prices.
In the tool costs for construction have been derived from tenders from projects implemented recently. As far as technical standards are concerned the costs introduced assume minimum requirements, additional requirements e.g. regarding the purification efficiency in sensitive areas can be added as additional treatment steps. Figure 2 shows as an example the cost base for investment (reinvestment) costs and operation and maintenance costs, respectively, for wastewater treatment plants.

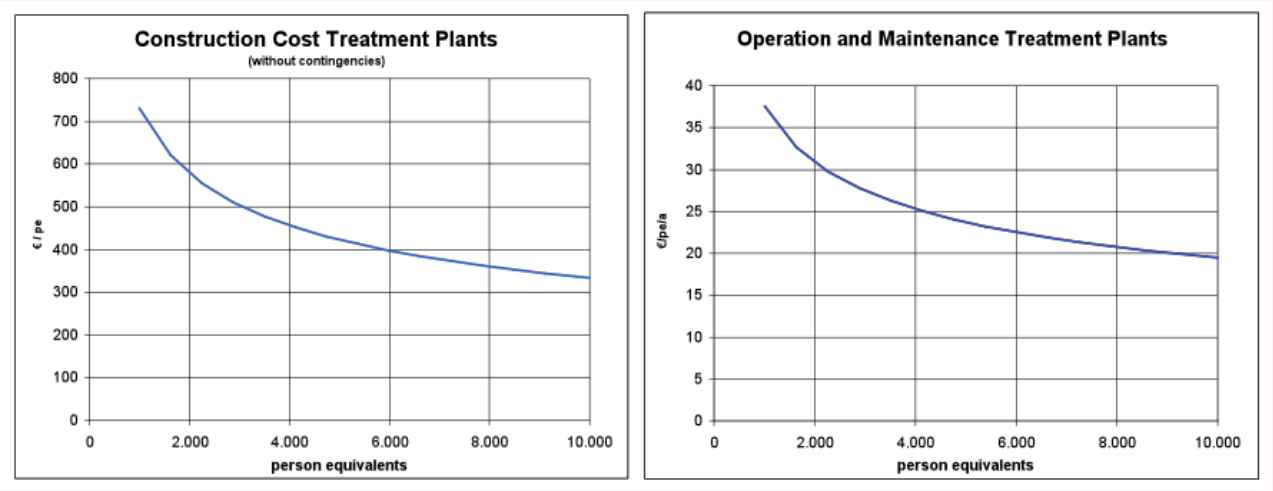

Figure 2: Construction costs (left) and operation and maintenance costs (right) in relation to the relative to design capacity of the wastewater treatment plant in person equivalent (Amt der NÖ Landesregierung, 2005, modified)

already mentioned there is no differentiation between costs for different wastewater treatment technologies. It is clear that the disadvantage of this method is that actually justifiable deviations can not be considered. However, at least the basis for a certain result of the calculation is transparent and the results become comparable.

It is also clear that the introduction of political/social preferences is possible. In the case of the presented tool it has to be understood that it was developed for rural areas at a time where small, decentralised solutions were politically preferred. Therefore the cost base leans towards favouring decentralised systems by assuming relatively low costs for operation and maintenance of small treatment plants and relatively high cost for connecting to an existing sewer. This results in a tendency that smaller systems with short sewers are the preferred solutions from an economic point of view and therefore considered for subsidies.

Life span of inve stments

The lifespan of the various investments is considered with fixed values:

sewer lines	- 50 years
pumping stations	- 17 years
treatment plants	- 25 years

After these periods the tool assumes full reinvestment cost in the same costs (depreciated) as the original investments.

Cost Comparison

Cost comparison in the tool is based on the actual cash value methodology. For each variant the actual cash value (of one unit) is calculated using the following formula:

$$\sum_{n=0}^{pa-1} I(1+i)^{(a\cdot n)} + \sum_{n=0}^{p-1} OM(1+i)^{n}$$

where I = investment costs; OM = annual costs for operation and maintenance; I = interest rate (minus inflation); p = timeframe for cost comparison; and a = lifespan of unit.

The standard timeframe used for cost comparisons in Austria is 50 years. The presented method allows comparing the entire costs of investments, reinvestments and operation and maintenance for any number of solutions for this period.

Example

The following example of a small rural village in Austria shall highlight the use of the tool. As mentioned in the introduction the tool was developed for water borne sanitation only. Therefore in this particular case the only two variants compared were (i) the construction of a decentralised small wastewater treatment plant of 250 person equivalents and (ii) the connection to an existing sewer system of a nearby town (via 2 km pressure sewer) and treatment of the wastewater in the existing treatment plant.

In this particular case it is not necessary to compare the entire solutions but only those parts where the two variants differ. Therefore the entire sewer system in the small village has been neglected, being the same for both options. Consequently the comparison starts at the point where wastewater is either discharged to a decentralised treatment plant or pumped to an existing facility. Figure 3 shows the proposed location of a decentralised treatment plant („Option A“) and the required sewer for connection to the existing system („Option B“).

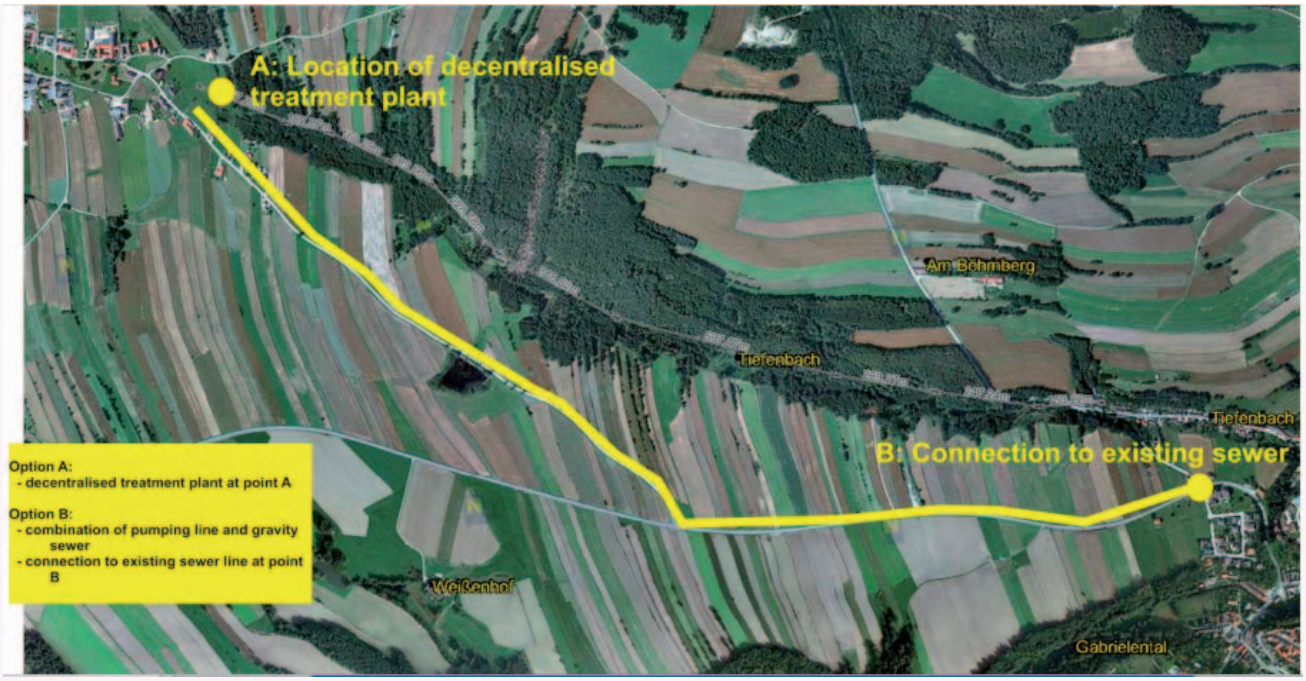

Figure 3: Aerial photograph showing the different option

For „Option A" additional costs for enhanced phosphorous removal had to be considered due to stringent requirements from the authorities. For this purpose the tool offers the selection of additional pre-determined cost for a phosphate precipitation unit.

For „Option B" additional cost for a pumping station with pressurised air were considered. The pumping line ends at the beginning of a combined sewer system of the town. To avoid odour problems during dry periods the authorities would not approve an ordinary pumping station. Here is one of the few options in the tool where own cost estimates can be introduced. However, such estimation requires prior approval of the authorities.

Figure 4 shows the results of the cost comparison. The decreasing effects of the consideration of operation and maintenance costs as well as reinvestments at the end of the lifespan of various different units can clearly be seen. In the case of „Option A" (= Variante 1 in Figure 4), the decentralised treatment system, shows slightly less costs over a period of 50 years and would be the solution which is eligible for receiving subsidies from the government. The client could still choose to implement „Option B" (= Variante 2 in Figure 4), however, full cost would have to be covered by the client without receiving subsidies.

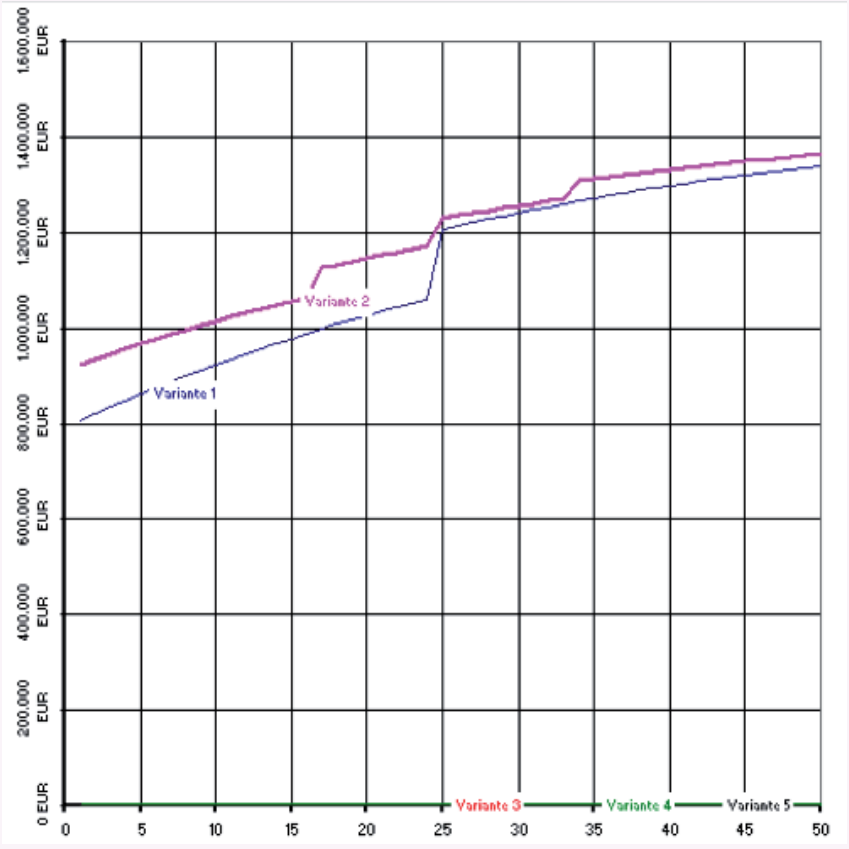

Figure 4: Result of the cost comparison of variant solutions („Option A" = Variante 1 = decentralised treatment plant; „Option B" = Variante 2 = centralised solution)

The example also shows limitations of the presented tool. There is quite a high degree of uncertainty of the following assumptions on which this calculation is based:

- fixed interest rate of 3 % over the entire 50 years,
- fixed reinvestment periods and
- pre-determined costs for investment, reinvestment and operation and maintenance.

Considering these uncertainties it must be questioned whether a comparatively small cost difference (e.g. less than 2 % in the example) already justifies a decision for one or the other solution.

Conclusion

The tool presented, which is mandatory to receive subsidies, compares different variants based on their economic costs. While it has been specially developed for Austria and water borne sanitation solutions only by

- changing the cost base and
- adapting the possible technology choices

adaptation of the tool to other circumstances should easily be possible.

The main advantage of using such a tool is that it produces a transparent result with the main input parameters being fairly indisputable (mainly physical parameters).

Another main advantage is the a-priori consideration of technical and legal standards. This prevents the comparison of variant solution with different performances regarding certain parameters like for example purification efficiency, related health risk, building standards, etc. On the contrary it eliminates the need to consider all these criteria separately as solutions which do not fulfil the defined legal and technical minimum standards will not be allowed.

On the other hand, such standardisation has also disadvantages such as that the introduction of new, alternative technologies is difficult or even impossible if the tool is not updated regularly and new technological solutions are included.

Another major disadvantage is the uncertainty of the data base. However, the fact that all projects in a defined area and all variant solutions make use of the same data base clearly outweighs this inherent flaw.

There is also a number of parameters which is not considered in the tool. For future applications the development of similar tools in which economics being only one of the criteria when comparing variants is required. In cases where either the costs of two variants are close of where costs are not the (only) major issue, other criteria, e.g. energy consumption, resources-efficiency, greenhouse gas emissions, etc., may be introduced

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Notes

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Next Issues:

Issue 8, July 2011: „**Solutions in mountain regions“**
Contribution due to 1. May 2011

Issue 9, October 2011: „**Biogas systems“**
Contribution due to 1. August 2011

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