EcoSanRes Publications Series

Report 2004-3

Open Planning of Sanitation Systems

Elisabeth Kvarnström and Ebba af Petersens

EcoSanRes

Open Planning of Sanitation Systems

Elisabeth Kvarnström and Ebba af Petersens
SwedEnviro Consulting Group

SEI STOCKHOLM ENVIRONMENT INSTITUTE

EcoSanRes Programme

Stockholm Environment Institute
Lilla Nygatan 1
Box 2142
SE-103 14 Stockholm, Sweden
Tel: +46 8 412 1400
Fax: +46 8 723 0348
postmaster@sei.se
www.sei.se

This publication is downloadable from
www.ecosanres.org

SEI Communications
Communications Director: Arno Rosemarin
Publications Manager: Erik Willis
Layout: Lisetta Tripodi
Web Access: Howard Cambridge

ISBN 91 88714 95 0

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Preface

This desk study has been produced by Elisabeth Kvarnström and Ebba af Petersens in the SwedEnviro Consulting Group, through funding from the Sida-financed EcoSanRes programme.

The list of criteria for sustainable sanitation in Appendix 1 was produced at a meeting held in Stockholm on March 30 to April 1, 2004, where Patrick Bracken (GTZ), Alberto Ysunza (CECIPROC), Erik Kärrman (Urban Water), and Anders Finnson (Stockholm Water Co.) participated. Darren Saywell (WSSCC) contributed with written comments.

The report has benefited from constructive comments from the EcoSanRes Programme Advisory Committee and also from Thomas Loetscher (Decisionscape, Australia).

Background

Approximately two fifths of the population in the world lack basic sanitation facilities today. Basic sanitation is defined by WHO as being connected to a public sewer or septic tank system, a pour-flush latrine, a simple pit latrine or ventilated improved pit latrine. This lack of sanitation was highlighted during the World Summit on Sustainable Development in Johannesburg, 2002, where the Millennium Development Goal set to halve the proportion of the population without access to safe drinking water was amended to also include a reduction by half of the proportion of the world population without access to basic sanitation by 2015 (UN, 2003). It is clear that a massive effort is needed to reduce this sanitation backlog in the coming eleven years. Moreover, it is of utmost importance that the concept of sustainability is considered in regard to sanitation during investments and planning for sanitation upgrade: what is needed in order to supply a sanitation system that will be sustainable from a social, as well as an economical and environmental perspective? In providing what may be considered as technically well-functioning systems, we might risk ignoring the broader issues of sanitation, which include environmental protection and human health, the important social aspects of sanitation and broader economic aspects. An integrated view of sanitary planning where the sanitation planner is moving beyond figures of initial investment, operation and maintenance cost is required to supply sustainable sanitation.

One way of reaching beyond the provision of purely technical solutions to sanitation is to focus on what criteria future sanitation systems should comply to in order to be sustainable in given settings. Such 'criteria thinking', or 'functional requirements thinking', can be used both on a macro level, by including criteria of sustainable sanitation in terms of reference for sanitation projects financed on an international level, down to the micro level where the discussions around sanitation investments in a municipality should be guided rather around the function requirements of the planned system than around sanitation techniques. By focusing on the function of a sanitation system rather than the technology itself, more room will be allowed for innovative solutions to sanitary problems (Tischner and Schmidt-Bleek, 1993).

OBJECTIVE

The objective of this capacity-building project was to produce a tentative manual for the planning and implementation of sanitation projects based on sanitation system function requirements rather than sanitation technologies, in order to supply sustainable sanitation systems. The manual is intended to create and support an open and democratic sanitation planning process and is aimed at planners and implementers at project level.

METHODOLOGY

The Open Comparative Consequence Analysis Method

The planning and implementation tool presented in this report is based on the Open Comparative Consequence Analysis (OCCA) methodology that has been developed in Sweden by WRS Uppsala AB (Ridderstolpe, 2000).

Fundamental to OCCA planning is the recognition that the desired result, sustainable household sanitation, can be achieved by utilization of different sanitation technologies. Ultimately, all factors influencing the sustainability of a sanitation system, such as local conditions, applicable regulations and user preference must guide the choice of a sanitation solution. This will ensure that the system most appropriate and sustainable for a specific community and its economic and environmental situation is selected. This approach also allows the promotion of new and innovative sanitation techniques, which is in accordance with the BAT (Best Available Technique) principle that is a part of the environmental legislation in many countries.

The OCCA concept is based on the establishment of a set of criteria describing the function requirements or targets to be achieved by a sanitation system. These criteria are context-specific and are identified in cooperation with relevant stakeholders. They cover practical, economic and institutional aspects and are described in so-called Terms of Requirement (ToR). The ToR are then used to assess the merits of various sanitation alternatives. A final choice is then made from those alternatives fulfilling the needs outlined in the ToR.

The Concept of Sustainability in Relation to Sanitation

In this report we consider sanitation systems sustainable if they protect and promote human health, do not contribute to environmental degradation or depletion of the resource base, are technically and institutionally appropriate, economically viable and socially acceptable[1].

A sanitation system encompasses, in our view, the users of the system, the collection, transport, treatment and management of the end products of human excreta, solid waste, industrial wastewater and storm water.

A tentative list of criteria that might be of importance for sustainability in relation to sanitation is provided in Appendix 1.

Open Planning of Sanitation Systems

This methodology has been further developed into the Open Planning of Sanitation Systems concept by using results from:

- a suggestion of criteria for sustainability in relation to sanitation, Appendix 1[2];
- a survey about existing sanitation planning and implementation tools, presented in Appendix 2; and
- views of selected sanitation professionals as presented in Appendix 3.

[1] This definition of sustainability in relation to sanitation was agreed upon at a meeting held by EcoSanRes and GTZ, see Preface.

[2] The suggestion for criteria to consider for sustainability in relation to sanitation was identified during a meeting held jointly by EcoSanRes and GTZ, see Preface for details.

Open Planning of Sanitation Systems

Proper planning is the key to success in any type of project. The more fundamental and controversial the problems addressed by the project are, the more important it is that problem identification and planning are made in a cross-cutting way, taking into consideration the voices of as many stakeholders as possible and as early on as possible. Sanitation planning definitely demands a cross-cutting approach in order to provide sustainable sanitation systems.

BOX 1: Stakeholder involvement in sanitation planning

In Sweden, piped water supply and sewerage were introduced to, among other things, improve public health and to protect the environment. The professionals and the primary users of the system probably had an opportunity to express their views during the early planning and implementation stages. However, it is most probable that farmers, for various reasons, were either left out of or were not interested in the sanitation planning, development, and implementation[3]. The Swedish sanitation system has now been in place for decades and is generating sewage sludge that the Farmer's Association recommend their members not to use, due to the sludge not meeting the fertilizer quality demands of the food industry. This creates problems for the society at large, and illustrates how a sanitation system can fail to function fully when stakeholders are not involved in its planning and selection. Similar observations can be made in most parts of the world, both in developed and developing countries.

Open planning of sanitation systems attempts to have a cross-cutting approach in its five steps described below. Some have similarities with the 'STEPs' suggested in the Household-Centred Environmental Sanitation approach as described in Schertenleib et al. (2004). We will use a Swedish case study throughout these five steps for illustration purposes (Ridderstolpe, 1999).

CASE STUDY: Background information

Vadsbro village is located in the county of Södermanland in Sweden. It comprises 40 households and a sewer system. The sewage system contains gravity-flow piping to a pumping station, from which the sewage is pumped to the village's run-down wastewater treatment plant. The plant is situated near a small, excavated river/ditch that drains both the village and the forest and farms upstream. The treatment plant is surrounded by flat farmland and the owner of the land west of the treatment plant is willing to allow land to be used as part of the wastewater treatment (Ridderstolpe, 1999).

STEP 1: PROBLEM IDENTIFICATION

Problem identification is an important component of successful project planning. If the problem and its causes are not identified, it is most probable that the project will fail down the line. For problem identification, we recommend the use of the logical framework approach (LFA) or PHAST. Both LFA and PHAST contain tools for problem identification and allow stakeholder participation. A workshop can be of great help further on in the process. In addition, the use

[3] It is probable that the abundance of chemical fertilizers after the Second World War made the farmers uninterested in closing the loop issues and that the sanitation professionals at the time did not see the need for nutrient recycling either.

of PHAST ensures that hygiene behaviour receives due attention. The workshop facilitator should, of course, be experienced in PHAST and LFA methodologies, and also be familiar with the links between sanitation and agriculture and aquaculture, and above all, have a very good understanding of the community situation.

CASE STUDY: Problem identification

The problem in Vadsbro was a poorly functioning wastewater treatment plant that needed upgrading in order to meet the wastewater discharge standards set by the local municipality. The project was initiated after some student reports from a nearby school had shown that alternatives to building a new treatment plant in the village existed.

BOX 2: Participatory methods and sanitation planning

The survey of planning and implementation tools (Appendix 2) clearly indicated the need for planning processes to facilitate the participation of future users of the systems and other stakeholders to ensure project success. One-sided promotion of a single sanitation technology may lead to a lack of project ownership and suspicion among future users that they are not offered the best solution for their needs. Consequently, users will not be motivated to understand and use the proposed system correctly.

The importance of participatory planning was also expressed by the survey respondents (Appendix 3). As one respondent expressed it: “to arrive in a community with the idea of implementing ecosan before consulting the community is making a mockery of participatory approaches and the project is probable to fail”. The respondents had a favourable opinion of PHAST, or, in a wider sense, the SARAR method, which several had used to facilitate participatory project planning. This approach would also be in accordance with the household-centred environmental sanitation approach (HCES) as advocated by Schertenleib et al. (2004), where the household is the focal point of planning. According to Schertenleib et al. (2004) only problems not manageable at the household level should be ‘exported’ to a larger jurisdiction, e.g., neighbourhood, town or city.

Stakeholder identification

The stakeholder groups and their roles need to be identified. The stakeholders themselves or, for large communities, their representatives should be involved in the planning process early on. In sanitation planning, stakeholders may include:

- Residents – users and often owners of the planned sanitation system
- Planners and political decision makers – for example, municipal planning and environmental authorities
- Schools and commercial operations
- Land owners – owners of the land where components of the sanitation system will be located
- Contractors – they may be involved in the construction and/or operation and maintenance of the system
- Farmers – users of treated waste products and, possibly, reclaimed water
- Community-based organizations
- Other stakeholders, such as neighbours with freshwater wells, people living downstream, etc.

- Engineers, both public and private
- Funding agencies

Stakeholder involvement should build on e.g. PHAST/SARAR methodology, using community mapping of water and sanitation conditions. We recommend that agriculture and aquaculture and their relation to sanitation (e.g. flow of nutrients) are also included into the community mapping.

> *CASE STUDY: Stakeholder identification*
>
> Residents, the municipality, the landowner/farmer and the school were identified as stakeholders and involved early on in the process. Although the project was very much a political process within the municipality, there was a great interest among the villagers. A village meeting was held, which a majority of the villagers attended. Several meetings at the municipality were held along the process, and the farmer/landowner was an interested and important participant.

STEP 2: IDENTIFICATION OF BOUNDARY CONDITIONS

This step has similarities to 'STEP 3: Assessment of current status', in the HCES approach (Schertenleib et al., 2004). Having identified the problem, the next step is to investigate the boundary conditions for the project. This could include a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of the community situation. Additional questions that would have to be answered for identification of boundary conditions include:

- Which socio-economic patterns prevail in the area?
- Which cultural habits that could affect the choice of a sanitation system can be identified?
- Is there demand for improved sanitation in the population?
- How well does the willingness to pay for improved services correspond to the capacity to pay?
- What is the legal framework?
- Which waste flows exists within the area, and how do they relate to each other?
- What does the area look like? What infrastructure is there? Location of nearby streams and lakes?
- What are the natural conditions such as groundwater level, soil conditions, precipitation?
- What is the amount and quality of the wastewater fractions to be treated?
- Are there successful sanitation schemes in neighbouring communities?

The possibilities for financing construction, operation and maintenance are also analysed at this initial stage. Are the households paying the actual costs, or a subsidized 'connection fee'? Will the municipality pay for parts of the system? Is it possible to apply for grants?

Sanitation system boundaries

The boundaries of the sanitation system need to be defined:

- Where does the system begin and end?
- Does the system include all wastewater fractions of the household? Will the wastewater fractions be managed in a separate or combined manner?

- Does the system start at the boundary of the garden or within the bathroom?
- Does the system include other houses?
- Does the system include treatment or only collection and discharge to a larger system?

The system boundary definition is important for cost calculations, the definition of responsibilities, and for selecting a sampling point for, if applicable, outgoing wastewater.

> *CASE STUDY: Sanitation system boundaries*
>
> In Vadsbro, there was an existing system with sewage pipes, pump stations and buildings. Therefore the system boundaries were set from the beginning, but extended to include an outdoor treatment.

STEP 3: TERMS OF REQUIREMENT (TOR)

This step has similarities with 'STEP 4: Assessment of user priorities' in the HCES approach (Schertenleib et al., 2004). The terms of requirement (ToR) for assessing sanitation alternatives are usually set by the facilitator together with the stakeholders and in collaboration with local government to ensure compliance with regulations. This can be done by using PHAST/ SARAR methodology. PHAST tools such as 'blocking the routes' can help identify ways to prevent disease propagation. If the project is of a larger scale, the ToR can be set in an LFA workshop.

ToR should be comprehensive and include all factors needed to ensure sustainable sanitation in the actual context. The discussion on what is needed for the sanitation to be sustainable can be inspired by the list provided in Appendix 1. It is, however, extremely important to remember that this criteria list is a suggestion of what might be worthwhile to consider, and needs to be adapted to the actual case.

In open planning of sanitation systems we choose to organize the function requirements in two blocks, where the first block contains what could be considered as primary functions, to avoid external effects, of a sustainable sanitation system. These primary functions include hygiene, environmental protection and resource conservation.

The second block is more geared towards the user, where practical functions such as user-friendliness, reliability and affordability are discussed.

These two blocks need to be considered in tandem and a balance between the two needs to be identified. The ToR, with these two blocks, can be compared to a bar for high-jumpers, where the level is set on one side by primary functions and on the other side by practical considerations.

Table 1 shows the ToR for Vadsbro village[4], as developed by the concerned stakeholders (Ridderstolpe, 1999).

Each heading in the ToR is explained and discussed below.

[4] Design # of pe: 140; design wastewater flow: 45 m^3/day (pe = person equivalents)

Table 1. ToR for Vadsbro village.

Primary functions	**Practical considerations and cost aspects**
Hygiene and disease protection • Avoidance of sanitary nuisances, e.g. bad odour • Infectious disease control, i.e. the effluent is either bathing water quality or excluded from direct exposure to humans until it has achieved bathing water quality ***Recipient protection*** • Phosphorous: reduced >90% (general requirement). In Vadsbro at most 0.1 kg/pe as annual discharge and <0.1 mg/L • Nitrogen: reduced >50% (general requirement). In Vadsbro at most 2.5 kg/pe as annual discharge. Discharged in the form of nitrate • BOD7: reduced >95 % ***Recycling of nutrients and/or organic matter*** • Phosphorus: >75 % recycled • Other resources valuable for agriculture	***Costs*** • Investment should not exceed USD 4000 per household • Operation and maintenance should not exceed USD 250 per year per household ***Technical function*** • A proven, robust system that gives few surprises ***Adaption to the local situation*** • Present and future land use in the area • Nutrient recycling possibilities in the area • Local objectives regarding energy and resource use • Possibilities to combine wastewater treatment with open water and wildlife habitat • Use of existing infrastructure when feasible ***Responsibility and control*** • New systems may require new responsibility arrangements between the municipality and farmers • Discharge monitoring may be more challenging for new systems and could require new methods for

Table 2 shows an example of ToR for assessing low-cost systems. It is important to remember that these are ToR examples only, and that a context-specific ToR must be identified for each setting together with the relevant stakeholders.

Table 2. Example of ToR for a low-cost sanitation system.

Primary functions	Practical and economical aspects
Hygiene and disease protection All parts of the system and subsequent handling of products must achieve a high level of hygiene and disease protection, including: • High hygienic standard within the toilet, the washing area, and with regards to greywater/wastewater effluent, etc. • Excreta must be stored/disposed of without risk of seepage of pathogens to the groundwater • It must be possible to manage collection and disposal of waste products in a hygienically safe manner ***Water Protection*** • Excreta must not be stored or disposed of so that there is a risk of leachate of nutrients into the groundwater • Surface waters (ditches, ponds, rivers, lakes) should be protected from nutrients and organic matter originating from toilets and greywater/wastewater ***Natural resources conservation*** • Virtually all nutrients from the sanitary system (urine as well as faeces) should be recycled to productive land, so as to minimise nitrogen losses within the system, pollution, etc. • The system (washing area etc.) should be constructed in a way that allows collection and recycling of water	***Economics*** • Investment costs should be reasonable • Households should be able to carry out operation and maintenance in kind ***Reliability*** • The technology must be robust, also during extreme weather conditions ***Flexibility*** • It should be possible to adapt the technology to varying household sizes. The system should work without electricity ***User aspects*** • The toilet should be inside the house • The system must be easy to use, including for children, women, and the elderly • Maintenance should be quick and easy ***Responsibility*** • Responsibilities of households and authorities must be clear ***Control*** • It must be possible to evaluate the system performance

Hygiene and disease protection

The sanitation system, including black- and greywater and solid waste, should not cause unsanitary conditions or nuisances such as odours or insect infestation in any part of the system.

The toilet should be easy to use and preferably be made of materials with a smooth surface to facilitate cleaning. Excreta must not be stored or disposed of in a manner resulting in groundwater contamination by pathogens. Therefore, an elevated collection tank is preferable for dry systems (SMI, 2004).

Handling of waste products, i.e. treated greywater, urine, faeces, sludge etc. should be possible to accomplish in a hygienic way, using appropriate procedures and equipment, such as wearing gloves and good hand-washing practices (SMI, 2004).

Recycling of waste products must be hygienically safe. This means that fresh faeces especially, which may contain large numbers of pathogens, must be treated before recycling. Suitable methods of treatment are long-term storage, composting and the addition of ash and lime. On a municipal scale, secondary treatment for faeces in larger systems may include alkaline treatments, composting and incineration (SMI, 2004). For urine, storage for a certain period will result in a hygienically safe fertiliser. When recycling nutrients in wastewater, measures must also be taken to minimize risks to public health. For example, wastewater that will be used for irrigation in California on produce to be eaten raw, needs secondary treatment, to be coagulated, filtered and disinfected (Metcalf & Eddy, Inc., 1991).

Water to be discharged, whether greywater or mixed wastewater from a conventional system, should not pose risks to humans or the environment. The outgoing water should be treated and discharged to surface waters or be reclaimed for irrigation. Infiltration as a means to treat wastewater/greywater should generally be avoided, as undisturbed groundwater is normally suitable for human consumption and thus should be protected from pollution, unless the local conditions allow for such a treatment alternative.

Water protection

Surface water (ditches, ponds, rivers, lakes) and groundwater should, as far as possible, be protected from nutrients, organic matter and pathogens originating from toilets and greywater/wastewater. What "as far as possible" means needs to be identified for each setting. In a densely populated area with a heavily polluted river, "as far as possible" may mean that removal of virtually all pollutants is required.

BOX 3: Water protection in Sweden

In Sweden, there is sometimes a demand on wastewater treatment units to provide a 90 per cent reduction of phosphorus and organic matter, depending on the sensitivity of the effluent recipient. Moreover, detergents with low phosphorus content are recommended for households not connected to a wastewater treatment plant.

This would mean that excreta are managed in a way that does not result in nutrients leaching into the groundwater. As mentioned above, since groundwater may be used for human consumption and thus should be protected from pollution, infiltration as a means to treat wastewater or greywater should generally be avoided, unless the local conditions allow for such a treatment alternative. Greywater should be treated before discharge.

Natural resources conservation

Natural resources to be considered for sanitation systems include water, nutrients, land requirement and energy.

BOX 4: Nutrient recycling in Sweden

Nutrient recycling is promoted in Sweden in accordance with the national environmental quality objectives, provided that the nutrients are not associated with harmful substances such as e.g. heavy metals.

It is possible to recycle virtually all nutrients from human excreta to agriculture or other productive areas. Before recycling, the urine, faeces, sludge, wastewater for irrigation etc. must be sanitized, see *Hygiene and disease protection* above.

In areas where freshwater is scarce, the system may include reclamation of wastewater or greywater. The reclaimed water can be used for domestic purposes, including yard irrigation, but should not be used as drinking water. However, the risk of soil salinization needs to be addressed in climates with high evapotranspiration and low rainfall.

Costs

The sanitary solution chosen should be economically reasonable with regards to capital as well as recurrent costs. What “reasonable” entails varies much between countries and locales and depends on the purchasing power of a community.

A possible approach is to assume that the cost of a new system should not be significantly higher than the cost of systems generally used in a community. If subsidies or grants are available, then the actual investment cost may be of less importance.

The user is normally responsible for operating the system and, therefore, also bears the cost of operation and sometimes also the maintenance. This cost could be in the form of in-kind work only, i.e. no expenses are incurred, or it could include payment of contractors.

Reliability

Inadequate system reliability will cause negative effects on users in terms of hygienic and environmental performance of the system and costs. The system should allow management of operational problems without negatively affecting people, property or the environment. It is, however, best to avoid operational problems by selecting technologies that are robust and that can cope with extreme weather conditions. Therefore, a basic function requirement is that the system is technically reliable. Additionally, the expertise to run and maintain equipment should be available locally.

User aspects

The sanitary installations (e.g. toilet, greywater) on the premises should fulfil basic user requirements concerning affordability, user friendliness, maintenance, reliability, comfort, privacy, and status. It is also important to ensure realistic expectations of the system through capacity building and information. Irrespective of the technical solution chosen, it is essential that households use the system in an appropriate way. Water consumption and the type and quantity of detergents are examples of factors that have a significant impact on system performance.

Another aspect to consider is the experience of users with certain (including the current) institutional frameworks and their relationship with authorities. For example, different societies and groups in a society will have different experiences with financial instruments, such as tariffs or taxes. This in its turn will have an impact on which incentives will be effective. If the regulation enforcement is poor, which is often the case in many countries, it is important that the motivation to “do things the right way” comes from within the community.

Further, the system should accommodate existing household habits and routines, rather than making the daily tasks more demanding or time-consuming. In fact, one of the greatest driving forces for a new system seems to be the reduction of the time taken to complete daily tasks, and the resulting economic benefits (Drangert, 2004). It must be borne in mind, however, that when it comes to sanitation, gender aspects can play an important role concerning the allocation of daily tasks.

Another aspect to consider is that the views people have about excreta and its handling can vary greatly. People might get disgusted when seeing excreta in, for example, a toilet, but on the other hand have no objections to using excreta for medical practices when sick (Drangert, 2004).

It is also important for the various stakeholder groups to understand how the system works. For the residents, for example, this could mean that they understand how their sanitation system works and how to operate and maintain it. For planners, on the other hand, this may include understanding contamination loops and the natural water cycle. This knowledge, or the lack of it, will directly affect the choice of a sanitation system and expectations of it.

Further, installations should suit women and men, disabled, elderly people and children. For example, if urine-diversion is used, additional urinals could be considered for men to avoid misuse of the system.

Responsibility and control

Responsibilities for operation and maintenance of a sanitation system can be organized in many ways. For example, each household could own and manage its system. Or each household owns its system, but operates it together with other households. A third alternative is that a municipality or a joint organization owns and operates all system components.

For a single family, it is usually best to select a standard sanitary solution. For a whole village, it is possible, and may be more cost-effective and practical, to design a tailor-made system. A centralized or semi-centralized system, with, for example, central storage of urine, facilitates design, construction, and maintenance for the system at large. Irrespective of the organizational form, it is important to have a clear delineation of private and collective responsibilities, and to have a person in charge who is accountable for system performance in accordance with the ToR.

Control of small sanitary systems cannot, due to practical and economical reasons, be carried out in the same way as for large treatment plants. Therefore, carefully performed off-site testing can be used to estimate on-site performance. For source diversion, nutrient amounts and contents can be measured in samples of urine and faeces from the collection tanks. To monitor treatment performance, the effluent can be sampled.

STEP 4: ANALYSIS OF POSSIBLE SOLUTIONS

This step has similarities with 'STEP 5: Identification of options' in the HCES approach (Schertenleib et al., 2004). In Step 4, different sanitation solutions complying to the ToR, as defined in Step 2, are compared. At this point the facilitator might need to consult sanitation specialists for the identification of appropriate sanitation alternatives and concerning their compliance with the ToR. It is important to analyse the solutions not only with regards to their economic performance, but also with respect to all other criteria in the ToR, especially hygiene performance. Moreover, the solutions must be feasible and appropriate for the context in question.

At least three appropriate (i.e. solutions that fulfil the ToR) sanitation systems should be presented to the community to choose from. It should be clearly explained why some technologies do not fulfil the ToR, for example with a matrix scoring exercise. The matrix scoring exercise for Vadsbro village is shown in Appendix 4. The proposed solutions are studied and discussed in such detail that that the community understands why they are feasible and adequate. The alternatives that do not fulfil the ToR are abandoned.

CASE STUDY: Possible sanitation system solutions identified for Vadsbro village

1. Primary treatment, storage and forest irrigation
2. Stabilization ponds with chemical ($Ca(OH)_2$ precipitation
3. Primary treatment, trickling filter and biofilter ditch
4. Primary treatment, trickling filter and crop/wetland rotation
5. Primary treatment, sand filter and biofilter ditch/wetland
6. Package treatment plant (sequencing batch reactor, SBR), including nitrification followed by a biofilter ditch or wetland.

Four different wastewater systems with decentralized solutions were also proposed to the stakeholders but were not accepted. The reason for this was the fact that the centralized system already existed where the sewerage system had been subject to a recent renovation.
The matrix scoring exercise is available in Appendix 4.

STEP 5: CHOICE OF THE MOST APPROPRIATE SOLUTION

Step 5 has similarities with the HCES approach STEPs 6-8 (Schertenleib et al., 2004). The Open Planning of Sanitation Systems Step 4 resulted in at least three sanitation alternatives that comply to the ToR. The final step is to evaluate and compare these alternatives, using, for example, a PHAST tool called 'Sanitation Options' and the matrix scoring exercise mentioned above. The final choice should be made by the future users of the proposed sanitation system.

CASE STUDY: Final choice of sanitation system for Vadsbro village

The stakeholders finally settled for alternative 3 above, after having discussed the consequences of each alternative in relation to the ToR with the sanitation expert. Presentations with simple sketches were used showing how each alternative worked technically and also its compliance and consequences according to the ToR. The use of ToR made the comparison between the alternatives quite easy. Considerations of costs and risks were decisive for the stakeholders' decision. Alternative 6, the package treatment plant, was the initially favoured alternative. However, the biofilter ditch in alternative 3 was seen, after going through the alternatives in relation to the ToR, as both significantly less expensive and more efficient for pollutant reduction and nutrient recycling (Ridderstolpe, 1999).

Discussion

By looking at several sanitation alternatives, the future users have the opportunity to select, in a participatory process, the system that best matches their preferences and that is affordable. Municipalities, private companies and NGOs will be less likely to show monopolistic behaviour and to impose their solutions on the future users. Merits, risks and costs of a sanitation system will be presented in an open process, and an informed choice can be made by future users and other stakeholder groups. As a result, they will be confident that they have selected the solution most appropriate for their situation and specific needs. This in turn will increase the likelihood of proper system operation and maintenance.

Even though the proposed procedure will take more time and cost more, it is likely to save time in the implementation phase, and to reduce overall project cost by allowing stakeholders to select a system that is sustainable both economically, socially and environmentally.

The Open Planning of Sanitation Systems method is a tentative planning tool, which needs to be tested in real planning situations. Moreover, it would be useful to harmonize the steps in Open Planning of Sanitation Systems with the HCES STEPs (Schertenleib et al., 2004).

References

Drangert, J-O. 2004. *Norms and Attitudes Towards Ecosan and Other Sanitation Systems*, EcoSanRes Report no. 5 (manuscript)

Metcalf & Eddy, Inc. 1991. *Wastewater Engineering – Treatment, Disposal, Reuse*. McGraw-Hill International Editions, 3rd ed.

Ridderstolpe, P. 1999. *Wastewater treatment in a small village – options for upgrading*. SwedEnviro report No 1999:1.

Ridderstolpe, P. 2000. *Comparing Consequence Analysis – a Practical Method to Find the Right Solution for Wastewater Treatment*. http://www.iees.ch/EcoEng001/EcoEng001_R4.html

Schertenleib, R., Morel, A., Kalbermatten, J., Saywell. D. 2004. *Guidelines for the implementation of the Bellagio-Principles and the household centred environmental sanitation approach (HCES)*. Ecosan – closing the loop. Proceedings of the 2nd international symposium on ecological sanitation, April 7–11, 2003, held in Lübeck, Germany.

Tischner, U., Scmidt-Bleek, F. 1993. Designing Goods with MIPS. *Fresenius Envir*. *Bull*., 2, pp.479-484.

SMI, 2004. *Guidelines on the Safe Use of Urine and Faeces in Ecological Sanitation Systems*. EcoSanRes Report no. 1 (manuscript).

UN. 2003. *Water for People Water for Life*. The United Nations World Water Development Report.

Appendix 1: A Definition and Identification of Criteria for the Sustainability of Sanitation Systems – 3rd Draft

To be published within the EcoSanRes[1] programme

Patrick Bracken (GTZ), Anders Finnson (Stockholm Water Company), Elisabeth Kvarnström* (EcoSanRes), Erik Kärrman (Urban Water), Darren Saywell (WSSCC) and Alberto Ysunza (CECIPROC).

* Contact person, address: VERNA Ecology, Inc; Malmgårdsvägen 14, 116 38 Stockholm, Sweden, e-mail: elisabeth@verna.se, phone #: +46-70-6178855

BACKGROUND

This working paper is the result of a three-day meeting held in Stockholm where sustainability in relation to sanitation was discussed and an extensive list of criteria to meet sustainability in sanitation was proposed. The organizations present at the meeting were

- EcoSanRes, a Sida-funded environmental and development programme on ecological sanitation
- Deutsche Gesellschaft für Technische Zusammenarbeit, GTZ
- Centro de Capacitación Integral para Promotores Communitarios, CECIPROC in Mexico
- Urban Water, a Swedish research programme on Sustainable Urban Water Management
- Stockholm Water Company

Water Supply and Sanitation Collaborative Council participated through written comments.

SYSTEM BOUNDARY DEFINITION

An additional, important consideration during the meeting was to identify what would be the appropriate boundaries of a sanitation system. This is of utmost importance when comparing different systems for a particular context, and should be determined in such a way as to ensure that there is no export in either space or time of problems that may be created by the system. It is reasonable to include at least the user of the system, the management of wastewater and its residual fractions, within the system boundaries. It is also possible, and even desirable, to include generation of nutrients and recovery of energy within the system boundaries.

SUGGESTION OF CRITERIA TO CONSIDER FOR SANITATION SYSTEMS TO BE SUSTAINABLE

It is impossible to identify a complete list of factors that will affect the sustainability of a sanitation system without knowing the specific context. Moreover, a list of criteria will not provide easy answers in the decision-making process but it will help narrow down the discussion. The attempt here is therefore to try and present an extensive range of different criteria that might be of importance in different contexts. The list would need to be reduced/expanded for each specific case. There will also be a need to identify locally relevant criteria that do not appear on this suggested list, irrespective of level of intervention, in close cooperation with all relevant stakeholders, the current legal framework and current cultural

[1] EcoSanRes (ecological sanitation research) is an international environment and development programme on ecological sanitation. It has its roots in the pioneering SanRes programme which ran from 1993 to 2002. It is sponsored by Sida, managed by Stockholm Environment Institute with Akkadia Environment, SwedEnviro and Vatema, and brings together a world network of 20 organisations. For more information on the EcoSanRes programme, please consult www.ecosanres.org

practices. The content of the list may depend on the level at which the criteria are used (household, neighbourhood, community, municipality, government, international donors etc.). Moreover, the list proposed here does not take into account the fact that certain criteria might need to be considered at different stages in the planning process and that there might be a need to weigh criteria against each other. For the specific planning case there is also a need to connect this criteria list to a sanitation planning tool adapted for the level of intervention. A list of criteria could also serve as a checklist to identify knowledge gaps for different sanitation systems, with respect to their sustainability in a given setting.

Below we present what we think might be important criteria, with which one could assess different sanitation systems before deciding what approach/system/technique would be the most suitable in a given setting. This list of criteria is based on the work of several different authors who have worked in this area (e.g. Balkema, 2003; Hellström et al., 2000; Urban Water, 2004; Larsen & Gujer, 1997; Larsen & Lienert, 2003; Lennartsson, 2004) as well as on the discussions held during the meeting. They have been divided into five broad categories of criteria which we believe cover the main areas to be addressed by a sanitation system. The list will hopefully encourage discussion and we would welcome all feedback related to it.

Criteria	Indicator
Health	
Risk of infection of complete use of system	Risk assessment or qualitative
Risk of exposure to harmful substances: heavy metals, medical residues, organic compounds	Risk assessment or qualitative
Environment	
• Use of natural resources, construction:	
• Land (investment)	m^2/pe
• Energy	MJ/pe
• Construction materials	Type and volume
• Chemicals	Type and volume
Use of natural resources, O&M:	
• Land (investment)	m^2/pe/yr
• Energy	MJ/pe/yr
• Fresh water	m^3/pe/yr
• Construction materials	Type and volume/pe/yr
• Precipitation agents or other chemicals	Type and volume/pe/yr
Discharge to water bodies:	
• BOD/COD	g/pe/yr
• Impact on eutrophication	g/pe/yr of NP
• Hazardous substances: heavy metals, persistent organic compounds, antibiotics/medical residues, hormones	mg/pe/yr
Air emissions:	
• Contribution to global warming	kg of CO_2 equivalent/yr
• Odour	Qualitative
Resources recovered (potential for approaches):	
• Nutrients	% of incoming to system of NPKS

• Energy	% of the consumption of the system
• Organic material	% of incoming to the system
• Water	% of incoming to the system
Quality of recycled products (released to soil):	
• Hazardous substances: heavy metals, persistent organic compounds, antibiotics/medical residues, hormones	mg/unit
Economy	
Annual costs, including capital and maintenance costs	Cost/pe/yr
Capacity to pay – user (% of available income), municipality	Disposable income/pe
Local development	Qualitative
Socio-culture (institutional and user related)	
Willingness to pay (% of available income)	Reasonable % of income
Convenience (comfort, personal security, smell, noise, attractiveness, adapted to needs of different age, gender and income groups)	Qualitative
Institutional requirements	
Responsibility distribution	Definition of level of organization
Current legal acceptability	Qualitative
Appropriateness to current local cultural context (acceptable to use and maintain)	Qualitative
System perception (complexity, compatibility, observability – including aspects of reuse)	Qualitative
Ability to address awareness and information needs	Qualitative
Technical function	
System robustness: risk of failure, effect of failure, structural stability	Qualitative
Robustness of use of system: shock loads, effects of abuse of system	Qualitative
Robustness against extreme conditions (e.g. drought, flooding, earthquake etc.)	Qualitative
Possibility to use local competence for construction	Qualitative
Possibility to use local competence for O&M	Qualitative
Ease of system monitoring	Qualitative
Durability/lifetime	Yrs
Complexity of construction and O&M	Qualitative
Compatibility with existing system	Qualitative
Flexibility/adaptability (to user needs and existing environmental conditions – high groundwater level, geology etc.)	Qualitative

All categories are considered over the entire life cycle of the sanitary system – from resource extraction for its construction to it eventually being taken out of service at the end of its useful life.

Additionally – there are strong overlaps between the categories, with, for example, items mentioned in economy possibly also fitting under socio-cultural.

Health

The prime objective of sanitation is to protect and promote human health. The entire sanitary system should therefore be hygienically safe, posing as small a risk as possible of infection. This covers the use of the sanitary installation, collection, transport, treatment and end destination of the treated products. The risk of infection from leaking sewers to the drinking water pipe system or groundwater should also be included, as there is also risk of being infected when bathing in lakes or the sea nearby an overflow or discharge point from a treatment plant.

Environment

With time, sanitary systems have also been developed in such a way so as to protect the environment against possible detrimental effects. There is a need to consider emissions to different recipients (water, soil and air), and also resource use by different sanitation systems, both during the construction and the operation phase. Moreover, it is important to consider the quality of the treatment product for possible reuse in agriculture.

Economy

The capacity to pay for sanitation among the users is an important criteria for sustainability. However, in the end it may be their willingness to pay that will define within what range the costs, both of construction and O&M, can vary and services be sustained financially by the population.

Socio-culture

The prime objectives of sanitation might be to protect human health and the environment. However, sustainability in sanitation cannot be based only on these objectives but need to include social criteria as well as they are most crucial to sustainability in use and services provided by the system. It is possible to distinguish at least three different types of important criteria in this category, namely cultural acceptance, institutional requirements, and perceptions on sanitation. The society is more dynamic than human health and the environment and therefore the socio-cultural criteria, like regulation, perceptions on systems etc. might be subject to a more dynamic change through time than criteria considering human health and the environment. How things are seen and their resultant acceptance can change with time (perhaps driven by their own priorities).

Although improved human health and environment are the main objectives to planners and politicians, this might not be enough to sell the sanitation concept to future users. It is also important to recognize that the prime driver for sanitation might be security and status rather than health and environment (Holden, 2003). Another sanitation driver could be the possibility of increased food security if the sanitation solution can provide hygienically safe fertilizers.

Technical function

The technical functions of the sanitation system are definitely important for it to be sustainable. One of the more important ones is probably robustness, both within the system (to be able to receive varying loads) and externally (to be able to withstand varying extreme environmental conditions as well as user abuse of the system).

The technical functioning of the system is seen as perhaps the most flexible group of criteria. Technologies can, to a large extent, be relatively easily adapted to the needs and requirements – it is easier to adapt the technology to the wider needs than vice versa.

REFERENCES

van der Vleuten-Balkema, A. 2003. *Sustainable Wastewater Systems – Developing a Methodology and Selecting Promising Systems*. Dissertation, Technische Universiteit, Eindhoven, the Netherlands.

Hellström, D., Jeppsson, U., & Kärrman, E. 2000. Systems Analysis of Urban Water Management. *Environmental Impact Assessment Review*, 20 (3).

Holden, R. 2003. Factors which have influenced the acceptance of ecosan in South Africa and development of a marketing strategy. Ecosan – closing the loop. Proceedings of the 2nd international symposium on ecological sanitation, April 7 – 11, 2003, held in Lübeck, Germany.

Larsen, T. & Lienert, J. 2003. Societal Implications of Re-Engineering the Toilet. Water Intelligence Online, March 2003.

Larsen & Gujer 1997. The concept of sustainable urban water management. *Wat. Sci. Tech* 35(9), p 3-10.

Lennartsson, M. 2004. *Review of Alternative Sanitation Systems*. EcoSanRes working paper, draft version.

Tischner, U. & Schmidt-Bleek, F. 1993. Designing goods with MIPS. *Fresenius Envir. Bull.*, vol 2, pp 479-484.

Urban Water, 2004. MIKA – *Methodologies for Integration of Knowledge Areas. Surahammar Case Study* (draft in Swedish).

WSSCC, 2000. *Report of Environmental Sanitation Working Group for 5th Global Forum*. Water Supply and Sanitation Collaborative Council (WSSCC), Geneva, Switzerland.

Appendix 2: Review of Some Existing Sanitation Planning and Implementation Tools from an Ecological Sanitation Perspective

Ecological sanitation entails the hygienically safe reuse of human excreta in agriculture. The pillars of ecological sanitation are containment, sanitization and nutrient reuse[2]. Thus, ecological sanitation projects entail involvement with at least one more field than conventional sanitation projects, it being agriculture. There is therefore a need to review existing sanitation planning and implementation tools, in order to assess their capacity to fully include all aspects of ecological sanitation. Our attempt in this section of the report is to review some existing sanitation planning and implementation tools from an ecological sanitation perspective. For a more extensive survey we recommend the ecosan source book for the preparation and implementation of ecosan projects, currently being compiled by the ecosan team at GTZ (www.gtz.de). Worth mentioning here is the SANEX software, developed at the University of Queensland, Australia and co-financed by the Swiss Development Cooperation (Loetcher & Keller, 2002). However, this tool is not further analysed in this report.

PHAST/SARAR (WOOD ET AL., 1998)

Background/aim of tool

The PHAST/SARAR guide was developed to help community workers promote community hygiene behaviour change and to improve water and sanitation facilities. This is achieved by demonstration of the relationship between sanitation and health status, by increasing self-esteem of the community members, and by empowerment of the community to plan environmental improvements and to own and operate water and sanitation facilities.

The guide presents seven steps, of which the first five take the community through the development of a plan to prevent diarrhoeal diseases by improving its water supply, hygiene behaviour and sanitation. Steps six and seven are about monitoring and evaluation.

[2] http://www.ecosanres.org

Evaluation of PHAST/SARAR from an ecological sanitation perspective

The key strength of PHAST/SARAR is that it is a tool to be used by the community. However, no special focus is made on the recycling of nutrients. The tool could be further developed to take nutrient recycling into consideration, using other sets of questions and pictures etc. In the province of Niassa in Mozambique, communities were taken through a PHAST process that helped them decide what key water and sanitation problems they would like to address. In these cases, several communities choose different ecological sanitation options over improved latrines (Breslin, 2003). Social marketing techniques such as using local radio, demonstration latrines during festivals, and agricultural demonstration plots were used in combination with the PHAST process in Niassa (Breslin, 2003).

LOGICAL FRAMEWORK APPROACH (SIDA, 2002)

Background/aim of tool

LFA is a method for objective-oriented planning, logical analysis, appraisal and evaluation of projects of any kind. The full use of the LFA method will facilitate improved dialogue between different project stakeholders and increase responsibility and ownership of the project. It also contributes to the illustration and concretization of the objectives, and of activities needed to achieve these objectives. The use of LFA matrixes is a format for describing projects, and facilitates the follow-up and evaluation of projects.

The LFA contains nine different steps:

1. Context
2. Problem analysis
3. Stakeholder analysis
4. Objectives analysis
5. Activities
6. Resources
7. Indicators
8. Risks
9. Assumptions

If effects of external risks (politics, natural disasters, corruption etc.) can be kept under control and the developed project plan is followed, the project will be likely to be successful.

Evaluation of LFA from an ecosan perspective

The main advantage of LFA is that, given all relevant stakeholder groups are involved, it will take into account all aspects of ecological sanitation.

DFID GUIDANCE MANUAL ON WATER SUPPLY AND SANITATION PROGRAMMES (DFID, 1997)

Background/aim of tool

The Guidance manual is concerned with household water supply and sanitation, with its emphasis on meeting the basic needs of the poor in rural and peri-urban areas, including inner city informal settlements and slums, and small towns.

The Guidance manual is following an interdisciplinary approach to water supply and sanitation through the analysis of key issues, whereby recommended practices are developed for the following aspects of water supply and sanitation:

- social development
- health

- environmental sustainability
- economic and financial, institutional, technical
- social marketing approach to hygiene promotion and sanitation promotion

The interdisciplinary nature of the water supply and sanitation sector is then accounted for in each of the eight stages of the project cycle:

1. Policy development, sector planning and programme formulation
2. Programme and project identification
3. Preparation
4. Appraisal and approval
5. Implementation and monitoring
6. Operation and monitoring
7. Extensions or next-phase project identification
8. Evaluation

The water supply and sanitation programmes should be truly demand-responsive. They should work directly with primary stakeholders (the intended users of the systems) as well as with secondary stakeholders, such as the local government, donors, local NGOs, etc. This implies, among other things, that a participatory approach to the stakeholders should permeate each of the above programme development stages.

Evaluation of the DFID Guidance manual from an ecosan perspective

The DFID Guidance manual is geared towards a programme level rather than project level. It does not include ecological sanitation in its technical options and even states that household management of nutrients poses a health hazard leading to difficulties in operation and management.

ENVIRONMENTAL IMPACT ASSESSMENT (SIDA, 1998)

Background/aim of tool

The Environmental Impact Assessment (EIA) is a systematic review of the positive and negative consequences of a project on the environment. It should be carried out during the initial stages of a project to allow for early mitigation of revealed and unwanted effects of the project. The EIA identifies alternative options and makes it easier to discover issues that otherwise would have been overlooked. The EU Council Directive 85/337/EEC On the Assessment of the Effects of Certain Public and Private Projects on the Environment states that an EIA should take into consideration direct or indirect effects on:

- people, flora and fauna
- land, water, air, climate and landscape
- material assets and cultural heritage
- interaction between the above-mentioned factors

Evaluation of EIA from an ecosan perspective

The EIA is not a planning or implementation tool as such, but rather a part of the project cycle. For sanitation projects it could be used to rank sanitation alternatives with regards to community circumstances.

TOWARDS BETTER PROGRAMMING: A SANITATION HANDBOOK (UNICEF, 1997)

Background/aim of tool

The handbook has been prepared to serve as a resource in planning realistic and better quality sanitation interventions on a programme level rather than a project level. The programming process employs participatory methods, objective-oriented techniques, and key principles that reflect positive and negative lessons learned about sanitation. The handbook should be seen as a guide for programme planners to use according to their need, specific location and time.

Key issues addressed in the handbook are that the programme workers should act as catalysts in a learning, programming and policy-development process, rather than engaging in programme work for the sake of implementation only. Team-building should be carried out on a national as well as a local level, and comprehensive and intensive stakeholder participation should take place at all programme stages.

The overall design cycle for programming contains six different stages:

1. Problem definition: Where we are now, what we know, and what we do not know, including defining a shared vision for the future
2. Information gathering: What we need to know to make better decisions
3. Analysis of issues and options: Selecting alternatives
4. Planning: Charting out a strategy and programme design
5. Implementation and monitoring
6. Evaluation, analysis, and re-planning

The programming design cycle is expressed in the triple-A approach: assessment, analysis, and action. It can also be used in conjunction with the Logical Framework Approach.

Evaluation of UNICEF Handbook from an ecosan perspective

The handbook is used on programme level rather than on project level. Agriculture, which would be part of an integrated view of sanitation, is not taken into consideration.

CONCLUSIONS FROM THE HANDBOOK REVIEW

The reviewed planning tools are operating on different levels. The LFA and PHAST/SARAR tools can be used for planning and implementation on the project level. The UNICEF Handbook and the DFID Guidance Manual are tools for the implementation of sanitation and, in the case of the DFID Guidance Manual, of water supply programmes. These programme planning tools are using both participatory approaches and LFA at different stages of the programme cycle.

None of the reviewed tools discuss in-depth links between sanitation and agriculture, where the obvious link is plant nutrients. In the sanitation context, nutrients pose a problem , whereas in agriculture and aquaculture they are beneficial. Soils, in tropical countries in particular, often have a low natural nutrient content and would, therefore, benefit from fertilisation.

One key issue emerging in all reviewed documents is the need for a widespread and extended participatory approach involving all relevant stakeholder groups. The Sanitation Handbook, for example, advocates extension of community involvement beyond the construction, stating that the use of existing community organizations and the improvement of their organizational capacity and problem solving skills are vital, as is the inclusion of the community in project design, management and financing (UNICEF, 1997).

Moreover, there is a need for projects to be demand-driven to allow for a greater success potential. No single technology option should be prescribed. Instead, an array of options reflecting the consumer's preferences and local conditions should be made available to the community (UNICEF, 1997; DFID, 1997).

The participatory approach to projects and programmes requires time, as do changes in sanitation and hygiene behaviour. This is not always taken into account in project and programme budgets. Cordova (2001) studied barriers and opportunities in the implementation of large-scale dry sanitation urban sites in Mexico and found, among other things, that the sanitation programmes often promoted only one type of toilet, and that there was a lack of user follow-up programmes as well as user education.

REFERENCES

Breslin, E. 2002. *Introducing ecological sanitation in northern Mozambique* – Field work report. www.ecosanres.org

Cordova, A. 2001. *Large-scale dry sanitation programs – Preliminary observations and recommendations from urban experiences in Mexico*. HDRU Series No. 01-6, Human Dimen-sions Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY, USA.

DFID. 1997. *DFID Guidance manual on water supply and sanitation programs* (http://www.lboro.ac.uk/well/resources/books-and-manuals/guidance-manual/guidance-manual.htm).

Loetscher T. & Keller J. 2002. A Decision Support System for Selecting Sanitation Systems in Developing Countries. *Socio-Economic Planning Sciences* 36, 267-290. www.decisionscape.com.au

Sida. 1998. *Guidelines for Environmental Impact Assessments in International Development Cooperation.* Department for Natural Resources and the Environment, Swedish International Development Cooperation Agency, Stockholm, Sweden.

Sida. 2002. The Logical Framework Approach (LFA). Metodenheten/Enheten för resursbasutveckling för internationellt utvecklingssamarbete, Sida, Stockholm.

UNICEF 1997. *Towards Better Programming: A Sanitation Handbook.* Water, Environment and Sanitation Technical Guidelines Series – No. 3 EHP Applied Study No. 5, UNICEF, New York, NY, USA.

Wood, S., Sawyer, R. & Simpson-Hébert, M. 1998. *PHAST step-by-step guide: a participatory approach for the control of diarrhoeal disease.* Geneva, World Health Organization (unpublished document WHO/EOS/98.3).

http://www.lboro.ac.uk/well/resources/books-and-manuals/guidance-manual/guidance-manual.htm

Appendix 3: Opinions on Planning in Existing Ecosan Projects – Survey Results

A survey concerning the use of planning and implementation tools in ecological sanitation projects was sent to EcoSanRes-connected people globally. Eighteen people were approached using contacts provided by SEI personnel. The questionnaire was also sent to a Yahoo discussion group on ecological sanitation, which meant that an additional 38 persons received the questionnaire.

The questionnaire consisted of two main sections; one concerning the current use of planning and implementation tools in respondent's projects, including an assessment of advantages and drawbacks of these tools in relation to ecological sanitation. The respondents also had an opportunity to indicate what they would like to see in a planning and implementation tool for ecosan projects. The second section concerned the use and rating of criteria in their sanitation projects and their rating of different criteria. Appendix 5 contains a sample of the questionnaire.

RESULTS OF QUESTIONNAIRE

Response rate

Eight out of 18 answered from the first batch of questionnaires sent out, which gave a response rate of 44 per cent. The additional mailing of questionnaires to the Yahoo discussion group generated another two answers. A plausible explanation for the low number of responses from the Yahoo discussion group is that many of its members participate because of a general interest in the subject, without them being active in ecosan project. The total response rate was 18%.

The low response rate implies that the results from the questionnaire are not statistically significant and, therefore, not representative of the views of the global community of ecological sanitation practitioners. Moreover, some participants did not answer all questions, which gave an internal fallout, that further compromises the survey results. However, despite these limitations, the results give some indications concerning the role of sanitation planning tools and current needs, which was the objective of the questionnaire.

Section 1: The use of planning and implementation tools today and their pros and cons

A selection of survey results are given below. The questions are shown in italics and the answers and comments provided underneath in bullet format.

- *Have you used any planning or implementation tool in your ecosan project?*
  - Seven out of ten of the respondents said that they do use planning and implementation tools in their ecosan projects.
  - The most frequently used tools were LFA and PHAST.
  - Combinations of different tools are often used.

- *With an ecosan perspective, what are the strengths of the planning/implementation tool?*
  - Tool components aimed at facilitating stakeholder involvement were seen positively
  - Project implementation is facilitated by stakeholder workshops
  - The possibility to compare ecosan technologies to other sanitation alternatives, thereby providing the stakeholders a new perspective on sanitation
  - Good planning will benefit the post-implementation phase, such as project evaluation.

- *With an ecosan perspective, what are the weaknesses of the planning/implementation tool?*
  - Risk of projects being over-planned
  - Risk of planning tools being too complicated, too time consuming and too general in their approach
  - Need for project manager to dare to move beyond the planning tool, if necessary
  - Risk of professionals planning for themselves and not for the people

- *Are there differences in the planning and implementation process between ecosan and other sanitation projects?*
  - Four respondents answered ‘yes’ and three ‘no’ to this question
    - Ecosan projects involves at least one more sector, agriculture, compared to other sanitation project
  - Comment: sanitation projects should be open-ended and offer ecosan solutions alongside other, more conventional, sanitation alternatives

- *What would you like to include in a planning and implementation tool for ecosan projects?*
  - Framework guide for introduction of ecosan to communities (based on local conditions and to be used in participatory planning)
  - Participatory stakeholder workshops
  - Framework guide for the introduction of ecosan to decision-makers
  - Data collection guide for cross-cutting pre-feasibility studies
  - List of guidelines/tools used for ecosan projects and where to obtain them
  - Suitable feedback mechanisms to obtain feedback from stakeholders
  - Adaptive planning
  - Presentation of strengths/weaknesses of different sanitation systems
  - Definition of the ecosan concept

Section 2: The use of criteria in sanitation projects and their ratings

The purpose of the second section of the questionnaire was to find out whether the respondents systematically use criteria to assess the merits of sanitation alternatives before a choice is made. Five respondents answered 'yes' and two 'no' to this question. The criteria practiced among the respondents in their projects included an expressed demand for improving sanitation, local support, affordability, acceptability, environmental protection etc.

One respondent explained that they work with a matrix in which the advantages and disadvantages of different technical solutions are compared. Another said that there is a need for project implementers to be flexible and open to multiple solutions even on a household level, which implies a need to be able to assist with decision-making on a household level.

The purpose of the remaining questions was to determine which criteria, in the opinion of the respondents, are important when selecting a sanitation system. The criteria proposed for consideration in the questionnaire were:

1. Hygiene
2. Water protection
3. Nutrient recycling
4. Water recycling
5. Economy
6. Reliability
7. Flexibility
8. User aspects
9. Gender aspects
10. Child aspects
11. Sociological and cultural aspects
12. Responsibility
13. Control

In summary, all respondents found that hygiene was the most important criterion for choosing a sanitation solution. The second most important criteria were water protection and economy, followed by reliability, sociological aspects and responsibility.

It is noteworthy that nutrient and water recycling, commonly used to promote ecological sanitation were, on average, not perceived to be very important. A possible explanation is that project workers lack experience or commitment to work in an integrated way taking into account both agricultural aspects and sustainable water resources management. Another explanation is that there is no shortage of water or nutrients in the areas where some respondents carry out their projects.

Appendix 4: Matrix scoring exercise for Vadsbro village (Ridderstolpe, 1999)

The alternatives for Vadsbro village were as follows:

1. Primary treatment, storage, and forest irrigation
2. Stabilisation ponds with chemical ($Ca(OH)_2$ precipitation
3. Primary treatment, trickling filter, and biofilter ditch
4. Primary treatment, trickling filter, and crop/wetland rotation
5. Primary treatment, sand filter, and biofilter ditch/wetland
6. Package treatment plant (sequencing batch reactor, SBR), including nitrification followed by a biofilter ditch or wetland

	Alt. 1 Forest irrigation	**Alt 2 Ca-precipitation**	**Alt 3 Bioditch**	**Alt 4 Rotation system**	**Alt 5 Sand filter**	**Alt 6 Treatment plant**
Costs	+++	+++	++	++	-	--
Reduction capacity	+++	++	++	++	++	+
Potential for recycling	++?	++	++	+++	++	++
Hygienically safe	-	++	++	-	++	-
Local adaption	--	+	++	++?	+	++
Responsibility/Control	-	++	++	-	+++	+++
Conclusion	Very efficient and cheap but hygienic hazards. Landscape impact.	Efficient, robust, service-demanding.	Efficient, cheap, flexible, robust.	Not enough experience, but very interesting.	Efficient but quite expensive.	Simple planning but not cost-efficient.

The final choice of wastewater treatment system for Vadsbro village was alternative 3 where primary treatment and trickling filter was combined with a biofilter ditch.

Appendix 5

Questionnaire regarding the use of planning and implementation tools in ecosan projects

Elisabeth Kvarnström, VERNA Ecology, Inc and Ebba af Petersens, WRS Uppsala AB.
Please, answer before April 7, 2003 to elisabeth@verna.se

1. Have you used any implementation or planning tools in your ecosan projects?

YES ☐ Continue with questions 2-8 NO ☐ Go to question 9 and 10

Comments:

Questions 2-8 are applicable for those answering YES above. For those answering NO, go to question 9 and 10.

2. Which tool have you used? If you tick the box "Other", please indicate where we could find more information about the tool in question.

Logical Framework Analysis, LFA	
Environmental Impact Assessment, EIA	
DFID Guidance Manual on Water Supply and Sanitation	
PHAST	
UNICEF/USAID Sanitation Handbook	
Other	

Comments:

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Elisabeth Kvarnström, VERNA Ecology, Inc and Ebba af Petersens, WRS Uppsala AB.
Please, answer before April 7, 2003 to elisabeth@verna.se

3. Have you used planning/implementation tools in other sanitation projects? If yes, please specify which tool.

YES ☐ NO ☐

Comments:

4. Are there differences in the planning/implementation process between ecosan and other sanitation projects? If yes, please specify.

YES ☐ NO ☐

Comments:

5. Has the tool been useful for the circumstances prevailing in your ecosan project? Please, exemplify under "Comments".

I fully agree	I agree	I disagree	I totally disagree
☐	☐	☐	☐

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Comments:

6. With an ecosan perspective, what are the strengths of the planning/implementation tool used?

7. With an ecosan perspective, what are the weaknesses of the planning/implementation tool used?

8. What would you like to include in a planning/implementation tool for ecosan projects?

Appendix 5

Questionnaire regarding the use of planning and implementation tools in ecosan projects

Elisabeth Kvarnström, VERNA Ecology, Inc and Ebba af Petersens, WRS Uppsala AB.

Please, answer before April 7, 2003 to elisabeth@verna.se

Question 9 and 10 are only for those answering NO on question 1.

9. Why have you not used a planning/implementation tool in your ecosan projects?

10. Can you describe how you implement ecosan projects?

In Sweden a planning tool called Open Wastewater Planning (OWP) is sometimes used for choosing an appropriate wastewater system for a village, group of houses or single houses. One of the main features is to define terms of requirements, where functional as well as practical and economical levels for the wastewater system is specified. This is done before the technique is chosen and is used as a tool when choosing an appropriate wastewater system for the given situation. It is our aim to adapt this OWP tool for ecosan projects. Questions 11-13 treat aspects regarding the OWP tool.

Appendix 5

Questionnaire regarding the use of planning and implementation tools in ecosan projects

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Please, answer before April 7, 2003 to elisabeth@verna.se

11. In your ecosan projects, is some kind of terms of requirements used before making the choice of technique?

YES ☐ NO ☐

If yes, please specify.

12. Of the following criteria, - which do you regard as important when deciding upon which technique to use for wastewater treatment? Please, give your priority for each criteria; 3: very important, 2: important, 1: not important.

☐ **Hygiene and disease protection** – of the receiving waters and users as well as agricultural land receiving the nutrient or water resource. Quality of the discharged water from the system (grey water or black water) and the wastewater fractions (urine, faeces, sludge etc)

☐ **Water Protection** – amount of nutrients and other undesired substances reaching the receiving waters

☐ **Recycling of nutrients** – possibilities to reuse nutrients from the system

☐ **Recycling of water** – possibilities to reuse water from the system

☐ **Economics** – the cost of installing and maintaining the system

☐ **Reliability** – how well the technique works for variations in load, different seasons etc

Appendix 5

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Elisabeth Kvarnström, VERNA Ecology, Inc and Ebba af Petersens, WRS Uppsala AB.
Please, answer before April 7, 2003 to elisabeth@verna.se

☐ **Flexibility –** e.g. if the system can easily be modified for a higher load.

☐ **User aspects –** if investment in own work is needed to keep the system running.

☐ **Gender aspects** – that the system is adapted to the needs of both men and women

☐ **Child aspects** – adaption of system for children

☐ **Sociological and cultural aspects** – washer/not washers, religious aspects etc.

☐ **Responsibility -** if the municipality, the village, or users are responsible for the system.

☐ **Control** – possibilities to control emissions and function of the system

13. Are there any criteria that you would like to add to the above? Please indicate which priority, as indicated for question 12, you give to the additional criterias you list below.

☐
☐
☐
☐

14. Are you attending the Lübeck conference on ecosan issues April 7-11, 2003?

YES ☐ NO ☐

Appendix 5

Questionnaire regarding the use of planning and implementation tools in ecosan projects

Elisabeth Kvarnström, VERNA Ecology, Inc and Ebba af Petersens, WRS Uppsala AB.
Please, answer before April 7, 2003 to elisabeth@verna.se

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15. If YES, would you be willing to meet for more in-depth interviews (not more than an hour) concerning ecosan and planning/implementation tools?

YES ☐ NO ☐

Comments:

Question concerning Review of regulatory framework

A study within the Ecosanres programme (Project B1 b) 32180) aims at providing information on how to identify obstructions and limitations in legislation and identify target areas in regulations and policies that can be openings for ecological sanitation as an option for sanitation. This will be done during 2003 by realizing local studies in five countries.

We know would like to know if you, when working with ecosan projects, have been in touch with specific investigations or projects concerning the legislative and regulative aspects.

16. Do you know of specific projects or countries/regions/municipalities that have incorporated ecological principles, e.g. recycling of nutrients, as part of their conventional water and sanitation management systems and policies?

YES ☐ NO ☐

Comments (Please, provide us with names and contact information to people or projects that you believe could be of interest for this project):

Appendix 5

Questionnaire regarding the use of planning and implementation tools in ecosan projects

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17. Do you find the regulative and legislative aspect of ecosan important?

YES ☐ NO ☐

Comments:

That was all. Thank you very much for your participation.

EcoSanRes is an international research and development programme sponsored by Sida (Swedish International Development Cooperation Agency). It involves a broad network of partners with knowledge/expertise in various aspects of ecological sanitation ranging from management and hygiene to technical and reuse issues. The partners represent universities, NGOs and consultants and they are involved in studies, promotion activities and implementation of projects in Asia, Africa and Latin America.

The network hub is Stockholm Environment Institute (SEI) which holds a formal contract with Sida. EcoSanRes has become an authoritative networking body within the field of ecological sanitation and also collaborates with other bilateral and multi-lateral organisations such as WHO, UNICEF, UNDP, UNEP, GTZ, WASTE, IWA, WSP, etc.

The EcoSanRes programme has three main components:

- outreach
- capacity
- implementation

The outreach work includes promotion, networking and dissemination through seminars, conferences, electronic discussion groups and publications.

Capacity building, is achieved through training courses in ecological sanitation and the production of studies and guidelines, with content ranging from eco-toilet design, greywater treatment, architectural aspects, agricultural reuse, health guidelines, planning tools, etc.

Implementation puts theory into practice with ecological sanitation pilot projects in diverse regions around the world. Because the most important factor to successfully implementing an ecosan system is local adaptation, EcoSanRes provides a logical framework for prospective pilot projects and insists the projects meet stringent criteria before approval.

EcoSanRes is currently running three major urban pilot projects in China, South Africa and Mexico. In addition preparations are being made to develop similar projects in Bolivia and India.

For more information about the partner organisations and programme activities please consult

www.ecosanres.org