



An ecosan source book
for the preparation and implementation of ecological sanitation projects
2nd draft – 10/2003

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Preface

Decision makers and planners are currently lacking a knowledge base that would enable them to adopt ecosan approaches to solve their sanitary problems. There is not only a lack of information concerning the technical options available, but also regarding suitable participatory methods and approaches, for the introduction and implementation of ecological sanitation.

At the same time, there has been a dramatic increase in the number of requests for assistance in the introduction of ecosan projects. These range from requests for specific material for awareness raising, to requests for assistance throughout the entire programme, including the installation, use and maintenance of the system hardware. The projects currently being planned or implemented cover a wide variety of contexts - from rural to densely populated urban areas, and from providing a few toilets to individual households to elaborating a sanitation concept for a newly constructed development area of tens of thousands of people. The projects also implement a wide range of technical solutions, from simple to very sophisticated technologies, and their initiation stems from a wide range of motivating factors.

As a response to the increasing need among decision makers and planners several organisations, including the WSSCC and EcoSanRes, are currently working on guidelines or tools that will be useful to ecosan practitioners for their activities. This publication represents the GTZ ecosan project's contribution to these urgently needed guidelines and tools.



1 Introduction to the guidelines and toolbox

In order to achieve the Millennium Development Goals and the Johannesburg Plan of Implementation, a new paradigm is required in sanitation, based on ecosystem approaches and the closure of material flow cycles rather than on linear, expensive and energy intensive end-of-pipe technologies. This paradigm must recognise human excreta and water from households not as a waste but as a resource that should be made available for reuse.

Ecological sanitation, 'ecosan' for short, is the urgently needed new holistic paradigm in sanitation based on the systematic closure of local material flow-cycles, thus introducing the concept of sustainability and integrated, eco-system oriented water and natural resources management to sanitation and water management.

The basic principle of ecosan is to close the nutrient loop between sanitation and agriculture. Ecosan has the main objectives of:

- reducing the health risks related to sanitation, contaminated water and waste
- improving the quality of surface and groundwater
- improving soil fertility
- optimising the management of nutrients and water resources

Closing the loop enables the recovery of organics, nutrients, trace elements and energy contained in household wastewater and organic waste and their subsequent productive reuse - if necessary after adequate treatment - predominantly in agriculture although the reuse options are not limited to agriculture only. An essential step in this process is the appropriate hygienisation and handling of the materials throughout the entire treatment and reuse process in order to ensure a satisfactory sanitisation of the excrement and protection of public health. Therefore, unlike conventional sanitation systems, ecosan systems not only control the direct hygienic risks to the population but also protect the natural environment. In making the organics, nutrients and trace elements available to agriculture, soil fertility is preserved and long-term food security is safeguarded. In practice the commonly applied ecosan strategy of separately collecting and treating faeces, urine and greywater minimises the consumption of valuable drinking water and enables treatment of the separate wastewater flows at low cost for subsequent reuse in soil amelioration, as fertiliser, as service or irrigation water or for groundwater recharge. Rainwater harvesting and the treatment of animal manure may also be integrated into ecosan concepts.

Ecosan systems restore a remarkable natural balance between the quantity of nutrients excreted by one person in one year and that required to produce their food and therefore can greatly help in saving limited resources. This is particularly urgent with regard to fresh water and mineral resources – for example current estimates for phosphorus state that economically extractable reserves will be exhausted within the next 100 years. Ecosan does not favour a particular technology but is rather a philosophy in recycling oriented resource management and offers modern, convenient, gender friendly and desirable solutions, in accordance with the Bellagio Principles as formulated by the WSSCC (Water Supply and Sanitation Collaborative Council).

Ideally, ecosan systems enable an almost complete recovery of all nutrients, trace elements and energy contained in household wastewater and organic waste and their productive reuse in agriculture. In this way, they help preserve soil fertility and safeguard long-term food security.

1.1 Aim of the guidelines and toolbox

The guidelines and toolbox presented in this publication aim to address the needs and interests of initiators, planners, practitioners and other stakeholders in the preparation and



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implementation of ecological sanitation (ecosan) projects which usually should be based on the participation of all important stakeholders (see section on participation). It aims to supply these groups with methods, material, information and ideas as to how they could raise awareness of ecosan; identify and ensure the active participation of the principal stakeholders; provide the necessary information in an appropriate manner; and structure the working steps of a particular project

The elaboration of this set of guidelines and toolbox is a result of the current lack of information and tools in these areas. First results of ecosan projects from around the world have highlighted that experience is still rare regarding how the project may best be planned and implemented in order to ensure its success. Guidelines and tools are therefore sorely needed for the promotion of ecosan and the dissemination of the related know-how in order to inform the concerned stakeholders of the concept, the wide range of existing technical and organisational ecosan solutions and the hygienically safe treatment and reuse of the recyclates.

Several good participatory approaches have been developed for use in conventional sanitation projects, to provide either on-site (such as pit latrines or septic tanks) or off-site, (such as sewer systems with centralised municipal sewage treatment works) sanitary systems. These approaches could be adapted to some degree for ecosan projects. However, ecosan, as a holistic approach to close the nutrient loop between sanitation and agriculture, goes far beyond the scope of these conventional projects. The ecosan approach recognises human excreta and water from households not as a waste but as a resource to be exploited and thus requires an interdisciplinary approach. Issues such as the agricultural reuse of recyclates and the social and logistic adjustments that may be necessary to facilitate this, the role of public service providers and the local private sector, and the tailoring of sanitary facilities to directly address the needs of the user and the society at large must all be included in the considerations of an ecosan project. This can best be achieved in a successful and sustainable manner if the entire process takes place in a well-informed, participatory environment. In this regard, the Bellagio-Principles and the Household Centred Environmental Sanitation Approach (HCES) developed by the Water Supply and Sanitation Collaborative Council (WSSCC) are seen as the most suitable approaches to underpin the new environmental sanitation concept that ecosan represents.

These guidelines are also intended to support and compliment the other work currently being developed by other organisations, such as the guidelines for the implementation of the HCES being developed by the WSSCC, and the guidelines for planners and implementers currently under development by EcoSanRes. The future development of these current guidelines will be co-ordinated with these other organisations.

1.2 How to use the guideline and toolbox

This publication has been divided into four major sections:

- Section 1 outlines the aims of the guidelines and how they should be consulted and used.
- Section 2 provides an overview of the current world water and sanitation crises, which sets the context for the guidelines. The ecosan philosophy is comprehensively presented for those readers who are as yet unfamiliar with this approach. This discussion is then broadened to describe the variety of ecosan projects possible.
- Section 3 presents the approach for the planning, preparation and implementation of ecosan projects, based on current global knowledge and thinking in the sanitation sector regarding requirements for sustainable solutions. These ten implementation steps are presented, as is the range of stakeholders who may be involved in the project. This approach is then applied to the four basic type of ecosan projects.
- Section 4 currently contains a limited number of tools that can be used by practitioners in each of the ten implementation steps of an ecosan project. We hope that,



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through the active participation and contribution of the members of the international working group, the toolbox will fill with a wide range of tools that have already been used in ecosan projects, as well as with suggestions of what new tools need to be developed specifically for ecosan projects.



2 Ecosan in the context of the world water and sanitation crises

2.1 The world water and sanitation crises

The problems raised by the decreasing quality and quantity of water resources are becoming increasingly serious. All indicators show that they are getting worse and that we are facing a serious world water crisis, which will affect us all, particularly the poor. They suffer most from this decrease in fresh water resources, and bear the brunt of water related diseases and a damaged environment. This water crisis is a direct result of the sanitation crisis, which, while much less often discussed, is causing huge health and environmental problems around the world. The intricate interdependence of current sanitary systems with the water cycle require that both these issues be considered together, before we can consider how both these problems can be de-coupled from one another.

A look at some of the figures of both these crises provides some insight into the scale of the problem facing us today:

- 80 % of all diseases and 25 % of all deaths in developing countries are caused by polluted water (WHO),
- Almost 2,5 billion people do not have access to adequate sanitation / wastewater treatment facilities,
- 6 000 people die everyday as a result of coming into contact with contaminated water,
- More than 90 % of wastewater world-wide is discharged into the environment either uncontrolled or after unsatisfactory treatment,
- Between 1,2 and 1,5 billion people do not have access to safe drinking water
- The estimated mortality rate in 2000 as a result of illnesses caused by contaminated drinking water and poor sanitation and hygiene in developing countries was approximately 2.2 million people. World-wide, over 2 billion people were infected with schistosomiasis and intestinal helminths, of which 300 million suffered serious illness, most of them children under the age of 5.

To the current global population of 6 billion people a further 2 billion are projected to be added in the next 25 years. Most of these people will be born in developing and emerging market economies and will be living in urban areas. Without a concerted effort, many of these people will be doomed to poverty. In order to address these problems in a concerted manner, the United Nations, during the Millennium Summit in New York in September 2000, developed a series of 8 Millennium Development Goals (MDGs). These goals aim to achieve poverty eradication and sustainable development by rapidly increasing access to basic requirements such as clean water, energy, health care, food security and the protection of biodiversity. The United Nations Summit on Sustainable Development, held in Johannesburg, South Africa, in autumn of 2002, returned to the targets set by the MDGs with regard to water supply and extended it too also include the provision of sanitation. The current international target is therefore to halve the proportion of people without access to safe drinking water and to adequate sanitation by 2015 (see box).

BOX 1 The Millennium Development Goals and the Johannesburg Plan

The Millennium Development Goals

The Millennium Development Goals aim to:

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women



- Reduce child mortality
- Improve maternal health
- Combat HIV / AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

With particular regard to water issues the goal of ensuring environmental stability has set itself the target of halving the proportion of people without sustainable access to safe drinking water by 2015.

(The World Bank Group: United Nations Millennium Declaration – September 2000)

Johannesburg Plan of Implementation

In the Johannesburg Plan of Implementation the goals of the United Nations Millennium Declaration were reaffirmed and further elaborated. With respect to the MDGs and water supply and sanitation they aim to:

(1) Halve, by 2015, the proportion of people without access to safe drinking water – thus reaffirming the target set in the Millennium Development Goals.

and

(2) Halve, by 2015, the proportion of people who do not have access to basic sanitation.

(United Nations: Key commitments, targets, and timetables from the Johannesburg plan of implementation, 2002)

An analysis of existing data regarding global sanitation coverage presented in most international reports (e.g. the UN World Water Report) may reveal that the current state of affairs is even much worse than previously thought, with much higher numbers of people requiring access to improved sanitation. Most existing sanitary systems, if considered with regard to their environmental, social and economic sustainability, hygienic safety, and resource efficiency, indeed perform most unsatisfactorily

An informal donor meeting of the World Bank in Paris, in May 2003 attempted to evaluate the current progress towards achieving the 2015 targets. This meeting announced that progress toward meeting the sanitation target, as set in Johannesburg, was progressing the most slowly of all, with an enormous gap still existing between the intended coverage and today's reality. Additionally, it was estimated that in order to supply half of those without sanitation systems by 2015 with conventional sanitary systems (e.g. a pit latrine or a flush toilet) an increase in annual investment in sanitation from 17.5 to over 32.5 billion USD would be needed.

2.2 Limitations of conventional sanitation systems

Conventional sanitation systems, either on-site, such as pit latrines or septic tanks, or off-site, such as sewer systems with centralised municipal sewage treatment works, have proven to be unable to make a significant impact on the backlog of nearly half of the world's population. Even if conventional sanitation systems could be provided to address the enormous backlog of those who lack access to adequate sanitation, the problem would not be solved in a sustainable manner. Practice shows that in many places, such conventional solutions today already pollute ground and surface waters and bring with them a whole range of problems which could lead to an actual deterioration of the situation. At the Lübeck Symposium on ecological sanitation in April 2003, Sunita Narain, the director of the renowned Indian Centre for Science and Environment, asked participants to imagine the environmental consequences if everyone in India were to have their own car, before adding



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“What would be much worse for the environment would be if every Indian were to have a flush toilet”.

Present conventional forms of wastewater management and sanitation systems fall either under the category of waterborne or dry systems. The design of these “flush and forget” or “drop and store” technologies was based on the premise that excreta is a waste and that waste is only suitable for disposal. It also assumed that this waste could be safely assimilated by the environment. “Modern” water-carriage sewer systems are a relatively new technology, which only began to spread in European cities from around the end of the 19th century, when piped water supply systems lead to an increased water consumption and subsequent wastewater production. This first caused stagnant pools and streams of wastewater in the streets of the cities that led to outbreaks of cholera and other diseases. Sewer systems were then gradually introduced. Later, when this resulted in heavy water pollution, mechanical wastewater treatment plants, biological treatment for the degradation of the organics and tertiary treatment for the removal of nutrients were added in order to reduce the pollution and the eutrophication of the receiving water bodies, and now represent the present state-of-the-art in wastewater treatment.

Such conventional wastewater treatment plants operating in an environment where there is no shortage of water and good possibilities to dispose of the treated wastewater have improved the hygienic situation in a large number of cities.

It would therefore appear that conventional centralised sanitation systems are extremely advantageous, as, when built and functioning correctly, they allow a relatively well assured hydraulic transport of excreta, used water and rainwater away from urban areas. Polluted surface waters in urban areas, which are a source of health and environmental problems, are also avoided. The hygienic situation of those inhabitants of urban areas being served by well functioning sewer systems is thereby improved. However, mainly due to lack of resources, this practice cannot be applied correctly and entirely in many countries. Consequently, the improvements of the sanitation situation in wealthy areas of towns is often directly related to a deterioration of the sanitary situation in surrounding, poorer neighbourhoods, as sewage is discharged with little or no treatment into water bodies. As poorer communities are often exposed to these contaminated waters in their daily life, during flooding or even as a drinking or washing water source, increased contamination of this water directly affects them. These problems are particularly aggravated when the urban population is rapidly increasing.

The conventional centralised systems require a huge financial investment, as well as having high maintenance and operation costs. The problems of expense do not only prevent developing nations from building comprehensive and correctly operating centralised sanitation systems, industrialised nations also face huge problems in the maintenance and operation of their sewer systems and treatment plants. In Latin America, for instance, less than 20% of the collected wastewater is treated at all and of 540 major European cities, only 79 have advanced tertiary sewage treatment, 223 have secondary treatment, 72 have incomplete primary treatment and 168 cities have no or an unknown form of treatment of their wastewater. (source – 2nd Forum on Implementation and Enforcement of Community Environmental Law. Intensifying Our Efforts to Clean Urban Wastewater. Brussels. 2001, in EcoSanRes 2002 “The Sanitation Crisis”

<http://www.ecosanres.org/PDF%20files/Kyoto/The%20Sanitation%20Crisis.pdf> .)

A closer consideration shows that conventional waterborne sanitation systems have even more fundamental shortcomings than their high costs. As water is necessary to transport the wastes, the high water-consumption connected with these sanitary systems makes them generally unsuitable in the long term for regions with water scarcity and arid countries and is in many places already leading to an over-exploitation of the limited renewable water resources. Drinking water is therefore becoming an expensive good, only available to the better off. Clean drinking water is clearly too precious a resource to be flushed down the toilet, and it is not the most pleasurable experience to operate a water flush toilet, when the water supply only operates a few hours per week. Additionally, even if these systems do



contribute to a healthier environment in the cities located upstream, they actually do the opposite for those living downstream. Even when functioning properly, the discharge from conventional wastewater treatment plants is from a health point of view not safe and does not even fulfil the quality requirements of bathing water. Conventional treatment plants have been developed mainly for the removal of large particles, biodegradable organic substances and nutrients in order to protect the ecosystems of the receiving waters. The reduction of pathogenic organisms is very limited. The effluent from these plants also contains many other potentially dangerous substances. For example, recent research has shown an increasing awareness of the effects of endocrine substances, which are contained in human excreta and that can, for example, have an effect on reducing the fertility of fish and even on altering the sex of male trout. The effects of pharmaceutical residues in the effluents and their impact on environment and humans living downstream and obtaining their drinking water from the same river are also being discussed. A further problem, for combined sewer systems (carrying both storm water and wastewater), is that a sudden heavy rainfall generally leads to the diluted wastewater being discharged directly into rivers as treatment plants are only designed for a limited influent.

Conventional on-site wastewater disposal systems, such as pit latrines or septic tanks, are also not a viable alternative, due to the resultant groundwater contamination, which increases with increasing population densities. In many densely populated areas, the nitrate contamination of groundwater, for example, exceeds the maximum level recommended by the WHO for drinking water and may represent a serious problem for babies. Shallow groundwater is still a major source for local and reliable water supply especially for the poor in rural and peri-urban areas. The design of the conventional “drop and store” pit-latrines (and of most other on-plot systems) however deliberately aims to retain only the solids in the pit and to infiltrate as much of the liquids into the subsoil as possible. As these liquids contain all the soluble elements of the excreta as well as viruses and pathogens, this type of sanitation, depending on the hydrogeological situation, may very well be a highway to groundwater contamination..

In theory, these pit latrines should be emptied when they are filled, with the content being treated before being put to any other use (e.g. in agriculture). In practice however, old pits are often simply abandoned, with users generally preferring to build a new pit latrine than to attempt the extremely unpleasant job of emptying the old one. However, it can prove to be relatively expensive for a household to dig a new pit, and provide a new superstructure each time the old pit is full. This is added to by the difficulty faced by homeowners living in densely populated areas, where plots are small and tend to already be crowded with old, previously abandoned pits. Many conventional latrines also smell quite badly, are a breeding place for flies, insects and other vectors and are very inconvenient to use, especially for children, women and girls, as they have to be built at a distance from the house, making night-time visits highly undesirable. Added to this are the problems of pit construction in areas with a high groundwater table, or where the ground is rocky, making the use of a pit extremely impractical. Pits are also susceptible to both flooding during heavy rainfall and subsequent collapse.

However, the most fundamental problem with all types of conventional wastewater disposal systems is that they directly impair soil fertility as the valuable nutrients and trace elements contained in human excrement are very rarely re-channelled back into agriculture. Even if sewage sludge is used in agriculture, only a very small fraction of the nutrients contained in the excrement are reintroduced into the living soil layer. Most are either destroyed (e.g. by nitrogen elimination) or enter the water cycle, where they pollute the environment, causing the eutrophication of lakes and rivers. The use of sewage sludge from central wastewater systems is also frequently restricted as it contains high concentrations of heavy metals and other hazardous substances, due to the mixing of domestic and industrial wastewater with storm-water run-off from contaminated streets. The consequence of this is that agriculture now has a huge demand for chemical fertilisers, which are regarded as the only solution to



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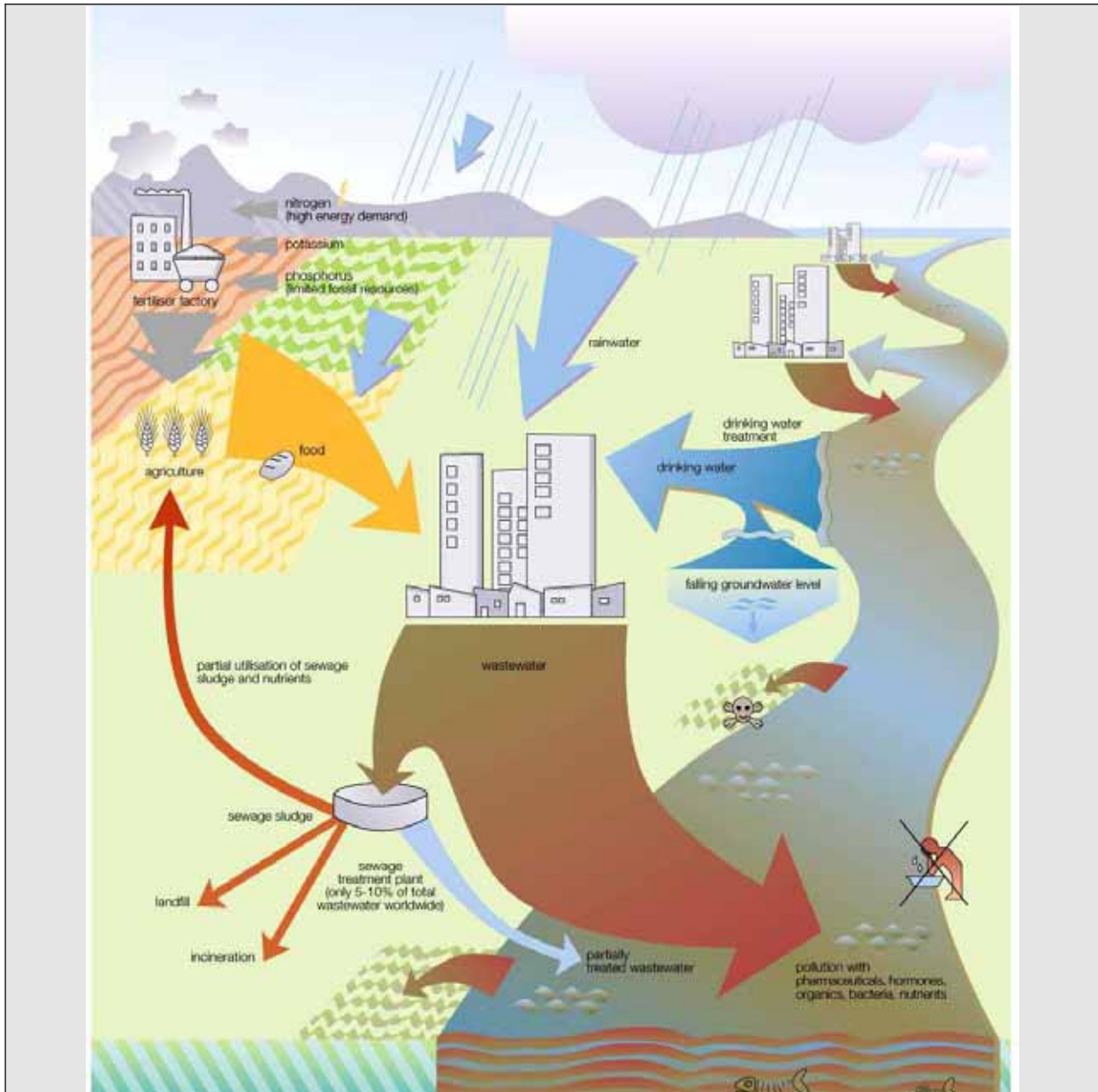
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address the problem of falling soil fertility. In order to produce these fertilisers large amounts of energy are needed along with the exploitation of finite mineral resources such as phosphorous. Current estimates state that phosphorous reserves will be exhausted in between 60 and 130 years at the present rate of consumption. The relatively inexpensive phosphorous used today will therefore almost certainly cease to exist in the next 50 years. Ecosan is therefore a decisive factor for environmental protection and resource conservation, sustainable food production and a stable future in food and health.

In fact, our conventional wastewater systems are largely linear end-of-pipe systems where drinking water is misused to transport waste into the water cycle, causing environmental damage and hygienic hazards. If we continue to promote these technologies in order to meet the MDGs, the overall result would be worse than our present situation as the hygienic situation of our waters would be further deteriorated and even more resources would be dissipated and introduced into water bodies.

Figure 1 schematically illustrates the main limitations of conventional wastewater management systems.

FIG. 1 The shortcomings of conventional sanitation systems



- Unsatisfactory purification or uncontrolled discharge of more than 90 % of wastewater world-wide
- Pollution of water bodies by organics, nutrients, hazardous substances, pathogens, pharmaceutical residues, hormones, etc.
- Unacceptable health risks and spread of disease
- Severe environmental damage and eutrophication of the water cycle
- Consumption of precious water for transport of waste
- High investment, energy, operating and maintenance costs
- Frequent subsidisation of prosperous areas, and neglect of poor settlements
- Loss of valuable nutrients and trace elements contained in excrement through their discharge into water bodies
- Impoverishment of agricultural soils, increased dependence on the chemical fertilisers
- Predominance of combined central systems, resulting in problems with contaminated sewage sludge
- Linear end-of-pipe technology



2.3 Principles, advantages and key issues of ecological sanitation (ecosan)

In order to achieve the MDGs and sustainability in the field of environmental sanitation a new paradigm is therefore clearly needed. This was also the unanimous conclusion of a group of experts from a wide range of international organisations involved in environmental sanitation that met in February 2000 in Bellagio, Italy. The group called for a radical overhaul of conventional policies and practices world-wide and formulated the four “Bellagio Principles” which should underpin any new approach in environmental sanitation (see box).

BOX 2 The Bellagio Principles (2000)

The Bellagio Principles (2000)

(1) Human dignity, quality of life and environmental security at household level should be at the centre of the new approach, which should be responsive and accountable to needs and demands in the local and national setting.

- solutions should be tailored to the full spectrum of social, economic, health and environmental concerns
- the household and community environment should be protected
- the economic opportunities of waste recovery and use should be harnessed

(2) In line with good governance principles, decision making should involve participation of all stakeholders, especially the consumers and providers of services.

- decision making at all levels should be based on informed choices
- incentives for provision and consumption of services and facilities should be consistent with the overall goal and objective
- rights of consumer and providers should be balanced by responsibilities to the wider human community and environment

(3) Waste should be considered a resource, and its management should be holistic and form part of integrated water resources, nutrient flow and waste management.

- inputs should be reduced so as to promote efficiency and water and environmental security
- exports of waste should be minimised to promote efficiency and reduce the spread of pollution
- wastewater should be recycled and added to the water budget

(4) The domain in which environmental sanitation problems are resolved should be kept to the minimum practical size (household, community, town, district, catchment, city) and wastes diluted as little as possible.

- waste should be managed as close as possible to the source
- water should be minimally used to transport waste
- additional technologies for waste sanitisation and reuse should be developed

These principles were endorsed by the members of the WSSCC during its 5th Global Forum in November 2000 in Iguacu (Brazil).

As it is clearly stated in the Bellagio Principle No 3, The new paradigm in environmental sanitation must be based on ecosystem approaches and the closure of material flow cycles rather than on linear, expensive and energy intensive end of pipe technologies if we are to avoid repeating the mistakes of the past. Ecological sanitation, 'ecosan' for short, represents this new paradigm. It is based on an overall view of material flows as part of an ecologically and economically sustainable wastewater management system tailored to the needs of the users and to the respective local conditions. It does not favour a specific technology, but



constitutes a new philosophy in handling substances that have so far been seen merely as wastewater and water-carried waste for disposal.

The basic principle of ecosan is to close the loop between sanitation and agriculture (see box 3), with the objectives of:

- reducing the health risks related to sanitation, contaminated water and waste
- improving the quality of surface and groundwater
- improving soil fertility
- optimising the management of nutrients and water resources

BOX 3 What is “agricultural reuse” in ecosan?

What is “agricultural reuse” in ecosan?

In ecosan approaches the basic principle is to ensure a closure of the nutrient loop between sanitation and agriculture, thus ideally enabling an almost complete recuperation of the nutrients, organic material and water that are normally discarded by conventional sanitation systems. This therefore contributes to safeguarding soil fertility and improve its structure and water retention capacity, while decreasing the consumption of finite resources by providing a natural alternative to chemical fertilisers.

In ecosan, the term “agricultural reuse” refers to a wide range of productive, ecosystem oriented, reuse options. This includes reuse in what could be considered as traditional agriculture, i.e. on farmers fields where crops such as cereals are grown, but also forestry, aquaculture, market gardening, horticulture etc. It also includes the reuse not only of nutrients but also of grey water, the organic content of wastewater and energy.

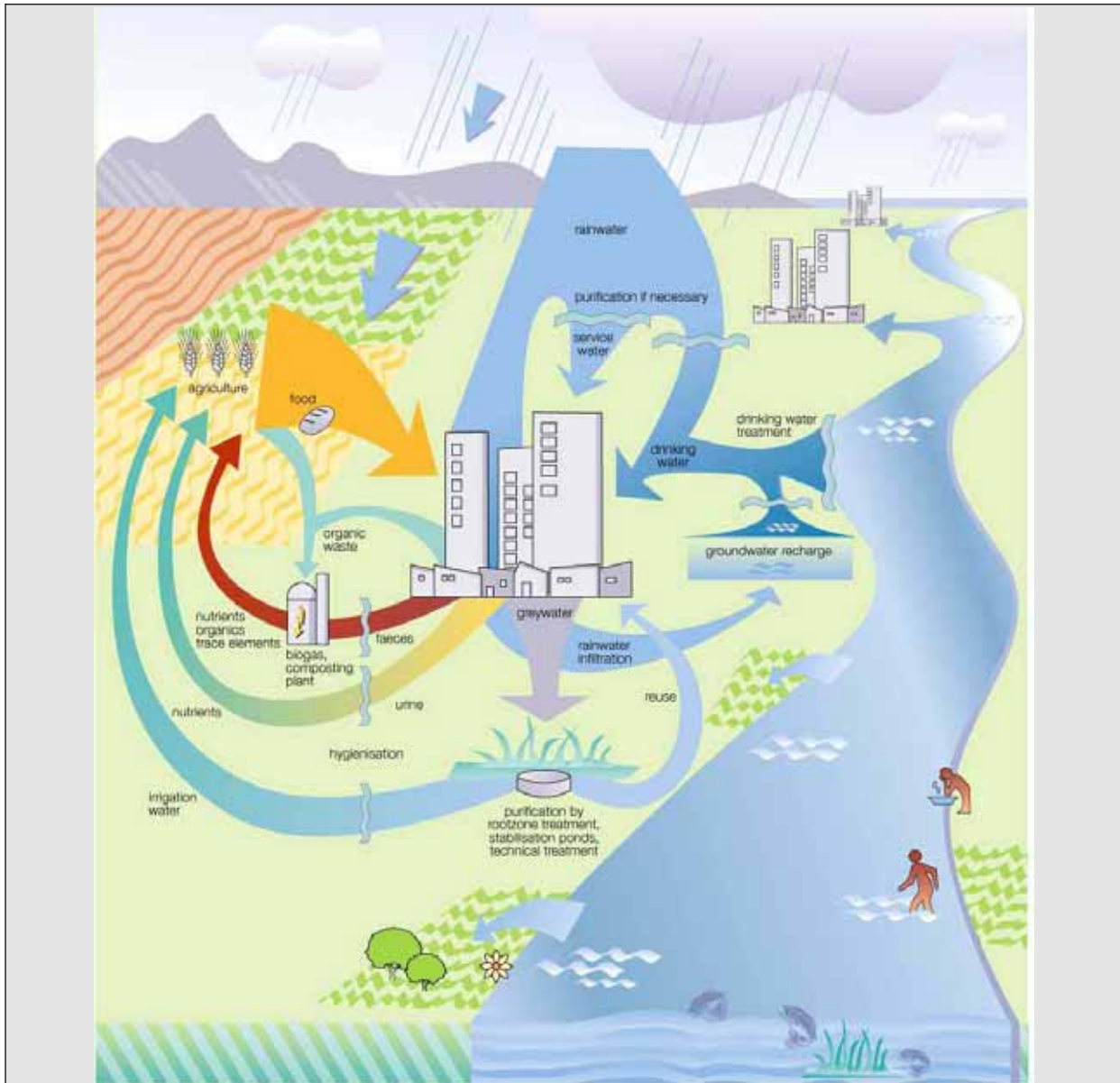
BOX 4 Other forms of reuse in ecosan

Other forms of reuse in ecosan

While ecosan aims to close the nutrient loop between sanitation and agriculture through the reuse of nutrients, organics, water and energy contained in wastewater, the reuse options of such an ecosystem approach are not limited to agriculture. There are a whole range of other reuse options which can and should be integrated into ecosan systems wherever possible. These include the domestic reuse of grey water, following suitable treatment, for example for flushing toilets, or possibly its use as service water in industry, or used to recharge groundwater. Rainwater use could also be incorporated into this, with rainwater possibly being treated and being used for drinking water. The energy contained in wastewater can be recuperated and put to an array of uses, for example for cooking, for electricity generation, for heating purposes or even for industrial use. Organic can also be recovered and out to use outside of agriculture, being used to generate biogas, or perhaps even as a general soil improver.

Ecosan is a holistic approach to sanitation and water management and represents a break with the poorly performing end-of-pipe technologies of the past, recognising human excreta and domestic used water as a resource that should be made available for reuse. As an integrated alternative, a hallmark of ecosan is its interdisciplinary approach that goes beyond the narrow disciplines of domestic water supply and technological aspects to address issues such as agriculture, sociology, hygiene, health, town planning, economics and small business promotion, the administration, etc. Such an intersectoral and interdisciplinary approach therefore makes a large contribution to the integrated management of water and other natural resources. The following figure illustrates the main advantages of ecosan systems.

FIG. 2 The main advantages of ecological sanitation systems



- Improvement of health by minimising the introduction of pathogens from human excrement into the water cycle
- Promotion of recycling by safe, hygienic recovery and use of nutrients, organics, trace elements, water and energy
- Resource conservation, through lower water consumption, substitution of chemical fertilisers and minimisation of water pollution
- Preference for modular, decentralised partial-flow systems for more appropriate cost-efficient solutions
- Possibility to integrate on-plot systems into houses, increasing using comfort and security for women and girls
- Contributes to the preservation of soil fertility
- Improvement of agricultural productivity and hence contributes to food security
- Promotion of a holistic, interdisciplinary approach (hygiene, water supply and sanitation, resource conservation, environmental protection, urban planning, agriculture, irrigation, food security, small-business promotion,)
- Material-flow cycle instead of disposal

In practice a frequently applied strategy in ecosan projects is to separate the flows and the treatment of faeces, urine and grey water, which minimises the consumption of valuable drinking water needed to flush away excreta. This has also important advantages as the different fractions have different characteristics and can be treated according to the specific reuse requirements. (see figure 3) Rainwater harvesting and the treatment of organic domestic and garden wastes and of animal manure may also be integrated into ecosan-concepts. The separation of the flows is, however, not a prerequisite in ecosan systems, and ecological sanitation is also possible in centralised and combined flow systems.

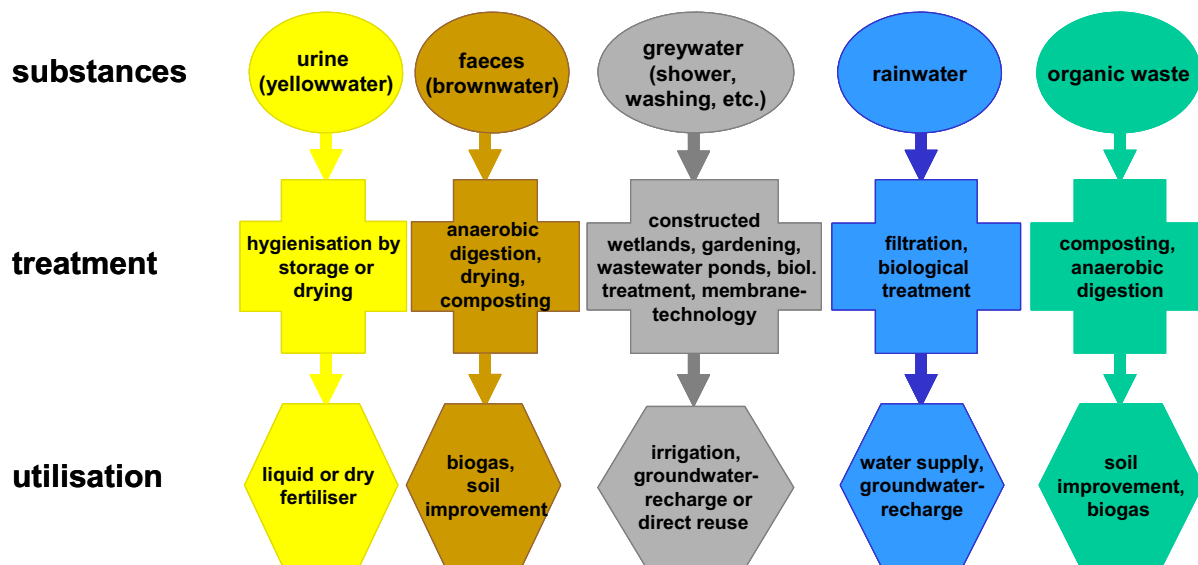


FIG. 3 Separation of substances and examples of possible ecosan elements

Closing local nutrient cycles by retrieving and using nitrogen, phosphorus, potassium, trace elements and organic components contained in excrement is even more important considering some of the disadvantages of mineral fertilisers. These have proven to be too expensive in many parts of the world or are simply unavailable to local farmers, who often turn to using the untreated contents of latrine pits or septic tanks on their farmland. The long-term effects of mineral fertilisers on soil and food quality are also in dispute. As has been already stated, the production of mineral fertiliser requires large amounts of energy and the exploitation of finite mineral resources.

The split-stream collection, treatment and reuse of different wastewater flows offers new possibilities for more specific and cost-efficient solutions. Separated wastewater flows can be characterised as follows:

- black water – a mixture of faeces and urine with or without domestic wastewater from showers, washing machines etc.,
- yellow water - urine only or mixed with domestic wastewater
- brown water – black water with no urine
- grey water - domestic water without faeces and urine

Ecosan systems restore a remarkable natural balance between the quantity of nutrients excreted by one person in one year and that required to produce their food (7.5 kg nitrate, phosphorous and potassium and for 250 kg grain). Ideally, ecosan systems enable an almost complete recovery of all nutrients, trace elements and energy contained in household wastewater and organic waste and their reuse in agriculture. In this way, they help preserve soil fertility and safeguard long-term food security. An essential step in this process is the



appropriate hygienisation and handling of the materials throughout the entire treatment and reuse process in order to ensure a sufficient sanitisation of the excrement and the protection of the public health. Therefore, unlike conventional sanitation systems, ecosan systems not only control the direct hygienic risks to the population but also protect the natural environment.

The human faeces obtained after separation, show valuable soil improvement qualities (structure and rise of the water retention capacity). They are treated if necessary together with the organic fraction of solid waste and according to local conditions (climate, power demand and socio-cultural acceptance etc) using the processes of either dehydration, composting, stabilisation, soilisation or fermentation. Thus, the organics and nutrients contained in faeces can be used in concentrated and hygienically safe form as a dry fertiliser, compost or fluid fertiliser. Dependent on the type of treatment energy can be produced if necessary in the form of biogas after anaerobic digestion.

Fraction	Characteristic
1. faeces	<ul style="list-style-type: none"> • hygienically critical • consists of organics, nutrients and trace elements • improves soil quality and increase its water retention capacity • average production ca. 50kg/cap/a • consists mainly of organics submitted to decomposition processes and a minor proportion of nutrients
2. urine	<ul style="list-style-type: none"> • hygienically uncritical • contains the largest proportion of nutrients available to plants • may contain hormones or medical residues • average Production ca. 500 l/cap/a • consists mainly of nutrients available to plants and very little organics, therefore no need for stabilisation
3. grey water	<ul style="list-style-type: none"> • of no major hygienic concern • volumetrically the largest portion of wastewater • contains almost no nutrients (simplified treatment) • may contain spent washing powders etc. • average production 25 – 100 m³/cap/a

FIG. 4 Characteristics of substances

The urine, or yellow water, contains the highest proportion of natural nutrients (nitrogen, phosphorus and potassium), which are directly available to plants and equally effective as mineral fertilisers. Urine contains approximately 90% of the total nitrogen, 55% of the total phosphorus and a substantial portion of the potassium contained in human excrement. A partial flow separation and use of the urine is particularly advisable due to its low volume and the high concentration of nutrients it contains. In order to obtain the yellow water fraction devices such as urine separation toilets or waterless urinals can be used.

The grey water from washing, rinsing, showers etc., while representing the largest fraction of the total wastewater flow, has only a very low nutrient content. Therefore, it can be treated to a high quality using simple techniques such as gravel filters, constructed wetlands, ponds, biofilm or activated sludge procedures. For high-tech applications more sophisticated



treatments, such as membrane filtration or activated carbon filters, may eventually be added. The treated grey water can be put to particularly good use in agricultural irrigation (especially in water scarce regions), but may also be used for groundwater recharge, industrial or urban reuse or discharged into surrounding watercourses.

Thus, diverse technologies can be used in ecosan systems, from simple low-tech to sophisticated high-tech solutions. These currently range from compost toilets or urine-separating dry toilets, to water-saving vacuum sewage systems, possibly with separate collection and subsequent treatment of urine, faeces and grey water through to membrane technology for material separation and hygienisation. Generally, precedence is given to appropriate modular and decentralised facilities, but in very densely populated areas centralised systems may still be needed. The essential advantage of the modular components is the optimal adaptation to the local social, economic, ecological and climatological conditions. As a result, they represent a comparatively rapidly and more economically realisable alternative to conventional systems.

Another advantage is, that even simple dry ecosan toilets in very poor areas can be constructed directly indoors, as these toilets, unlike traditional on-plot sanitation, do not endanger the stability of the houses as they do not require a pit, and have no flies and no odour when well managed. Indoor toilets contribute to the security of the user, particularly women and girls using the toilet at night. They also save a good deal of time, as adults, normally women, can help children to the toilet with only a minimal delay in other activities.

Of particular importance in ecosan approaches are innovative logistics to return nutrients to farmland, marketing strategies for the recovered nutrients and directions for their safe application in agriculture. New ecosan schemes may also entail setting up service enterprises and hence kick starting income generating measures for the construction and easy and safe operation of the installations as well as the collection, treatment and marketing of the recyclates.

As has already been mentioned, the ecosan is fully in accord with the Bellagio Principles which have been endorsed by the Water Supply and Sanitation Collaborative Council (WSSCC). These recommend that waste be considered as a resource that should be diluted as little as possible, and that sanitation problems should be solved on the minimum practicable size (household, community, town, catchment etc.). The ecosan approach is also largely in line with the Household Centred Environmental Sanitation Approach (HCES), which has been developed by the environmental sanitation working group of the WSSCC for implementing the Bellagio Principles in strategic environmental sanitation planning. (see Section 3 of these guidelines).

2.4 What is a typical ecosan project?

Ecosan is often currently misinterpreted as being a sanitary solution restricted to use in rural, grass root, small scale projects with a few low cost composting or urine separating toilets being provided for local farming families in developing countries. Whilst a majority of ecosan experiences do come from this rural context, it would however be incorrect to suppose that ecosan is only applicable in this milieu.

Ecosan projects have proven themselves around the world in a rich variety of contexts. Environmentally friendly settlements in the temperate climates of northern Europe have employed closed loop sanitation systems, treating their grey water locally and providing agriculture with fertiliser from urine separation or from sludge from biogas plants, as can be seen, for example, in Germany.. In China, the combined treatment of human excreta and animal manure in small scale biogas plants is common and plans are afoot to provide an ecosan solution for the sanitation needs of 50 000 people in a suburb of Peking, whilst in Mexico an ecosan programme to address the sanitation needs of the population of Tepoztlán, an urban centre with 33 000 inhabitants just south of Mexico City, began in 2002. In southern Africa, pre-fabricated dehydration toilets have been available on the local market since 1994, with over 18 000 of these decentralised units installed world-wide. Each one of



these projects employ a different technology, tailored to the needs of the user and the local market.

However, even if a similar technology is employed in two ecosan projects, the motivation behind choosing such a system can be completely different, often depending on a mix of factors unique to a given situation. For some it may be seen as a status symbol to have a clean, odourless toilet in their own homes, others may have chosen ecosan simply for reasons of cost, while some may have made a conscious choice based on environmental considerations. Municipalities may opt for ecosan as part of their Agenda 21 activities, for purely economic reasons, or to protect local water resources. A list of just some of the different motivations for choosing ecosan is presented in Chapter 6.

These examples illustrate that, depending on the technologies chosen and the motivation of the stakeholders, ecosan can be a solution for both the “poorest of the poor” and the “richest of the rich”.

This mix of different framework conditions, technical options, stakeholders involved and motivating factors, serves to ensure that no two ecosan projects are alike. For the moment therefore, there is no such thing as a typical ecosan project. However, on the basis of experience gained, it is possible to broadly identify four basic types of ecosan projects, and give a general description of the stakeholders involved, their degree of participation in the process, and the activities to be undertaken. This allows an identification of the tools and instruments that may be necessary, and who may need them, at different stages throughout the project.

As would be expected, these four broad categories of ecosan projects are quite general in their description. Projects in reality may not fit so neatly into one of the categories and individual projects may lie somewhere in between two types. The four basic types are therefore mainly intended to provoke reflection on who the stakeholders in a planned given project might be, what their roles and information needs could be, and what tools should be foreseen to encourage their participation.

2.5 The 4 basic types of ecosan projects

Project type A (rural upgrade) corresponds to what could be considered as the “classic” ecosan-project. Farming households, in rural areas, receive support to establish ecological sanitation systems either on their compounds or in their houses.

The farming households are generally responsible for handling the recyclates (usually only urine and faeces), using them on their own fields as fertiliser and soil conditioner. Grey water treatment and reuse, rainwater harvesting, and organic waste management can be integrated into the system, although this is rarely practised.

The decision to implement ecosan may result from the initiative of a local NGO or CBO engaged in ecological development. The organisation may start their activities by contacting local opinion leaders, informing them of the ecosan approach and asking for their support. It is hoped that once these people have accepted the system, a broader introduction among the farming households will be facilitated and accelerated.

The decision can also however be made at the political macro-level, for example within the framework of a rural development programme. This would involve a large number of farming households in the project, enabling economies of scale to be made, but possibly complicating the participation process. In this case, information structures (public/private) and appropriate financing methods would generally be provided by the government.

Project type B (peri-urban and urban upgrade) corresponds to ecosan projects implemented in all existing urban or peri-urban areas of cities and towns, where more or less well functioning existing sanitation systems are converted to closed loop systems. This therefore applies to all areas, from informal settlements to luxury multi-storey apartment or office blocks, where the existing infrastructure is to be upgraded to ecosan systems. The implementation of such projects generally tends to be much more complex than those in



areas of new development, for several reasons. The use of the existing infrastructure may still be foreseen in the project, which means that ecosan solutions must be built around this system, which may cause a considerable degree of technical difficulty. Private households may also only reluctantly agree to convert their sanitary facilities to ecosan, as they will most likely have to foot the bill for the change over. Private investors may also not be willing to participate in such projects as there is a considerably smaller opportunity for them to make a profit. Additionally, these built up areas may have very little space for the installation of decentralised solutions. Projects in this context may therefore have to adopt a long term approach to the completion of an ecosan system, with innovations being introduced gradually over many years.

The eventual handling and reuse of the recyclates (faeces, urine, grey water, rain water, storm water, organic waste and energy) is carried out, either only partially or for a particular recyclate, by the householders themselves in an urban context (in vegetable gardens, urban agriculture, for toilet flushing etc.).

More usually, however, the households may not have the opportunity, or the need, to use the recyclates themselves. In such cases external service providers, working either privately or for the municipality, can be charged with marketing, collecting, treating, storing and marketing the recyclates, eventually transporting them to a reuse site, for example in urban parks or to farmers cultivating on the outskirts of the town, for energy production or for producing service water for private or public users.

The initiative for projects of this type can come from a variety of sources. The households concerned may themselves initiate the project on a local level, but it can also come from the macro-level, for example in the case of improvement projects for informal settlements implemented by the municipality or the government. The projects in this case address a large number of households, with the degree of support from the authorities (government/municipality) being considerably stronger (regulation, financial support) than for local micro-initiatives.

Project type C (new urban development) is to be found when new dwellings or development areas are being constructed either by the authorities (national, regional or local government) or by private developers (these are normally private businesses, but may sometimes also include citizens groups who wish to build their own homes in an ecological way). The dwellings come equipped with ecosan systems, and these systems are therefore considered from early on in the planning stage, facilitating considerably the consideration of all relevant aspects of town planning, land use, (urban) agriculture, water management etc. as well as their rapid and comprehensive introduction. They are often sold or rented to a relatively well-off section of the population, if the developers themselves do not occupy them. There is however also the possibility of new development areas with closed loop ecological sanitation systems being constructed specifically for low-income households. Because of the urban location and the favourable planning conditions, all the treatable resources (urine, faeces, grey water, rain water, storm water and organic waste) may be integrated into these sanitation systems. However, the application of ecosan systems may only be restricted to faeces, urine and grey water.

Depending on the social status and activities of the users of the sanitary facilities, the handling and reuse of the recyclates may proceed in two ways; (1) they could be collected and treated by a service provider (either private or from the municipality) at a certain cost to the users. The products are then used by a third party (e.g. farmers, city parks etc.) who may have to pay to buy and transport the products or (2) the households themselves collect and reuse the recyclates on their own plots of land (gardens / urban agriculture).

In projects of type C, the initiative to opt for an ecosan system often comes exclusively from the investors (i.e. the private developers or citizens group) or the local, regional or national government and their respective planners. Householders then first come into contact with the system when they move into their bought or rented property. They should, at the latest, be informed at this point of the principles and operation of their ecosan system.

Project type D (non-residential) is a regrouping of all ecosan applications in buildings and areas that are not intended for normal residential purposes. Examples of these include public institutions, such as schools or hospitals, private establishments, such as banks or offices, as well as hotels or holiday lodges situated in sensitive areas (e.g. in national parks, on islands etc.), or in regions that are not being served by the public sewer network.

Projects of this type may address the upgrading of an existing conventional sanitation system to ecosan or the construction of a new building with a closed loop sanitation system. Depending on the circumstances, upgrade or new construction, different levels of technical difficulty may be encountered.

Depending on the circumstances both the faeces and urine alone are recycled or grey water, rainwater and organic waste are integrated into the system for recycling. The handling of the recyclates can be carried out either by the users of the building (e.g. employees, pupils etc.) or service providers are engaged, requiring a marketing and transport of the recyclates to the end users.

The decision to use an ecosan system in this case can be taken at the micro level, if the owners of an individual building, for example a hotel, voluntarily opt for closed loop sanitation. Alternatively, macro level decisions, for example that all schools should dispose of ecosan or that certain natural resources in a region must be protected, can be taken at the macro level by governments.

An overview of the description of the four basic types of ecosan project is given in Table X.

Basic types of ecosan-projects				
Project-type	A	B	C	D
Characteristics	 rural upgrading	 urban upgrading	 new urban development areas	 non-residential (tourism, schools ..)
• User of sanitation facilities	household	household / neighbourhood	household / neighbourhood	tourists, employees, pupils ...
• User of the end products (Range: in house / other)	household	household (partly) farmer, external user (partly)	household (partly) farmer, external user (partly)	user-institution (partly) farmer, external user (partly)
• Level of initiative and Decision (min / max)	micro macro	micro macro	macro	micro macro
• Considered resources (minimum / optimum)	faeces + urine only plus greywater, rainwater harvesting, organic waste	faeces + urine + greywater only plus rainwater harvesting, stormwater management, organic waste	faeces + urine + greywater + stormwater-management plus rainwater harvesting, organic waste	faeces + urine + greywater + stormwater-management plus rainwater harvesting, organic waste
• Service provision for operation, transport, treatment and marketing (Range: in house / other)	household	household public/private service provider	household public/private service provider	user institution public/private service provider

TABLE 1 The characteristics of the 4 basic types of ecosan project

2.6 Implementing ecosan

Ecosan approaches have been adopted in a variety of contexts around the world, from sparsely populated rural areas to densely populated urban environments. These experiences



have however been mostly limited to relatively small-scale pilot projects. In the long term, ecosan can only significantly contribute to the sustainability of water resources management, food security etc. when successfully operating on a large scale. Large scale application will allow market-oriented production and supply of ecosan equipment and maintenance / treatment services. Furthermore market-orientation supports the development not only of technically different sanitation solutions, but also of different model designs corresponding to the different tastes and level of comforts demanded by the consumers. If it is to be accepted as the new state of the art solution to sanitary problems there is therefore an urgent need to up-scale current experiences. In order to address this issue the participants at the recent Lübeck Symposium on ecological sanitation in April 2003 formulated 10 priority actions for the further promotion and up scaling of ecosan (see box 1).

The Lübeck Recommendations clearly identified awareness raising, the availability of information and stakeholder participation as being of crucial importance to the successful promotion, up scaling and implementation of ecosan projects. However what also became clear during the symposium was the lack of tools ecosan practitioners have at their disposal to help them address these issues confidently. It became clear that in order to ensure ecosan is accepted as the new sanitation paradigm, this knowledge gap had to be closed.

With its aims of raising awareness, creating demand, ensuring the participation of all stakeholders in the planning, design, implementation and monitoring processes, providing for decisions on an informed basis and promoting education and training for ecosan these guidelines directly address the of the 2003 Lübeck Symposium (see box "Lübeck Recommendations for Action").

BOX 5 The Lübeck recommendations for action

Lübeck Recommendations for Action

In April 2003, at the 2nd International Symposium on Ecological Sanitation in Lübeck, Germany, 350 experts from 60 countries formulated 10 Recommendations for Action, as priorities for the further promotion of ecosan and for bringing ecosan to scale.

1. Promote ecosan-systems as preferred solutions in rural and peri-urban areas

A variety of ecosan solutions, ranging from low to high-tech, exist for rural and low density urban areas. These should now be implemented on a large scale, in accordance with local physical, cultural and socio-economic conditions.

Technologies based on ecosan principles should be vigorously promoted for all new construction of buildings and for the refurbishment of older structures wherever feasible. Additionally, existing on-site sanitation facilities that pose a significant health risk should be upgraded in accordance with ecosan principles.

2. Accelerate large scale applications of ecosan principles in urban areas

Urban areas with their rapidly growing populations are in greatest need of sustainable sanitation. Although initial experiences with ecosan systems are available from urban areas, further research and development is urgently required. Further ecosan pilot-projects should be carried out in order to develop a variety of technological, organisational and economically viable solutions for densely populated urban areas and to obtain results concerning the costs and performances of different systems in both industrialised and developing nations. The conversion of existing conventional systems towards ecosan should, wherever possible, be immediately started, adopting if necessary a step-wise approach.

3. Promote agricultural use

Ecosan systems are not complete until the fertiliser products are reused. The promotion of agricultural reuse must therefore be a key element of every ecosan project. Reuse options for ecosan fertilisers need urgent field testing at medium and large scale, and appropriate pre-treatment, distribution,



marketing strategies and guidelines for safe handling and use for different local conditions must be developed. Particular care has to be taken to ensure that the pathogen cycle is broken.

4. Raise awareness and create demand

To be willing to make a change, politicians, local and regional authorities and the public need to know that the current system can cause many problems and that the application of ecosan principles can solve several of them. Advocacy and lobbying is therefore essential. There is also an urgent need to showcase ecosan systems at a municipal or large neighbourhood level in order to convince decision makers (“seeing is believing”).

5. Ensure participation of all stakeholders in the planning, design, implementation and monitoring processes

Planning with a household or neighbourhood-centred approach should be adopted as it places the user at the core of the planning process. The Household Centred Environmental Sanitation Approach (HCES, as developed by the WSSCC) responds to the knowledge, needs and demands of the users. This approach attempts to avoid the problems resulting from either “top-down” or “bottom-up” approaches, by employing both within an integrated framework. Gender issues must be given particular consideration in all processes.

6. Provide for decisions on an informed basis

People should be involved in assessing a range of ecosan options addressing their needs, thus placing, as far as possible, the decision for the type of system they wish to use directly in their hands. In ecosan projects, all stakeholders must be informed intensively about the closed-loop ecosan philosophy, the use of the sanitary facilities, and the safe treatment and application of the recyclates with respect to hygiene and the environment. Study and documentation of the health risks posed by the different sanitary concepts, and the necessary means to overcome these, is required.

7. Promote education and training for ecosan

Ecosan is multidisciplinary and should be integrated in the teaching curricula of universities, schools and vocational training centres. The engineers, architects, farmers, developers, constructors, consultants, municipal planners, economists and authorities concerned should know about the concept, the wide range of existing technical and organisational ecosan solutions and the hygienically safe treatment and reuse of the recyclates. Ecosan principles should be integrated into capacity building and continuous learning programmes for all the actors involved. The documentation and results of pilot-projects must be transformed into e.g. technical, socio-economic, and reuse guidelines reflecting the interdependencies of water supply, sanitation, waste management, health, hygiene, environment, agriculture and energy supply.

8. Adapt the regulatory framework where appropriate

Ecosan technologies should be codified into the local, national and international systems of technical standards and norms in order to provide reference for Best Practice and Best Available Technology. The regulatory framework should be verified or adjusted with the aim of authorising and promoting a closed loop with new innovative technologies and management concepts.

9. Finance ecosan

Appropriate financing instruments need to be developed, putting particular emphasis on the possibility to finance the users investment for on-site and neighbourhood systems, recognising that ecosan systems have a different cost structure from conventional sanitation systems. Innovative financing alternatives including start-up funds, community based finance programmes and cost recovery mechanisms may be required. The possibilities for private sector participation are large and should be stimulated, thus opening opportunities particularly for small and medium-sized enterprises and job creation. Additional financing should also be provided to secure research activities.



10. Apply ecosan principles to international and national Action Plans and Guidelines

Ecosan strategies should be implemented in national and international action plans including the Implementation Plans for the MDGs (Millennium Development Goals), PRSPs (Poverty Reduction Strategy Papers) and the National Plans of Action within the UNEP GPA (Global Programme of Action for the Protection of the Marine Environment from Land-based Activities). The indicator system for safe and sustainable sanitation provision should be revised to reflect the real risks and dangers to the environment and public health posed by all forms of sanitation.

2.7 Existing experiences and the need for new tools

Many individual, successful examples of ecological sanitation systems already exist in various countries. However there is still a great deal of research and development work that needs to be done before ecosan is established internationally as a way of solving the many different sanitation problems facing societies. Most applications of the approach to date have tended to concentrate on rural areas, whereas experience with urban and peri-urban areas remain rather limited. However, faced with rapid urbanisation world-wide there is a pressing need for solutions in built up areas.

One of the main difficulties in trying to implement ecosan systems is that the closed loop approach to sanitation is still relatively unknown, not only amongst the general public, but also among planners, engineers, consultants, politicians, and local and regional authorities. The result of this is not only a general lack of information as to how such a system might function in a given set of circumstances, but also a complete lack of experience among all those involved in implementing such a system.

Paradoxically, this current lack of awareness as to how ecosan systems work exists in many societies where the reuse of human excreta, most often mixed with livestock manure, was, for centuries, an essential element in maintaining soil fertility (for example in Central America, Asia or Europe). Increased urbanisation and the arrival of the “modern” flush toilet and water borne sewage systems led to the demise of this tradition and a loss of the know-how that had developed regarding the safe agricultural reuse of excreta. This abandoning of the traditional systems was a result of their failure to protect public health. Systems that transported excrement and used water away from inhabited areas were then seen as producing the desired improvement on sanitary conditions, which contributed to the current prevalent attitude towards the reuse of human excreta, which borders on outright rejection, as a result of great hygienic concern. Work continues on optimising these solutions, despite their disadvantages, rather than on devising methods to ensure that the productive reuse of used water and treated excrement could be carried out safely. In so doing we are concentrating a great deal of effort in optimising the wrong solution, from a sustainability point of view.

Ecosan on the other hand returns to the theory behind traditional sanitation practices (i.e. of closing cycles for productive reuse), whilst at the same time ensuring that hygienic concerns are correctly addressed. It should therefore be noted that while the entire reuse aspect of ecosan-approaches can be linked to traditional sanitary practices, ecosan does not mean turning back the clock to a time of unhygienic, dirty and uncomfortable sanitation with a great risk posed to human health. Modern ecosan solutions are represented by a variety of well designed, hygienic, comfortable systems, either dry or waterborne, which protect public health and are suitable for a range of geographical contexts and economic conditions. They are the latest technological development and innovation in sanitation, in a field that is attracting increasing amounts of interest from researchers, engineers, industry and service providers which hopefully will lead to even more rapid technical advances in the near future.

In recent years, environmental concerns regarding the contamination of the soil sphere with hazardous substances have increased as a result of the agricultural reuse of sewage sludge from central wastewater treatment plants (a common practice in Europe) that had been contaminated with heavy metals or dangerous organic substances. These concerns



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for the preparation and implementation of ecological sanitation projects

2nd draft – 10/2003

continue, despite an improvement in the control of the sources of the contamination, which has resulted in sewage sludge having a lower heavy metal content than many artificial fertilisers or even the soil itself. Within the European Union there is currently even a discussion regarding the prohibition of the use of sewage sludge in agriculture, with expensive incineration proposed as the alternative. Such harsh legislation is based on the imposition of limit values that have become so restrictive that farmers fear that they may soon no longer be able to even return the remainder of the harvest from a field back to the soil of the same field as sometimes the concentration of certain parameters exceed the imposed limit values. In constantly reducing these limit values, theoretically to protect the soil, there is a very real possibility that soil fertility and stability will be damaged by preventing the reuse of nutrients and organic material. These initiatives should in fact aim to ensure the safe reuse of this sludge by guaranteeing the removal of the harmful contaminants at the source, rather than making any form of reuse virtually impossible.

Further governmental initiatives also serve to discourage the productive reuse of the contents of waste and used water. For example the subsidies of mineral fertilisers actively discourage the reuse of the nutrients contained in excrement and wastewater, and the subsidisation of water supplies for irrigation purposes discourages farmers from reusing treated grey water for this.

Flush toilets, waterborne sewage systems and multistage conventional wastewater treatment plants eventually even followed by an incineration of the resultant sewage sludge is generally seen as the ideal sanitation concept by the public (mainly because it is the only concept they are aware of) and is still currently considered as the preferred and desired solution by many experts and even environmentalists and public health specialists. They are convinced that these modern technologies have eradicated waterborne diseases in industrialised nations and have brought ecologically dead water courses back to life. There is, therefore, a strong belief that sanitary problems world-wide can be solved by simply increasing spending to provide more sewerage systems and treatment plants, which will in turn eliminate the problems of water related diseases and reduce the death toll caused by water pollution in developing countries. However, in light of the pressing need to develop programmes to achieve the MDGs, international agencies are slowly beginning to realise that the huge amount of money necessary to achieve the goals using conventional sanitation systems will never be available. There is however much less awareness of the fact that the present water and sanitation crisis is not simply a question of missing funds, but that the conventional water and sanitation system itself has created the crisis. Additionally, if one considers the problem in a holistic way, these conventional sanitation systems have also contributed to a most serious soil crisis, by failing to recover the nutrient content of wastewater for agricultural use, which in the near future may lead to a serious threat to world food security.

In order to establish an enabling environment for the application of ecosan there is a need to spread information and create awareness of these ecosystem flow streams and interdependencies, and of the basic fact that humans also physically belong to these systems and currently dominate many of the flows with our collective resource use.

The holistic and interdisciplinary nature of ecosan, and its advocacy of participatory approaches in its implementation also mean that existing tools used in conventional sanitation projects only partly address the needs of ecosan projects. Many organisations are unfamiliar with interdisciplinarity and participation and therefore feel they lack the competence to work in these areas. There is therefore a need for a whole range of tools, addressing the needs of all stakeholders involved in ecosan projects, from the user of the toilets, to engineers, regional and national authorities, international institutions, donor agencies, producers of equipment, service companies, the end users of the recycling products and the consumers, if the success of existing ecosan schemes is to be effectively up-scaled. A list of the issues to be tackled is given in the box below.



BOX 6 What issues must tools of an ecosan tool-box address?

What issues must tools of an ecosan tool-box address?

- sensibilisation of the world water and sanitation crises and their interrelationship with conventional flush and discharge and drop and store sanitation
- sensibilisation of the closed loop philosophy and the hygienic, environmental, agronomic and economic benefits of ecosan
- sensibilisation of policymakers, regulators and financiers about the economic and environmental benefit.
- information on the different available eco-sanitation systems currently in use around the world
- the hygienic aspects the safe use of the different recycled resources and products by households, in agriculture, aquaculture, energy production, etc.
- costs and other monetary aspects
- financing instruments facilitating the application and use of ecosan sanitation systems
- stakeholder-participation in awareness raising and mobilisation, planning, implementation, evaluation and large scale-dissemination, with special focus on the unserved population, service providers and the user of the recycling products
- the skills for producing the technical equipment and construction
- the skills for operating ecosan sanitation systems, for the treatment of the resources to be recycled and the transport, marketing and use of the recycled resources
- sensitisation of the gender aspects of sanitation and the benefits of ecosan in this regard
- the large scale application of ecosan sanitation systems



3 Planning, preparation and implementation of ecosan projects

3.1 Awareness raising and providing information

Awareness is a somewhat broad and vague term, yet one that most people intuitively understand. Awareness raising is related to knowledge, attitudes and behaviour – and to communication, as awareness raising must be seen as an interactive process in which different parties are engaged, each with their own roles, responsibilities and methods to make their voices heard and create social consciousness and demand.

The main reason for awareness raising with regard to ecological sanitation is that the ecosan philosophy and vast range of possible technical and logistical solutions are at the moment relatively unknown, not only among the general public but also amongst engineers, planners, decision makers, agriculturists and even sanitation professionals. If the urgently needed paradigm change in sanitation is to occur, there is therefore a need to broaden the nature of the debate concerning the role of sanitation and the aims of sanitary provision.

Conventional environmental sanitation systems are concerned with the disposal of human excreta, sullage from domestic activities, the drainage of storm water and the disposal of solid waste. In focussing on these issues, designers and planners of conventional systems consider how disposal methods can best be provided that mainly aim to displace, destroy, discharge or even bury waste material. These considerations may begin with the type of system that can best transport the excreta, storm water etc. away from the user of the sanitary facilities – using either on-site (i.e. drop and store) or centralised (i.e. flush and discharge) technologies. Depending on the situation, environmental pollution may prove to be a concern, however the overriding priority is to remove the harmful and hazardous material from the vicinity of the household in question, thus improving the hygienic and health situations.

Ecosan systems aim to address exactly the same concerns that motivate designers of conventional systems, i.e. of improving public health and hygiene, however, the basic premise of ecosan, of closing the nutrient loop between sanitation and agriculture, means that designers of ecosan systems must also consider a much wider range of factors. The needs of the users of the recyclates are a major consideration, including how the recyclates may be treated, stored, transported and used in a safe and hygienic manner. This also leads to consideration of soil conservation, increased food security in the long-term, and the sustainable use of resources (in the form of nutrients, organics, water and energy). Another aspect of ecosan is the reduction and optimisation of water use, with water for sanitation being kept to an acceptable minimum and treated water being used for agricultural purposes or as service water in households and industry. As ecosan aims to solve sanitation problems and ensure reuse at the lowest possible level, promoters of these systems must also consider the capacity of the local private sector to actively engage in them, for example through the production of equipment or through the provision of services, such as maintenance or marketing of recyclates, thus contributing to job creation. Ecosan systems also aim to contribute to poverty reduction through this stimulation of the local economy, as well as by increasing harvests through providing affordable agricultural fertiliser and soil conditioner.

To address all these concerns sufficiently there is a vast array of technologies, organisational structures, and reuse options available to implement ecosan. Just a few examples include systems that deal with wastewater as a series of split flows (i.e. urine, faeces are collected and treated separately), systems that incorporate the collection and treatment of domestic organic waste, or systems that combine some wastewater flows (e.g. urine and faeces). These approaches can lead to the production of agricultural fertiliser and soil conditioners, energy and service water for households or industries or provide water for irrigation or groundwater recharge.



However in order for stakeholders to decide to make a change in their sanitary systems they must first have experienced problems with their current practices. For many years conventional solutions have been promoted to address these problems, and thus in almost all cases conventional solutions, even with their associated problems such as high cost and environmental pollution, are adopted. Even the most well informed stakeholder is often unaware that the negative aspects of conventional solutions could be avoided if a closed loop sanitation solution were to be adopted, simply because they have not been informed of these alternatives. In order to provide for an informed choice amongst stakeholders it is therefore necessary to raise their awareness of ecosan solutions and to provide them with the appropriate information that addresses their needs.

Ecosan offers a wide range of benefits over conventional sanitation solutions (see chapters 2.2 and 2.3). The role of awareness raising is therefore to spread knowledge and to raise the profile of ecosan solutions among all stakeholders. In order to do this most efficiently, the information provided to the stakeholders should be tailored to their specific information needs targeted at different groups of stakeholders. This information may range from mainstream media coverage, technical publications, workshops, training, education in schools and higher education, and guided tours of existing ecosan projects to academic studies of specific aspects of closed loop sanitation.

Awareness raising will bring better results, if people have more opportunities to be involved and participate actively in the decision making.

It should be noted that the range of stakeholders involved, their tasks, their information needs, and the ways in which this information must be presented differs from project to project, and the correct identification of these is in itself a very demanding exercise. With this in mind, these guidelines and toolbox aim to provide a reflection on some generalised project-types to help form a check-list of the potential stakeholders involved, their possible motivations and constraints, and their tasks in an individual project. They should also serve to help initiators, planners and facilitators of sanitary projects, to ensure that the stakeholders make decisions on an informed basis, in order to increase the chances of project success. The toolbox should provide material, information and methodologies helping all stakeholders to fulfil their respective tasks.

3.2 Participation

This chapter aims at providing a working definition of participation for ecosan projects. It briefly presents some tools currently being used in participatory water and sanitation projects, and provides some more detailed information on a new approach in environmental sanitation known as the Household-Centred Environmental Sanitation Approach (HCES) and the related 4 Bellagio Principles.

Planning and implementing systems in conventional sanitation have to date tended to be highly centralised, hierarchical and bureaucratic, severely limiting opportunities for the participation of a range of stakeholders, while the policy and legal framework often only allows government organisations to deliver services - which are themselves often rigidly defined. Additionally, the practice of centralised planning, decision making and financing often serves as an obstacle to ensuring the flexibility, suitability and sustainability of sanitation systems, with central planners often being too far removed from the problem to be able to correctly analyse the real needs and the existing economic opportunities of those involved. An example of this can be seen in the former German Democratic Republic, where, following German reunification in 1990, large and oversized centralised sewer and multi-stage sewage treatment systems were built, which have led to extremely high costs for wastewater disposal and treatment that the municipalities and communities concerned are left struggling to pay.

Present experiences show that the use of sanitation and wastewater management equipment and of recycled resources are intricately related to social and cultural values and norms. The applied equipment, treatment, necessary maintenance activities to be carried out



and the available (form of the) recycled resources have therefore not only to be economically affordable, but also socially and culturally acceptable in their given context. This can best be achieved with the active participation of all relevant stakeholders in planning processes.

3.3 Definitions and interpretations of participation

The concept of participation is currently applied across the board in many different types of projects, but what is meant by participation? And how can participation be interpreted in the context of ecosan projects?

BOX 7 What is participation?

What is participation?

“Participation is the process through which stakeholders influence and share control over priority setting, policy-making, resource allocations and access to public goods and services”. (The World Bank)

“Participation means that people ... are involved in economic, social, cultural and political processes that influence their lives”. (United Nations Development Programme)

“Participatory development stands for a partnership based on dialogue between the different partners involved.... This requires negotiation rather than the dominance of a project agenda that has been defined from outside. In this process the people are no longer seen as recipients but rather as actors.” (Organisation for Economic Co-operation and Development (OECD))

“Participation is an important precondition for successful and sustainable development co-operation. Participation contributes to a sense of ownership of programmes and projects among those involved, allowing them to bring in their respective cultural values and interests. In so doing, participatory development co-operation supports a self-determined improvement in living conditions in partner countries. It empowers the target group to expand their possibilities and capacity to improve their “boundary conditions””. (The Federal Ministry for Economic Co-operation and Development (BMZ), Germany)

As can be seen from the definitions in the box, the term participation is open to a large degree of interpretation. In its most crude form, it is contrived as a means of manipulating people or groups. However, we consider participation to be a collective action aimed at achieving a common objective; it implies that people take part and become involved. In a participatory process, persons and groups share knowledge, ideas, opinions, votes, materials, labour, finances etc. in order to reach a common agreement or reach joint decisions in a transparent way. Participation is a communication process between all the people and groups involved in making a joint decision to ensure that it has been made on the basis of a partnership. It is a collective action aimed at achieving a common objective; ideally it implies that all relevant stakeholders "take part" and "get involved" in the process. In a participatory process, persons/groups share knowledge, ideas, opinions, votes, materials, labour, finances etc. in order to reach a common agreement or reach joint decisions in a transparent way.

Participation is therefore not simply a process where external agents “inform”, “instruct”, “motivate” and “educate” people to take what they, the agents, believe to be the correct course of action. It is rather a process of sharing information, consultation, discussion and negotiation, with no imposition of externally developed solutions to problems. In participatory processes all sides must be open and be ready to learn from one another. Such processes



also require the participants to have a great deal of flexibility so that pre-conceptions and hidden agendas do not serve to bog down the process.

While the very poor and disadvantaged are often perceived as being the classic “target group” of participatory approaches, participation in itself is in no way limited to these groups. Different groups may have different levels of participation. This depends on the final responsibility these groups are expected to have in the overall project. Some stakeholders may therefore only passively participate, by merely providing information, or by being informed of what is going to happen, while others will actively participate, taking initiatives independently from external institutions. In larger projects the participation of several groups, all sharing a similar interest, may only be possible through a representative who speaks for them.

There are different levels of participation, ranging from passive participation, where people are involved merely in the sense that they are informed of what is going to happen, to active participation/self-mobilisation, where people take initiatives independently from external institutions. In this regard four basic levels of participation can be identified, with each level increasing the intensity of the participation of a particular stakeholder. These four levels are:

- Information
 - Consultation
 - Participation in decision taking
 - Taking of initiatives
- ↓
INCREASING INTENSITY

Participation in the framework of ecosan projects aims to provide for an informed choice among the stakeholders. This generally means firstly informing potential users of the sanitary facilities and the fertilising products, planners, engineers, consultants, municipal, local and regional authorities etc. of the philosophy behind the ecosan approach. Only when this information has been conveyed in a manner that satisfies the information needs of the different groups is there actually a basis for an informed choice. If the stakeholders do not know that alternatives to conventional sanitary systems exist, they can never be expected to opt for these alternatives. Informing the stakeholders about the ecosan philosophy is therefore not the same as advocating it as the solution to sanitary problems; it simply supports the process of informed decision making. If however stakeholders do choose a closed loop philosophy to their particular sanitation problems, special participatory tools will be needed to develop solutions adapted to the specific local conditions and to the needs and capabilities of the users of the sanitation facilities (e.g. regarding convenience and costs), the end-users of the recycling products (e.g. regarding the quality of the end-product) the service providers (e.g. with respect to the operation of the system) and the authorities (e.g. with respect to aspects of environmental control and public health).

Participation should always have an important role in ecosan projects, however in reality. the number of stakeholders who are able to actually adopt an active participatory role varies according to the project. For example, in a rural, developing country context, where ecosan toilets have been proposed for individual farming households, it should be possible for the households to assume the central role in the process, and thus directly determine for themselves the systems that best address their needs and wishes. On a much larger scale however, where residential areas for tens of thousands of people are planned, such as the case is in China, other stakeholders, for example construction companies, investors, representatives of the municipality and local or regional governmental institutions and the future user of the recyclates as well as those who will be responsible for their treatment, transport and storage may have to intensively participate in the process. It may not be possible to directly include the user households as they may not exist as such during the preparation phase of the project. Their interests, wishes, motivations and constraints may therefore have to be represented by groups who will be able anticipate these. With



increasing project size it will generally become increasingly difficult for all stakeholders to participate personally in workshops or other project planning activities and individual stakeholders will have to be represented by interest groups (for example the users of the sanitation may choose to express their point of view through the representatives of a community based organisation (CBO)).

Participation in ecosan projects also serves to appropriately include the different interests, needs, priorities, and boundary conditions, as well as the economic and organisational potential and limits of the different stakeholders, in the decision making process, insofar as they do not contradict the needs of other participants. If no consensus can be achieved then mediation or other processes to balance the different interests, including majority decisions or possibly decisions made by legal representatives, may be necessary.

3.4 Commonly applied tools and methods

To date most participatory approaches applied in sanitation projects have been developed mainly with a rural context in mind, with similar tools for densely populated urban areas still lacking. As these approaches were developed for, or adapted to, programmes dealing with conventional systems of water supply and sanitation, they fail to address issues which are of vital importance in ecosan programmes, such as the hygienically sound reuse of recyclates from household sewage in agriculture, and the needs of the user of the recyclates. In an urban environment one of the few publications dealing directly with participatory approaches are the “Tools to Support Participatory Urban Decision Making”, from the United Nations Centre for Human Settlement. (<http://www.unhabitat.org/cdrom/governance/html/cover.htm>).

While lacking ecosan specific elements, these participatory tools have in many cases shown a great deal of success in water supply and sanitation programmes. They therefore have a proven track record that should not be neglected. These tools should be adapted wherever possible to the specific needs of ecosan programmes enabling them to address the philosophy of a closed loop approach to sanitation.

In the following box a few of the most commonly applied participatory tools in water management processes that we are aware of are presented. If you know of other commonly applied tools please add them to the following list:

BOX 8 Common participatory tools used in water management projects

Common participatory tools used in water management projects

While a more extensive list is given in the appendix “participatory tools and methods”, the following briefly presents some of the most commonly used participatory approaches in water management projects, with the information having been collected from the given sources.

BA - Beneficiary Assessment

“Beneficiary Assessment is a consultative methodology used to gain insights into the perceptions of beneficiaries regarding a project or policy. The overall objective of a BA is to make the voices of beneficiaries and other local-level stakeholders heard by those managing a project or formulating policy. ...”

(from: www.worldbank.org/poverty/impact/methods/ba.htm)

DDA or DRA - Demand Driven Approach or Demand Responsive Approach

The DDA or DRA involves (...)



- (1) "Paying attention to users' preferences and providing users with the services that they want and for which they are willing to pay. (...)"
- (2) "Unbundling sanitation services into discrete parts (such as household services and trunk services) and providing these components in the sequence that the users prefer (typically starting from the household level). (...)"
- (3) "Involving creative use of both non-formal institutions (such as neighbourhood associations and non-governmental organisations) and formal institutions (such as municipalities and utilities) in co-producing services (...)"
(from: "Toward a Strategic Sanitation Approach" UNDP – World Bank Water and Sanitation Program, 1997)

SARAR

The acronym SARAR stands for the five attributes and capacities that are considered the minimum essentials for participation to be a dynamic and self-sustaining process:

Self-esteem: a sense of self-worth as a person as well as a valuable resource for development.

Associative strength: the capacity to define and work toward a common vision through mutual respect, trust, and collaborative effort.

Resourcefulness: the capacity to visualise new solutions to problems even against the odds, and the willingness to be challenged and take risks.

Action planning: combining critical thinking and creativity to come up with new, effective, and reality-based plans in which each participant has a useful and fulfilling role.

Responsibility: for follow-through until the commitments made are fully discharged and the hoped-for benefits achieved.

SARAR is based on the principle of fostering and strengthening these five attributes, in order to enable the development of people's own capacities for self-direction and management and to enhance the quality of participation among all of the stakeholders.

(from: www.worldbank.org/poverty/impact/methods/pr.htm)

PHAST – Participatory Hygiene and Sanitation Transformation

PHAST is an adaptation of the SARAR methodology of participatory learning and it

(1) it "is an approach designed to promote hygiene behaviours, sanitation improvements and community management of water and sanitation facilities (...)"

(2) "it aims to empower communities to manage their water and to control sanitation-related diseases, (...)" and

(3) "it does so by promoting health awareness and understanding which, in turn, lead to environmental and behavioural improvements."

"PHAST uses methods and materials that stimulate the participation of women, men and children in the development process. It relies heavily both on the training of extension workers and on the development of graphic materials (sets of which are called "tool kits") that are modified adapted to reflect the actual cultural and physical characteristics of communities in a particular area. The production of PHAST materials therefore requires trained artists as well as trained extension workers."

(from: "The PHAST Initiative" WHO, Geneva and UNDP- World Bank Water and Sanitation Program, 1997)

PRA - Participatory Rural Appraisal

PRA "(...) aimed at shared learning between local people and outsiders."



PRA is today being used not only in rural settings, and not only for project appraisal, but throughout the project cycle, as well as for research studies.

The five key principles of any PRA activity are:

Participation: (...) “to enable local people to be involved, not only as sources of information, but as partners with the PRA team in gathering and analysing the information.

Flexibility: The combination of techniques that is appropriate in a particular development context will be determined by such variables as the size and skill mix of the PRA team, the time and resources available, and the topic and location of the work.

Teamwork: Generally, a PRA is best conducted by a local team (speaking the local languages) with a few outsiders present, a significant representation of women, and a mix of sector specialists and social scientists, according to the topic.

Optimal ignorance: To be efficient in terms of both time and money, PRA work intends to gather just enough information to make the necessary recommendations and decisions.

Systematic: As PRA-generated data is seldom conducive to statistical analysis (given its largely qualitative nature and relatively small sample size), alternative ways have been developed to ensure the validity and reliability of the findings. (...)

PRA offers a "basket of techniques". Herein diagrammatic techniques are used to stimulate debate and record the results. Many of these visuals are not drawn on paper but on the ground with sticks, stones, seeds, and other local materials, and then transferred to paper for a permanent record. Key PRA diagrammatic techniques are (1) Mapping techniques, (2) Ranking exercises, and (3) Trend analysis.”

(from: www.worldbank.org/poverty/impact/methods/pr.htm)

The toolbox provided along with these guidelines currently contains a very limited number of ecosan-specific tools, however it is planned that the box will gradually fill as a result of the numerous tools developed within the increasing number of ecosan-projects world wide. To start with, the toolbox presently contains a wide range of general participatory tools and methods that are currently also being used in conventional sanitation or other types of projects. In many cases these may be adapted to ecosan and should prove to be of use for some ecosan projects. Some examples of the tools included in this list are:

- the “Village Resource Map” - a tool to learn about a community and its resource base
- the “Slide Language for environmental conservation” wherein local women are trained in the use of a camera and then asked to record a story about their environment
- the “Trend Lines” - a tool to facilitate learning about changes in the local environmental, social, economic or institutional patterns, and then for looking at what is improving or getting worse.

The ecosan philosophy should be generally included in some of the more specific tools of the above mentioned toolbox. For example in:

- the “Quality Service Approach”, which is a tool to improve both the quality and availability of services by promoting participation, client-orientation, decentralisation, privatisation, higher efficiency in government services and by empowering clients to get the services they need from a wider range of suppliers. All this in particular through reforms of bureaucracy and government services in rural areas;
- the “Participatory and Integrated Watershed Management (PIWM)”, which is an approach to watershed management and sustainable development of mountain areas, based on participation of local people, civil society and institutions, local governance and integration of conservation and development goals;



- the “Participatory Training and Extension Programme for Farmers' Water Management (PT&E-FWM)” where through a participatory approach in extension, technical staff and other stakeholders (1) put farmers in charge of water management at field and scheme level, (2) promote the adoption of appropriate technologies and (3) establish the necessary local capacity to put farmers in charge of water development and management.

While the tools above could prove to be useful, a relatively new tool for environmental sanitation is seen as being almost ideal for ecosan projects. This is the Household Centred Environmental Sanitation Approach (HCES) and the related Bellagio Principles.

3.5 The Household Centred Environmental Sanitation (HCES) approach and related guidelines

With the end of the International Decade for Water Supply and Sanitation in 1989, there was a feeling that the momentum developed during this period needed to be fostered and developed further. A Collaborative Council was established at a meeting in The Hague, Netherlands, November 1988, met for the first time in 1989 in Sophia Antipolis, France and again in 1990 in connection with the Safe Water 2000 Global Consultation in New Delhi, India. At this second meeting it was agreed that a new Council should be formed, that would include sector professionals from both External Support Agencies and developing countries. The first meeting of the newly constituted Water Supply and Sanitation Collaborative Council (WSSCC) was held in Oslo, Norway in September 1991. The WSSCC acts as a donor co-ordinating committee attached to the WHO with their headquarters in Geneva. The WSSCC is, among others, currently working on new approaches to the world sanitation crisis.

These new approaches include the Household Centred Environmental Sanitation Approach (HCES) which has been developed by the Environmental Sanitation Working Group of WSSCC based on the Bellagio Principles (see Chapter 2.3).

The HCES represents a new approach for planning environmental sanitation services, with the promise of correcting current unsustainable practices in planning and resource management by concentrating on the below given two main components.

BOX 9 The two main components of the HCES

The two main components of the HCES

(1) The focal point of environmental sanitation planning should be the household, reversing the customary order of centralised top-down planning. The user of the services should have a deciding voice in their design, and sanitation issues should be dealt with as close as possible to the site where they occur. With the household as the key stakeholder women are provided with a strong voice in the planning process, and the government's role changes from that of provider to that of enabler;

(2) A Circular System of Resource Management should be used emphasising the conservation, recycling and reuse of resources, in contrast to the current linear sanitation service system.

First, planning with a household or neighbourhood-centred approach places the user at the core of the planning process. The HCES responds to the knowledge, needs and demands of the users.

The following figure presents the radical re-think of current planning practices, proposed by the HCES. This approach attempts to avoid the problems resulting from either “top-down” or “bottom-up” planning approaches, by employing both within an integrated framework.

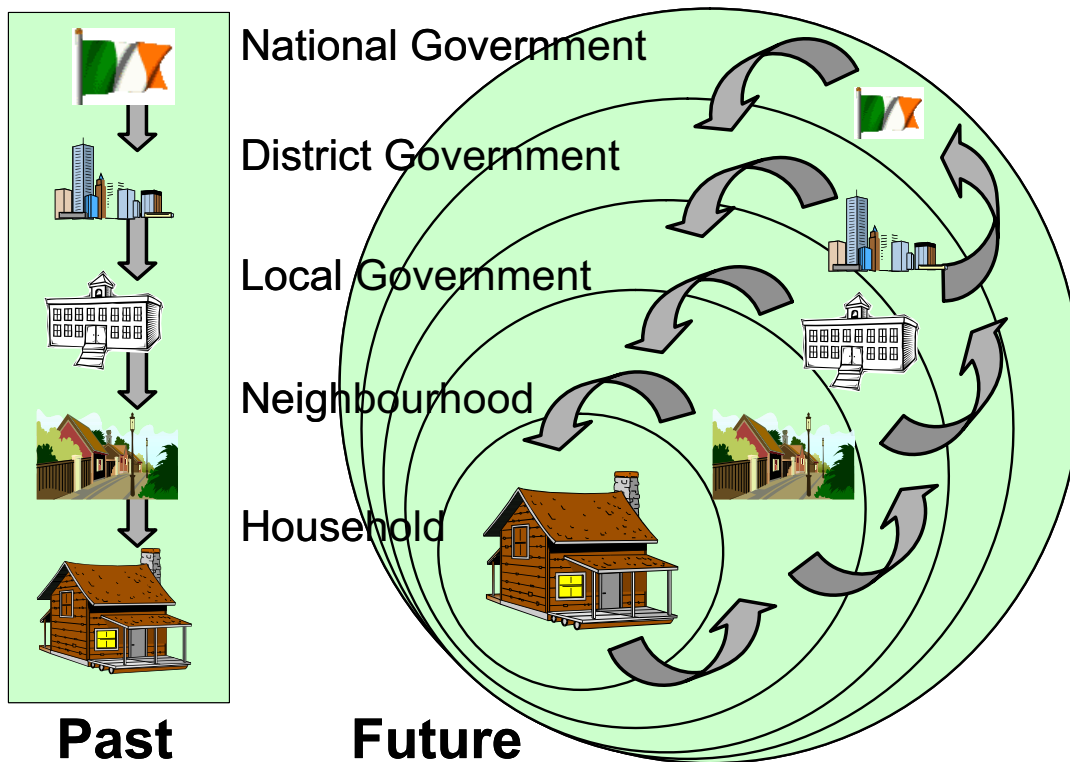


FIG. 5 Decision making in the past and in the future according to the HCES

Secondly, HCES is suggesting to minimise the transfer of waste across circle boundaries by reducing waste producing inputs (e.g. water) and by maximising reuse and recycling activities. Ecosan projects are obviously promoting and applying this concept in a very systematic way.

Implementing the HCES approach

A guideline for decision makers, such as municipal planners and civic officials, on how to implement the Bellagio-Principles and the HCES approach is currently in preparation by the WSSCC. A preliminary version was elaborated in July 2000 (Kalbermatten et al. 2000), and was then discussed by an invited group of experts in 2001, and presented at the Lübeck ecosan symposium in April 2003 (Schertenleib et al. 2003).

The “guidelines for implementing the HCES” provides specific information on (1) the creation of an enabling environment for the use of the HCES approach and (2) a 10-Step process for developing and implementing the HCES approach.

The creation of an enabling environment should ensure that the correct atmosphere exists within which an innovative approach, such as the HCES, can succeed. This enabling environment must therefore ensure that the approach receives widespread government support at all levels, the legislative framework (including national or municipal standards) is both appropriate and enforceable, the institutional arrangements respond to the household as the stakeholder, suitable communication structures between central organisations and the community are developed, all groups and organisations are suitably trained for them to satisfactorily fill their role, and the suitable credit and financial arrangements are in place which encourage the selection of appropriate systems and technologies.

With regard to the 10-Step implementation process, an output and an indicator has been developed for each of the steps, allowing progress and success to be measured. The 10 Steps is given in the BOX 9 “10 Steps for implementing the HCES-Bellagio-principles Approach”. (See also Appendix 1 for further details)



Along with putting the household at the core of the planning process two further principles of the HCES are (1) to initiate activities only when a clearly formulated request from the (prospective) users of the sanitation facilities has been received and (2) to get an agreement with all principle stakeholders in the beginning of the project (Step 2), that the Bellagio-principles are accepted as ground rules, thus establishing “a bill of rights for sanitation” in the further course of the project.

The implementation guideline for the HCES committed to only initiate activities when a clearly formulated request from the (prospective) users of the sanitation facilities has been received, ensuring the demand comes from the appropriate level. At the start of the process all stakeholders are then given a detailed explanation of how the HCES process works, to ensure that the participating stakeholders understand it and accept the implications. The guideline also states the need for reaching an agreement on the selection of a skilled programme manager for the overall management and co-ordination of an HCES project.

The authors note further that “these (10) steps are presented in sequence, but in practice they will usually overlap, some steps may need to be repeated more than once in an iteration to find acceptable solutions, and they will always need to be undertaken bearing in mind the concerns of the municipality as a whole. This presentation (of the 10-Steps) is therefore a simplification.” (Schertenleib et al 2003).

BOX 10 The 10 Steps for implementing the HCES-Bellagio-principles Approach

The 10 Steps for the Implementation of the HCES (from Schertenleib et al 2003)

1. Request for assistance
2. Launch the planning and consultative process
3. Assessment of current status
4. Assessment of user priority
5. Identification of options
6. Evaluation of feasible service combinations
7. Consolidated UESS (Urban Environmental Sanitation Services) plans for the study area
8. Finalising of consolidated UESS plans
9. Monitoring, (internal) evaluation and feedback
10. Implementation

The explanation of the steps according to Schertenleib et al (2003) is given in the appendix. In chapter 4.1 are discussed the adaptations of the 10 Steps undertaken for the application in practice oriented ecosan projects.

The HCES, and the Bellagio Principles, clearly represent an extremely suitable approach for ecosan projects. As they stands they are fully compatible with the ecosan philosophy, however both the HCES approach and the Bellagio Principles have so far been mainly developed on a conceptual level. Efforts are now concentrating on the development of a guideline for implementation. Field testing of these guidelines and the collection of feedback are foreseen as the next phase.



3.6 The “ecosan project steps” - an adaptation of the HCES 10-STEP-process¹

As stated above the “10-STEP-process for developing and implementing the HCES Approach” is currently the most suitable approach that could be employed in ecosan projects. A draft version of this guideline is currently available. The Bellagio Principles and the HCES approach have so far been developed as a general tool for planning environmental sanitation services (including Strategic Environmental Sanitation Planning to decide what kind of environmental sanitation systems are most adequate in the different areas of an urban/peri-urban area). These ecosan guidelines use the same approach to prepare and implement a specific kind of project in a particular project area and concentrate on giving practitioners a pragmatic, practice oriented guide as to how the HCES and the Bellagio Principles can be implemented in the reality of an ecosan project. The accompanying toolbox is intended to supply practitioners with the corresponding aids, technical information and practical tips to help them prepare and implement successfully an ecosan project.

These guidelines also address the question of how the participatory requirements of the HCES can be interpreted in the case where, at least at the beginning of some projects, no user or user household can be identified (for example for the construction of new residential areas, or the provision of sanitation in non-residential properties). This represents a pragmatic interpretation and adaptation of the HCES for practice.

Practitioners should pay attention to the following considerations when implementing their ecosan projects, as these points are generally specific considerations in ecosan projects:

- Ecosan programmes favour that sanitary infrastructure programmes focus directly on the users. Two different groups of users are seen as being central to the process in ecosan – firstly the user of the sanitary facilities and secondly, the user of the recyclates.
- Ecosan involves the development of innovative sanitary systems and their integration into existing sanitary practices, however, in ecosan projects attention must also be paid to wider field of agriculture and the hygienically safe reuse of recyclates. Ecosan therefore explicitly requires looking beyond the framework of conventional sanitation projects and considering sanitation as an integral part of a much wider system.
- Presently one of the main concerns of practitioners wishing to implement an ecosan project is the up-scaling of ecosan solutions for large scale urban implementation. Unfortunately, to date, most participatory approaches to sanitation were originally conceived in the context of small rural or peri-urban projects. There is therefore very little experience of how such an approach could be implemented in an urban environment.
- As those benefiting from an improvement in sanitation services are usually not even aware of the possibility of a closed-loop sanitary system, they are not usually in the position to make an informed choice regarding sanitation. The “10 ecosan project steps” therefore begin with raising awareness of ecosan systems. Step 0 in the process therefore represents the initial awareness raising activities among all stakeholder groups, simply informing them of the ecosan philosophy.
- In participatory ecosan projects, participation is seen as being a means to an end. Ensuring participation in ecosan projects, whilst being very important, is not the main project activity.
- In a participatory ecosan approach, monitoring, evaluation and feedback (MEF) is seen as an ongoing activity that must be carried out at every stage of the project, from raising awareness to implementation, in order to ensure it remains on track and that necessary readjustments are made as quickly as possible. It is therefore graphically represented

¹ The original text of the 10-steps in the draft for the implementation of the Bellagio Principles (Schertenleib et al. 2003) is given in the appendix.



below as an arrow to the right of the figure “ecosan project steps”. As a consequence the “HCES Step 10” becomes the new “Step 9” in the “ecosan project steps”.

- The implementation of an ecosan programme, the “new” Step 9, explicitly includes tasks, such as the reuse of recyclates.

Much of the work carried out in the development of these practice oriented ecosan guidelines has been oriented towards, and carried out in parallel to, the WSSCC working group on environmental sanitation who are developing the guidelines for the implementation of Bellagio Principles, while other sections have been developed independently. When the drafts of both these sets of guidelines are available they should be discussed and critically compared to one another in order to correct possible misunderstandings.

Of equal importance in both the HCES and ecosan approaches is the need for the creation of an enabling environment before any sanitation programmes begin. With particular regard to ecosan, this environment needs to ensure that governmental support and the legislative framework will result in the development of appropriate standards that will allow the installation of ecosan systems (including the agricultural use of ecosan products). It is essential to establish institutional arrangements that suit the user and to provide different stakeholder groups with the skills that they will need to perform their tasks (e.g. builders must be trained in the proper construction of ecosan elements, those handling the recyclates must be trained in their safe treatment, transport and reuse etc.). Additionally, as ecosan systems will require different cost structures than conventional sanitation with probably a larger share of private investment from the households, and a smaller investment from the public sector, ecosan systems and their users may also require new suitable financing mechanisms. These could also be needed for the development and field testing of appropriate new technologies and systems and their introduction to the market..

The entire process for an ecosan project will almost always require a good deal of facilitation to ensure, for example, that communication between the stakeholders remains open and misunderstandings are avoided or that the entire process is not dominated by any one party. The role of the facilitator may be taken up by a range of participants, depending on the project type and phase. At times it may be most useful to have a neutral party who is recognised as having no agenda of their own to impose, at others it may be better that one of the stakeholders themselves facilitates the proceedings. The facilitator should however be identified in advance, accepted and approved of by the stakeholders, aware of his/her duties in the process and have sufficient knowledge, experience and means at their disposal to allow them to fulfil their task.

3.7 The “ecosan project steps” – key moments, necessary activities and expected results

In the following section, the steps for implementing a ecosan project will be described, along with the main activities and outputs of each step. This description restricts itself to the particularities of a participatory ecosan project, and the detailed descriptions of the corresponding steps from the guidelines for the implementation of the Bellagio Principals have not been repeated. The following description should therefore be read in conjunction with the guidelines for the implementation of the Bellagio Principals, currently being finalised by the environmental sanitation working group of the WSSCC.

The ecosan project steps

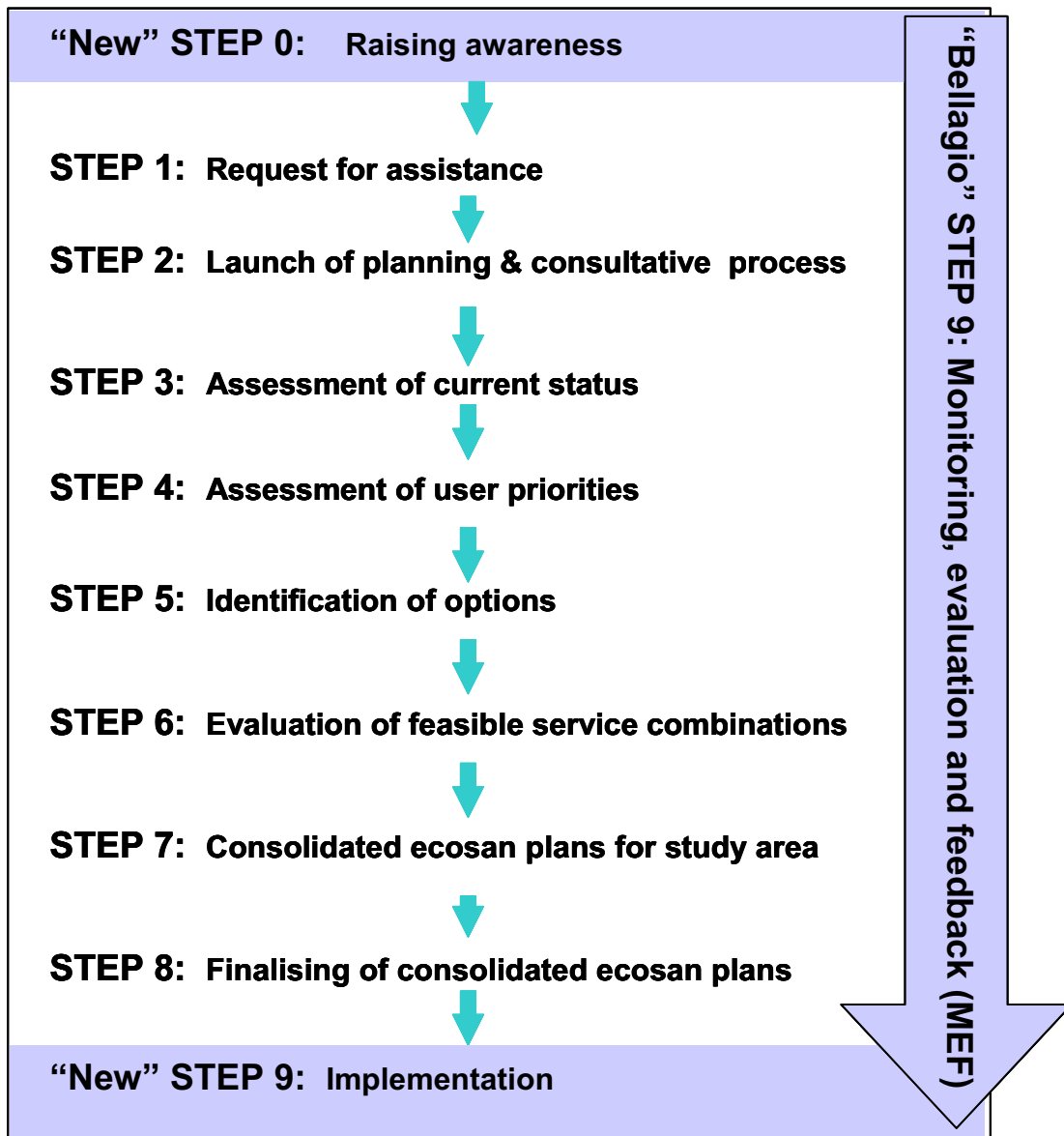


FIG. 6 The ecosan project steps – an adaptation of the 10-STEP-process for developing and implementing the HCES approach.

There are certain key tasks and moments in the course of an ecosan project that can determine whether and how the programme will continue. They are discussed below in the framework of the particular project step in which they occur, and can be seen in the simplified flowchart of the process (see figure 7). The flowchart shows these key moments as being either workshops or reports, although in reality a wide range of different tools and methods could possibly replace them. In our view this flowchart and description of these key moments is useful as it transforms the theoretical steps into an idealised practical example.

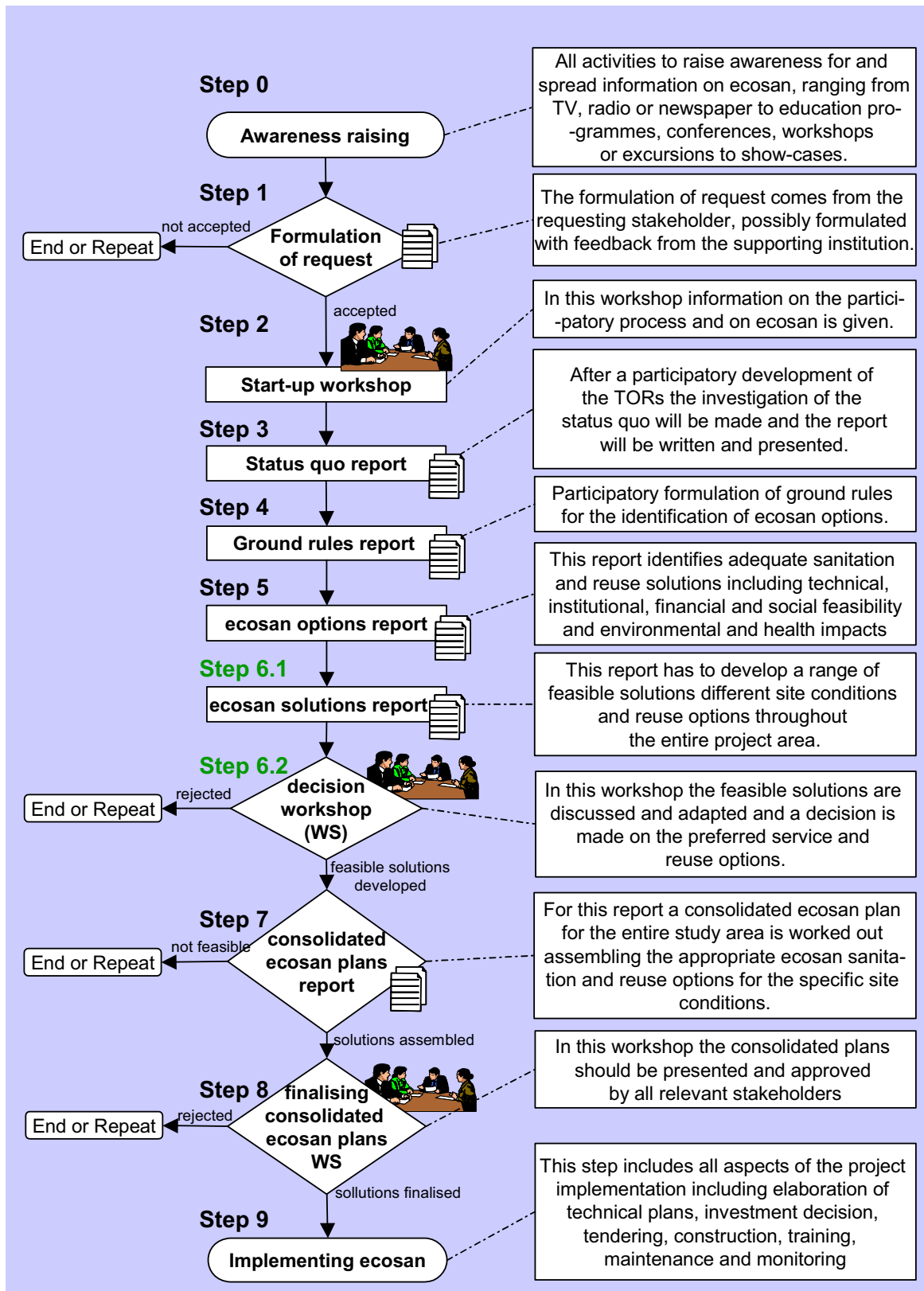


FIG. 7 The “ecosan project steps” – key moments, necessary activities and expected results



Monitoring, evaluation and feedback – a continuous activity

Ongoing monitoring, evaluation and feedback (MEF) activities are extremely important in an ecosan programme. These should be performed throughout the entire process, beginning in the awareness raising phase, with the activities and results being monitored and evaluated. The results of this should be used to make necessary adjustments in the activities to ensure that the process continues as desired. While MEF is important it should however not be carried out at the expense of other project activities, with only the most relevant information being collected for this purpose. Recognised methods such as interviews, statistical evaluation, questionnaires or observations, should be used to collect the necessary information within reasonable and appropriate limits. Energy should not be wasted collecting information which will serve no practical purpose.

MEF remains important in all other steps of the project, right through to implementation for both the documentation of the change in the original situation for research and development purposes (with respect to the environment, hygiene, user satisfaction, costs, profits, resource use, productivity, increase in harvests, job creation etc.) as well as for long-term quality assurance of the end-product and the monitoring of environmental and hygiene standards by both the operator and the authorities.

Step 0 – Raising awareness

Activities: advocacy; lobbying; information provision; demand creation

Output: increased awareness of the ecosan philosophy and systems, demand for ecosan

Awareness raising activities should concentrate on subjects such as: the water, sanitation and soil crisis, the closed loop approach to sanitation, the shortcomings of conventional sanitation, the advantages of ecosan, ecosan technologies and operating systems, aspects of hygiene, health and user comfort, costs, technical information etc.

As ecosan is still a very new and relatively unknown concept and as the decisions in any programme based on the HCES must be made on an informed basis, the first step should be to raise awareness among the stakeholders of all the options available to them. Only when the stakeholders know of all these possibilities can they make a truly informed choice. No project exists at this stage. Stakeholders simply receive information, possibly from different sources, on different sanitation systems. One way in which this may be achieved with regard to ecosan is to organise a regional or national advocacy workshop with information being provided in presentations, handouts, discussions etc.. Other possible means of raising awareness would include publications for both the general public and experts (planners, engineers etc.), education in schools and universities, vocational training, media coverage (e.g. newspaper articles, documentary films etc.), fairs, conferences, web-sites, posters etc. Awareness raising activities however do not stop once a request for assistance has been made. They should continue throughout the entire programme, serving to inform and support decision making processes.

Step 1 – Request for assistance

Activities: formulation of request

Output: request formulated and submitted to relevant party

The request for assistance has to be formulated by the relevant stakeholders (e.g. the users of the sanitation facility or of the recyclates) possibly with the feedback of the supporting institution (e.g. an NGO) and be passed on to the body that is in a position to respond to the demand (e.g. the local authorities or a supporting organisation like an NGO or international development organisation). A positive response to this demand should lead to "Step 2".



Step 2 – Launch of planning and consultative process

Activities: facilitation including identification of all relevant stakeholders; information on planning process and ecosan; active participation in workshop

Output: start-up workshop report; agreement among stakeholders on the working procedure, their tasks, roles and means, and the project boundaries

In this step a “start-up” or advocacy-workshop can help inform all stakeholders about the process itself. Who has made the request? What is needed in the next step? What does this imply? What must be decided upon by the stakeholders? What are the tasks, roles and means of the stakeholders? What are the financial implications of starting the planning? Who will pay for this? What are the project boundaries (both physical and for example in terms of the flow streams and reuse possibilities to be considered)? Is there a need to define sub-projects due to differences in urban structure, income levels, cultural aspects? Are there specific objects to be dealt with (e.g. schools etc.)? Apart from obtaining agreement to use the participatory approach, the “start-up workshop” can also be used to further inform stakeholders on ecosan and to start the participatory development of the terms of reference (TORs) for the investigation of the status quo. As in all phases of the project, the expectations of the stakeholders should not be raised beyond the project’s ability to deliver.

Step 2 may have to be carried out using a series of steps. The advocacy workshop may be followed by a series of discussions with and between different stakeholder groups. It may also be necessary to carry out a stakeholder analysis in order to identify all relevant stakeholders, including the user of the sanitary facilities, the users of the recyclates (e.g. foresters, aquaculturists, etc.), service providers, the municipality as well as sector agencies and regulatory bodies if necessary.

Step 3 – Assessment of current status

Activities: participatory development of terms of reference; investigation of status quo; elaboration of reports; present findings of investigation; correct possible factual errors

Output: report on status quo

The participatory development of the TORs are used to investigate the current situation. In the ecosan approach this covers not only an assessment of the current level of urban environmental sanitation services (UESS), but also considers water supply, social-cultural and legal aspects, aspects of reuse, urban planning, agricultural practices, fertiliser needs, energy needs, social acceptability, environmental pollution, etc. These investigations are used as a basis for writing the report on the current status quo.

Step 4 – Assessment of (user) priorities

Activities: establish ground rules for step 5 (priorities, levels of service, institutional arrangements, cultural acceptability etc.)

Output: ground rules for the identification of options

After presenting the “status quo report” to the stakeholders and incorporating their feedback into it, the “ground rules” for the identification of ecosan options (Step 5) are formulated, based on the assessment of user priorities. This will take place in dialogue with the stakeholders. They should include information on user priorities (for both the users of the sanitary facilities and the recyclates), as well as the priorities of the service providers, the municipality and sector agencies, the willingness and capability of each of these to pay for or otherwise contribute to the implementation or operation of the project, minimum acceptable levels of service, institutional arrangements, cultural acceptability, etc..

Step 5 – Identification of options

Activities: elaboration of adequate ecosan solutions; elaboration of reports

Output: report on suitable ecosan options



Based on the ground rules established in step 4 a variety of ecosan solutions, including their technical, institutional and management aspects, should be elaborated and described in the report. These solutions should comprise sanitation and corresponding reuse options and respond to the priorities of the different stakeholders and provide them with the possibility of making an informed choice. The range of solutions developed should not only be limited to ecosan systems. Where appropriate, characteristic conventional solutions should also be elaborated which should serve as a comparison for the technical, institutional, ecological, economical, public health and other implications of the different approaches. This report should include all adequate possibilities according to the results of step 4 in order to provide the user with the widest possible choice.

Many stakeholders are likely to be unfamiliar with the latest developments in sanitation provision and may consider flush toilets as being the ultimate answer to all their sanitary problems. It may therefore be necessary to carry out pilot projects or to construct demonstration installations in order to build confidence and increase acceptability of alternative sanitation concepts. Sometimes it may also be necessary to keep the initial degree of innovation in the proposed sanitary systems to a minimum in order to ensure acceptance, or to take existing sewers and treatment facilities into consideration, but allowing the possibility of a step-wise implementation of the complete system over time.

Step 6 – Evaluation of feasible service and reuse options

Activities: participatory determination of feasible service and reuse combinations; elaboration of reports; decision making workshop

Output: decision on continuation and service / reuse combinations

While in step 5, a wide variety of available options that fulfil the ground rules are identified and presented in a report, step 6 involves the participatory determination of the options that are likely to be feasible and most suited to the needs identified. This will require a participatory evaluation of the options identified, with respect to the technical, economic, social, institutional, public health and other relevant aspects. This may require an iterative approach to steps 3, 4, 5 and 6 before a range of solutions are developed that are acceptable to all stakeholders. This range of options may be necessary due to differences in the social structure of the project area, with corresponding differences in the financial means and expected service levels among the users of the sanitary facilities.

Step 7 – Consolidated ecosan plans for project area

Activities: assemble / integrate the service and reuse combinations into a broader water supply, sanitation and reuse framework

Output: Consolidated ecosan plan for entire project area

In this step the technical, institutional and management plans for the project area are elaborated. This is achieved by fitting together the accepted service and reuse combinations from step 6 in order to appropriately cover the needs of the entire project area.. An example of how such a range of sanitation and reuse solutions could fit together would be:

- Communal toilets for a market place with an anaerobic treatment of faeces producing biogas used for baking in a local bakery, and with sludge from the biogas reactor and urine being used by local farmers,
- Urine separating dehydrating toilets installed in a poorer neighbourhood with the collection and reuse of the urine and faeces being organised by a local CBO,
- A biogas installation operated by a local farmer that treats and reuses the black water of surrounding houses together with animal manure of from the farm,
- and a constructed wetland in the centre of a main street, used to treat grey water, which is subsequently reused to irrigate a local park or other green area..



Step 8 – Finalising consolidated ecosan plans for the study area

Activities: presentation of assembled plans; approval of assembled plans

Output: approved ecosan plans

The process and plans developed in “Step 7” should be “officially” presented to, and approved by, all stakeholders. This may best take place during a workshop or official meeting. Again it may be necessary to repeat steps 7 and 8 several times to adequately address the concerns of the stakeholders allowing them to approve of the assembled plans.

Conflicts of interest between groups of stakeholders may become critical at this point and complicate attempts to reach a consensus or obstruct the finalising of the consolidated plans. For example the inclusion of a composting plant may have initially been accepted by all participants as a suitable method of treating both faeces and biodegradable domestic waste, however in finalising the plans it may become clear that none of the stakeholders are prepared to accept such an installation in the vicinity of their homes or offices. Practical methods of resolving such problems are therefore needed. This may involve another series of awareness raising activities, the elaboration of a more acceptable alternative, mediation or perhaps compensation for the disadvantaged party. As a last resort, a majority decision or recourse to legal representation may be necessary.

Step 9 – Implementation

Activities: elaboration of technical plans; elaboration of implementation plans; decision on infrastructure; tendering; granting of financial support / subsidies; hardware investment; provision of equipment; construction; training / advice to users and service providers; use of sanitary system; maintenance; collection, treatment; storage, transport; reuse of recyclates; marketing of recyclates

Output: sustainable, user oriented closed-loop sanitary system

This step includes all aspects of implementation of the project according to the process and plans developed in the preceding steps. In many projects, full implementation of ecosan systems may have to be introduced in a stepwise process, as the systems may not yet be sufficiently developed or well known to decision makers and users, and they may therefore lack the confidence to apply an ecosan systems to cover the entire project area. Implementation steps may therefore begin with pilot and demonstration projects which may subsequently be evaluated, adjusted and further developed for implementation across the entire area. In general implementation may prove to be easier for new development areas than it is in areas where (sanitary) infrastructure already exists, particularly in an urban context. Here plans should most probably be made for a stepwise modification and upgrading of the present system over a longer period of time before eventually achieving a complex and complete ecosan system.

3.8 Where do conventional planning and implementation instruments fit in?

Currently the most frequently applied instruments used in the planning and implementation of infrastructure projects are pre-feasibility and feasibility studies, which are generally comprised of the following steps: a general the survey and assessment of the existing situation; strategic planning; elaboration of feasible concepts; technical design; cost estimates; elaboration of a financing scheme and financial analysis; an assessment of the expected project outputs and the environmental, socio-economic and socio-cultural impacts and risks (with respect to poverty, gender, etc.); the design of an implementation programme and operating concepts including a staging and investment programme, followed by the elaboration of detailed technical plans and tendering documentation; the tendering procedure; construction; and finally the operation of the system. These planning and implementation instruments are well established and widely known, with a great deal of information available on them in many planning and implementation guidelines.



These instruments should also be appropriately applied in the planning and implementation of ecosan-projects. They should, however, be adapted to address the specific needs of the ecosan approach and to allow thorough consideration of the “ecosan-project steps” as described above. This adaptation is necessary in order to make due consideration of the following points:

- *the integration of reuse aspects in the assessment of the current situation and in all the planning activities and conceptual work:*

As the basic principle of ecosan is to close the loop between sanitation and agriculture enabling reuse and recycling rather than disposal, a wider range of aspects have to be considered when compared to planning processes in conventional sanitation. Included in these are, for example, the assessment of the current agricultural situation with respect to soil quality, the type of crops cultivated, agricultural practises, water and fertiliser needs, the use of agricultural equipment, irrigation practises, the quality of the irrigation water currently being used, livestock production, practises concerning the treatment and reuse of manure, current and traditional practises of fertilisation and soil conservation, productivity, costs and benefits, farmers and consumers perception of the use of artificial fertiliser, manure, treated wastewater and human excreta and many more aspects. One should remember that in ecosan approaches agricultural reuse refers to the recycling of nutrients, organic material, water and energy not only in traditional agriculture, but also in areas such as forestry, aquaculture, market gardening etc. There is therefore a vast range of possibilities to be considered with respect to agricultural reuse.

- *the integration of aspects concerning water supply:*

As ecosan solutions also aim at reducing water consumption of sanitation, integrating rainwater harvesting systems along with grey water treatment and reuse, water supply systems may often have to be reviewed and modified within an ecosan-project

- *the integration of aspects of urban planning:*

As ecosan solutions ideally lead to the closing of material flow cycles on the minimum practical level (i.e. reuse close to the wastewater source), in order to minimise transport requirements and avoid simply transferring the problems to another area, the consideration of aspects of urban planning may be required (e.g. in order to provide space for the integration of a constructed wetland in an urban park, to support urban agriculture or to provide small scale service providers with an area for the treatment and storage of ecosan products in the neighbourhood).

- *the integration of some aspects of solid waste management:*

As ecosan also offers solutions for integrating the treatment and reuse of organic wastes

- *the consideration of a much wider variety of sanitation solutions with respect to centralised or decentralised, conventional or closed-loop oriented, high tech or low tech, well-known or brand-new, split-stream or combined technical solutions and the corresponding institutional and management solutions.*

(It should be noted here that in practice, the huge variety of different technical and operational combinations may represent a considerable challenge for planners. The consideration of appropriate sanitation solutions in an ecosan approach will require a great deal of know-how and experience in order to ensure that interesting and feasible technical and service options are not discarded at the beginning of the planning process, while at the same time not overburdening the planning process with a huge number of different and perhaps far-fetched combinations.)

- *the application of new and wider ranging evaluation criteria for water supply and sanitation services:*



As ecosan-systems aim to avoid pollution through the productive reuse of excreta and wastewater, classical evaluation criteria currently in use in sanitation projects, e.g. the limiting parameters for discharge into receiving water bodies, no longer suffice to evaluate the different options. New criteria therefore have to be developed and applied to sanitary systems, such as resource efficiency, the system energy demand, recovery rate, the hygienic risk (not only of ecosan-systems, but also for conventional systems, with regard to: in house hygiene, hygiene of neighbourhood and water bodies, hygienic aspects of the handling, processing and reuse of the products etc.), environmental risks, lifecycle analysis, self-help criteria, factors regarding job creation, full cost and benefit analysis etc.

- *the adaptation to the information and output needs of the stepwise and participatory project preparation and implementation process, in order to supply the relevant information to enable the stakeholder to make an “informed choice”*
- *the necessity to focus on the assessment of the needs of the user of the sanitary facilities and other relevant stakeholders, particularly the service providers and the end users of the recyclates.*
- *the consideration of smaller planning units and a greater number of decentralised options and*
- *the integration of education, institution and capacity building aspects into planning instruments.*

As the requirements of the project preparation and planning process in ecosan-projects are comparatively much more demanding than those of conventional sanitation projects, and as the ideas behind ecosan, and the practical options it offers, are still relatively unknown to many people, including decision makers, planners, supervisory boards and service providers, several recent ecosan projects supported by the GTZ have experimented with the introduction of a simplified preliminary study, known as an ecosan-baseline-study, which has been carried out before making the decision to embark upon a full scale feasibility study.

The ecosan-baseline-study

These base-line studies can fulfil a variety of functions depending on the prevailing conditions but most generally are used to gather basic information concerning the existing water supply and sanitation conditions, agricultural practices (including the availability of fertiliser, the types of crops grown etc.), aspects of urban planning, hygiene, traditional practices and perceptions related to water supply and sanitation, institutional aspects and the legislative framework, the ability of local businesses to engage in sanitary provision, the availability of appropriate materials or the possibility for local production etc.. The process involved in the base line study can also serve to raise awareness of the ecosan philosophy and assist potential users and other stakeholders in deciding on whether an ecosan system could prove to be a viable sanitation alternative for them. This approach has already proven useful in several contexts (e.g. Mali, China, Burkina Faso).

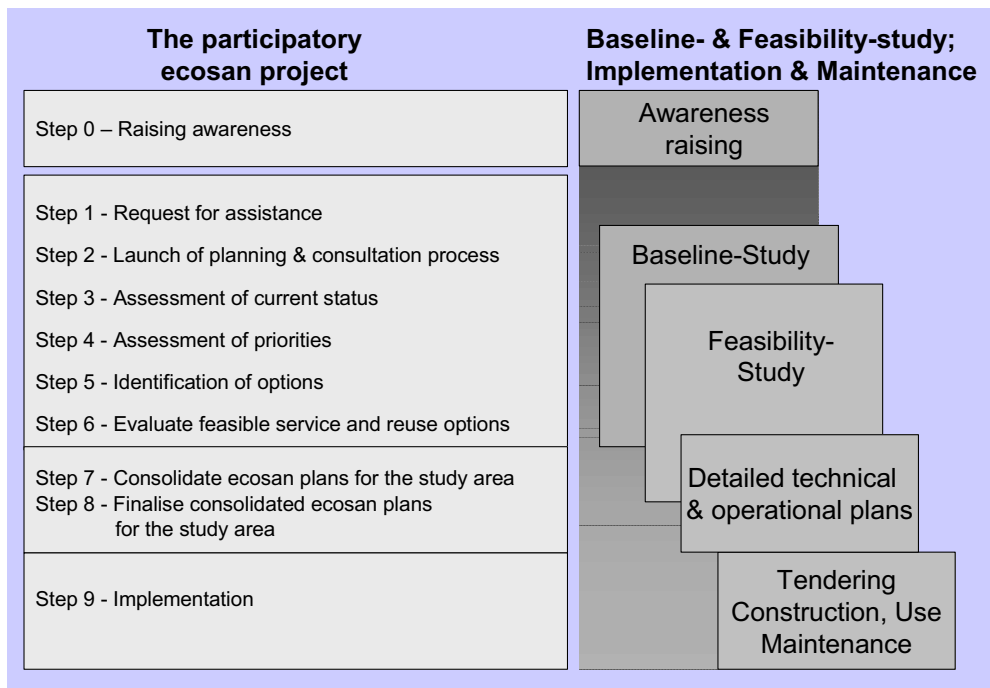


FIG. 8 How conventional approaches correspond to the ecosan project steps.

With respect to the project steps, as described in chapter 4.1, a base-line study would cover steps 2 to 6 of the “ecosan project”. The ecosan project step 2 corresponds to the start-up or advocacy workshop undertaken during the base-line study, which is then followed by steps 3, 4 and 5. In performing these steps for the first time, the base-line study aims at establishing a good clear impression of the current situation, including the relevant figures and data, as well as trying to establish what the expected level of service might be. Once the relevant information has been collected and evaluated in a baseline study, the feasible service combinations, including suitable conventional solutions, proposed in the study are evaluated by the stakeholders, corresponding to Step 6 in the participatory ecosan project process.

If in Step 6, the stakeholders decide for an ecosan solution it may then be necessary to carry out a detailed full-scale feasibility study which would include a repetition of the steps 3, 4 and 5, previously covered in the baseline study, in order to obtain very detailed information on the current sanitary situation, the user priorities and to make more detailed planning of technical and organisational service options including detailed cost estimates and implementing schemes of the feasible solutions. This will then lead to a repetition of Step 6 and a participatory evaluation of the service and reuse combinations. If the stakeholders agree on a particular approach, then the ecosan solutions must be assembled by technical and planning professionals into the broader plans for the area and the finalised plans presented for approval to the stakeholders (Steps 7 and 8). This corresponds to the process of a conventional feasibility study, although the participatory nature of these steps and the much broader context of the study as described above makes the process much more inclusive than classical feasibility studies.

Depending on the local situation and the technological level, experienced professional technical staff, engineers, socio-economists, urban planners, agronomists, public health experts and possibly experts from other disciplines, will be needed to develop a detailed plan of the technical services, the treatment and reuse options, logistic concepts, education plans, institutional and legal concepts, operating systems and to estimate the financial requirements of the system.



3.9 What is a stakeholder?

In general stakeholders are those groups of individuals or organisations who have an interest in the outcome of a particular process. They can range from households and community based organisations to local, regional and national government, and can also include private sector institutions, social services, such as health and education, national and international donor institutions and civil society at all levels. Relevant stakeholders are those who should be involved in a particular process, as well as those who are mainly affected by it or involved in the related decision making process.

3.10 Who are the stakeholders in ecosan projects?

The relevant stakeholders in ecosan projects are presented in the table below. However, as will be shown in sections 3.12 to 3.15, the relevance of a certain stakeholder is dependent on both the type of ecosan project as well as on the project phase, with their roles and tasks varying. Therefore, not all the stakeholders presented in the following stakeholder analysis will always need to participate in the programme.

The number of different stakeholders that may be involved in a project can be quite large, depending on its type and scale, and will include very different individuals, groups, institutions etc. Even within stakeholder groups there may be smaller sub-groups, who may in turn be sub-divided into even smaller groups. For example a community based organisation may be considered as representing a stakeholder community, however this community consists of different interest groups such as men, women, the elderly, the young, the poor, the wealthy, etc. who may also consist of other small sub-groupings. It is therefore extremely difficult to directly address the needs and concerns of all stakeholders. However, a detailed stakeholder analysis should be carried out at the start of an ecosan project in order to identify who are the individuals, groups or institutions that will be relevant to the process and to work out ways in which large stakeholder groups may be effectively addressed and represented in the process.

The stakeholder analysis given below, and in Table 2 aims to give an overview of the possible types of stakeholder who may be involved in a project. This list aims to assist reflection on who the stakeholders might be, by providing a general overview of the types of stakeholder.

(I) Users of sanitation facilities: In many cases the user of the sanitary facilities can be considered as the individual households. In the context of most sanitation projects the term household is generally applied to describe the smallest user unit, composed of different individuals (e.g. women, men, children, the elderly, handicapped people, the rich, the poor etc.) each with perhaps their own needs and expectations with respect to levels of comfort, hygiene, privacy, ease of use and maintenance, construction and maintenance costs etc.. Due to the wide range of household types and their different expectations, the role of the household in an ecosan programme varies enormously. In projects of type A (rural upgrading) the households are usually the final decision makers and are often responsible for the construction and maintenance, as well as the collection and treatment of the recyclates, whereas in projects of type B, the households may be only very marginally involved in these processes, with service providers collecting the recyclates, possibly for further treatment, generally against payment. In practice it is often necessary to determine if the user of the facilities in a house is also the homeowner as this may have a decisive impact on the decision to invest in an ecosan system. In urban areas the household may prove to be too small a unit to work with (for example in a large apartment block or neighbourhood). In such cases it may make more sense to consider all the people living in a building or settlement as a single unit and to work with a neighbourhood group.

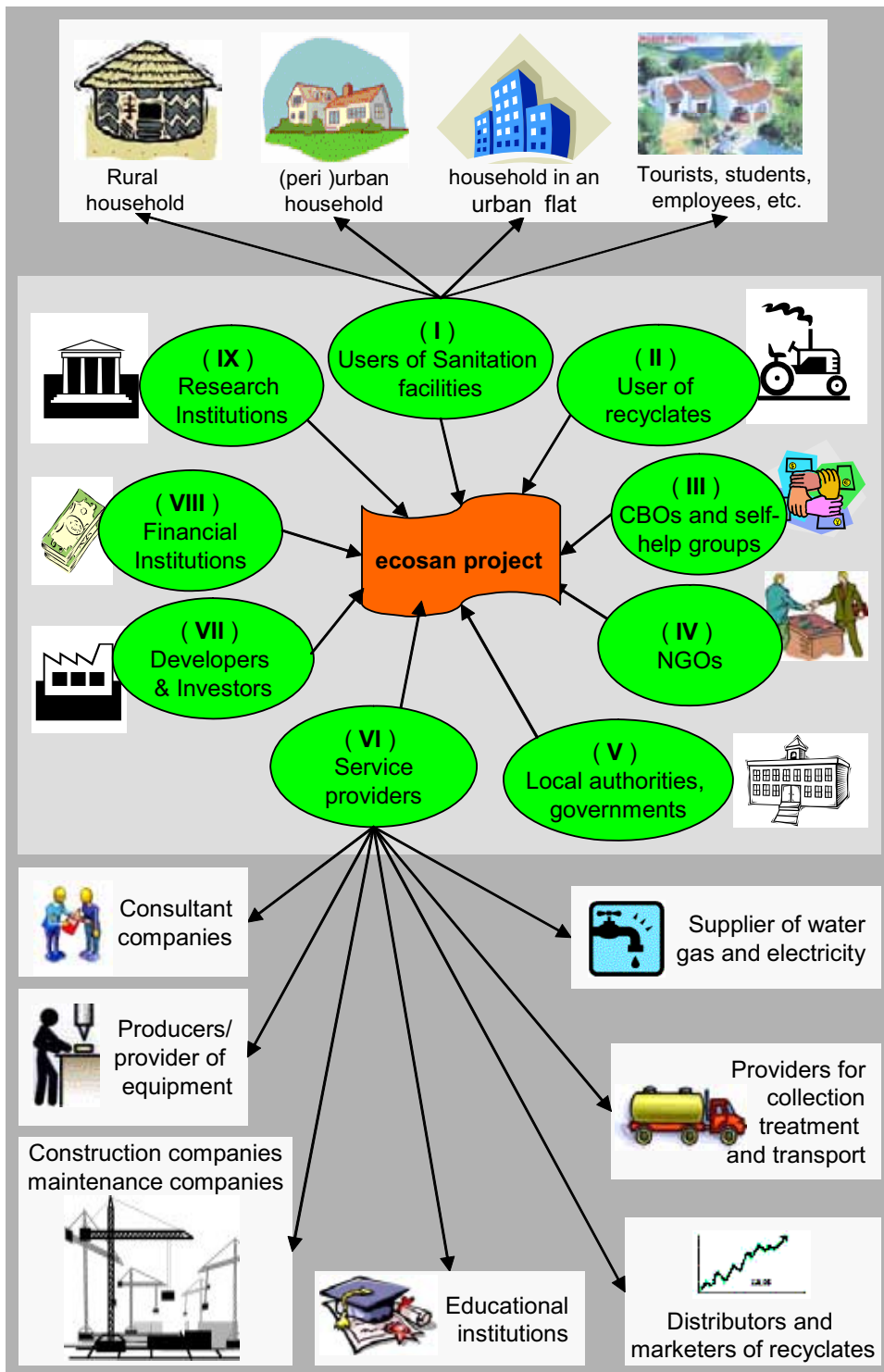


FIG. 9 Principal stakeholders in participatory ecosan projects

(II) Users of the recyclates: In some cases, these may be the users of the sanitation facilities (e.g. the households) themselves. In urban areas, the users of the sanitation facilities may not be able to fully reuse the recyclates due to their particular situation (confined space, no gardens etc.) and may only be able to partially reuse the different flow-streams (e.g. using of rainwater for washing, grey water for toilet flushing, energy for cooking



etc.). Here the majority of the recycled organic material and nutrients will be reused outside of the urban area by external users such as farmers or foresters. They may also be used within the town in urban agriculture, by market gardeners, municipal parks etc. who receive the recyclates from a service provider or directly from the households. Recycled water (including grey water and rainwater) may be used as service water by industry or small businesses, or to irrigate recreational areas, or even in aquaculture.

(III) CBOs and self-help groups are generally formed by user-groups. These organisations may already be in existence before the introduction of ecosan or may be created in response to an ecosan project. CBOs and neighbourhood groups provide the households or other users involved, the opportunity to exchange experiences and to obtain advice from their peers. These groups may also support their members to organise the delivery of the different services needed (maintenance, collection, treatment etc.) and the use of the produced fertiliser at the level of the CBO/ neighbourhood-groups. In an ecosan programme CBOs may eventually develop into (market-oriented) service providers (maintenance, collection, treatment etc.)

(IV) NGOs are generally of great importance regarding information and awareness raising among potential users. They also often support the households in forming CBOs and neighbourhood-groups and advising them on the use of eco-sanitation systems, and support (poor) households by connecting them to financing institutions, municipalities, producers of ecosan equipment (bulk-buying) etc.

(V) Local authorities and governmental institutions are responsible for establishing the framework conditions for the implementation of ecosan systems. They can however also be directly involved, for example by initiating local or regional sanitation programmes promoting or even requiring ecosan, providing subsidies to households, collecting user-fees and disseminating information to potential user households. Governments are also responsible for ensuring the creation of a legislative enabling environment making it possible to install and use ecosan systems to their full potential.

(VI) Service providers is a term that encompasses a wide range of diverse stakeholders, engaged in public or private market oriented activities of service provision, for situations where user households are either not willing or unable to carry out certain activities on their own. In an ecosan programme these could include planners, consultants, equipment producers / suppliers, construction companies, academic institutions, utilities providers, and companies involved in recyclate collection, transport, treatment, packaging and marketing services. Service providers carry out their different tasks against payment. Along with being users of the recyclates, farmers could also act as service providers in ecosan projects by collecting and treating excreta from the users of the sanitary facilities.

(VII) Developers and investors: These can be either private or public investors, who initiate the construction of residential units to be sold or rented. The introduction of ecosan is thus tightly related to the demand for houses / flats with such systems anticipated by these investors. In these cases, the developers themselves may be very actively involved in the planning and implementation process of the entire programme.

(VIII) Financial institutions: The introduction of new infrastructure generally requires that the investment and operation costs are secured. Initially in conventional sanitation systems, investment costs for public sewer systems and treatment plants are generally initially covered by local authorities. The costs for both the public part of the system and its operation are however later recovered from the users through fee collection. The private owners of the buildings have to provide the investment and operation costs for the in-house installations and on-plot part of the system (bathroom equipment, house installations, branch and house drains, or on-plot treatment).

With the introduction of ecosan, it is assumed, that the total costs of the system (i.e. of the private and public parts together) will be considerably reduced, however the costs to be borne by the private householders may possibly increase (on the other hand, if one were to



An ecosan source book

for the preparation and implementation of ecological sanitation projects

2nd draft – 10/2003

take into account the initial cost to connect to a conventional sewerage network into the private costs of conventional systems, it quickly becomes apparent that this is also a considerable sum to be covered by private money and ecosan systems may also be cheaper in this regard). In any case, new financing instruments may have to be developed in ecosan projects in order to support these private investments as only a small part of the user households may be able to pay these costs immediately, at the time of the installation of the sanitation system. Large scale application of ecosan sanitation systems may therefore necessitate the introduction of corresponding subsidy or credit schemes, and thus the involvement of financial institutions, such as local or international banks or donor agencies. During the piloting and development stage of new ecosan-systems, additional funds are also needed for the start-up phases of projects, the development and introduction of new technologies, technical, agricultural, environmental and social research, and the market introduction of hardware producers or service providers.

(IX) Research institutions: These may be universities or other research oriented institutions or organisations. They can fulfil different tasks by providing advice to programme initiators, such as developers, municipalities and NGOs. Universities and research institutions can also initiate ecosan programmes for research purposes, usually with external financial assistance. They also have the important role of providing research results regarding their research, which can then be disseminated and used for information, advocacy and lobbying activities among the different stakeholders.

The table below (Table 2), presents some of the factors that may either encourage (motivating factors) or discourage (constraints) different stakeholders to opt for ecosan solutions. The table does not present an exhaustive list of all the motivating and constraining factors all the stakeholders may have, but should serve to provoke thought on what these factors may be. In many cases the motivating factors represent expectations of the stakeholders involved, while the constraints represent their fears. It is important that all stakeholder groups are well informed of how an ecosan system could work for them to avoid unrealistic expectations and groundless fears.

Both the motivating factors and the constraints of the stakeholders can vary enormously and may not always be obvious to outsiders. It is therefore important in a participatory approach that the stakeholders have the possibility to voice their motivating factors and the reservations they may have about the programme. When these are known for all stakeholders it may then be possible to tailor the ecosan programme to their needs and to adequately address their concerns. It is important and very useful to continually refer to the motivating factors and to confirm that they will be addressed by the project. Equally important is to check that the constraints have been convincingly dealt with. To map the motivations and constraints is therefore an important prerequisite, which should be adapted during the course of the project, becoming increasingly specific.



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Principal Stakeholders	Examples of Motivating Factors	Examples of Constraints
I. Users of sanitation facilities households, neighbourhoods tourists, pupils employees, ...	<ul style="list-style-type: none"> - hygiene improvement, - structural stability, - local physical factors (high groundwater table, rocky ground...) - reduced costs, - increased comfort, - improvement of quality of life, - greater security, - interest in recyclates, - prestige, - ecological reasons, - water scarcity, - unreliable water supply - ... 	<ul style="list-style-type: none"> - culture, habits, taboos, - hygiene concerns, - unfamiliarity, - fear of loss of comfort, - unavailability of structural elements, - legislative restrictions, - economic factors (e.g. for start-up etc.), - ...
II. User of recyclates	<ul style="list-style-type: none"> - economic reasons, - local and reliable availability of agricultural inputs (water, nutrients, organics) - increase of crop yields for either the market or for family needs - improvement of self sufficiency - ecological reasons - ... 	<ul style="list-style-type: none"> - culture, habits, taboos - lack of logistics - fear of negative consumer perception - fear of negative long term effects on soil, - ...
III. CBOs and self-help groups	<ul style="list-style-type: none"> - failure of conventional / existing sanitation system, - local improvement of quality of life, - Agenda 21, - interest in recyclates, - reduced costs, - local physical factors (high groundwater table, rocky ground...) 	<ul style="list-style-type: none"> - culture, habits, taboos , - lack of information, - insufficient financing, - inappropriate legislation, - influence of interest groups, - hygienic concerns, - ...
IV. NGOs	<ul style="list-style-type: none"> - failure of conventional / existing sanitation systems, - economic reasons, - ecological reasons, - agricultural reuse of recyclates - improve quality of life, - ... 	<ul style="list-style-type: none"> - culture, habits, taboos - lack of information, - insufficient financing, - inappropriate legislation, - influence of interest groups, - hygienic concerns, - ...
V. Local authorities, governmental institutions	<ul style="list-style-type: none"> - political reasons, - economic reasons, - ecological reasons, - Agenda 21, - failure of conventional / existing sanitation system, - possibility of financial support, - sustainability of system, - support regional self-sufficiency, - promotion of (urban) agriculture - job (and income) creation - long-term security of social services (water supply etc.) - ... 	<ul style="list-style-type: none"> - culture, habits, taboos, - lack of information, - lack of start-up funds / insufficient financing, - monitoring of treatment / handling etc. more difficult for decentralised system - distrust of alternative systems - not recognised as state of the art technology - reluctance to change status quo - contradiction of existing legal framework / long term plans - powerful lobby from conventional centralised sanitation industry - corruption - ...



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<p>VI. Service providers Planners / consultants constructors (builders) maintenance service providers producers of equipment providers of collection, treatment, transport and marketing of the recyclates</p>	<ul style="list-style-type: none"> - increase profit - opening up of a potentially huge new market - request / need for particular product - further develop their own know-how - ethical / ecological reasons 	<ul style="list-style-type: none"> - absence of technical knowledge, - absence of products, - inappropriate legislation, - lack of suitable tools, - economic interest of (waste) water monopolies, - fear of failure (economic risk), - not yet recognised as state of the art, - reluctance to make the necessary increase in effort, - lack of experience in decentralised planning / participation, - lack of start-up funds, - fear of reduced profit margins in smaller / decentralised projects, - regulatory obstacles - ...
<p>VII. Developers & Investors</p>	<ul style="list-style-type: none"> - increase attractiveness of developments (eco-label), - safe and secure "disposal" (especially in tourist areas), - user satisfaction, - economic reasons, - legal requirements - ... 	<ul style="list-style-type: none"> - absence of service logistic - culture, habits, taboos - lack of information, - lack of start-up funds, - monitoring of treatment / handling etc. more difficult for decentralised system - distrust of alternative systems - not recognised as state of the art technology - reluctance to change status quo - contradiction of existing legal framework / long term plans - powerful lobby from conventional centralised sanitation industry - corruption - less« commission »for ecosan projects - ...
<p>VIII. Financial Institutions</p>	<ul style="list-style-type: none"> - economic reasons, - failure of existing / conventional systems, - improving sustainability, - guarantee repayment of credit, - ... 	<ul style="list-style-type: none"> - absence of specific financing instruments, - not recognised as state of the art technology, - need for research and development, - ...
<p>IX. Research Institutions</p>	<ul style="list-style-type: none"> - Need for research and development, - availability of research funds, - ecological reasons, - ... 	<ul style="list-style-type: none"> - availability of research funds, - prestige, - ...

TABLE 2 Factors motivating and constraining stakeholders to participate in an ecosan programme

Most stakeholders will be relatively new to the ecosan approach in the beginning of a programme and will almost certainly require a degree of training in order to familiarise them with it and enable them to complete their task and fulfil their responsibilities. Such training may include the following: instructing the users of the sanitation facilities on the correct use and maintenance of their facilities, informing the users of the recyclates of the correct and safe use of the recyclates, possibly with the aid of agricultural extension agents, training CBOs and NGOs to provide their members or partners with the necessary information for the programme to function correctly, capacity building measures in local and regional authorities governmental institutions to support inter-ministerial and inter-sectoral co-operation and co-ordination, a wide range of training measures for the service providers (including technical training for technicians, such as plumbers, or construction companies), informing developers and investors of the opportunities offered by ecosan systems and their particularities,



introducing financial institutions to ecosystem based sanitation and their long-term financial sustainability and highlighting the need for start-up funds and new financing mechanisms for such systems, and informing research institutions of the current state of the art on an international level and the need for locally relevant research.

3.11 General introduction to the tasks and roles of the stakeholders in the different ecosan project types

The following chapters aim to provide preliminary guidelines for the tasks and roles of the different stakeholders in the four basic types of ecosan project. For each project type, a table has been drawn up listing the modified steps for the implementation of the HCES approach together with the respective tasks of the stakeholders involved. The participation of the stakeholder groups in the table has been represented as being either active (i.e. the stakeholder involved should adopt a pro-active role), passive (i.e. the stakeholders react to the initiatives of another), or possibly both.

The four tables are intended to function as a matrix, allowing those who are in ecosan projects to have an overview of who should be involved and in what way at a particular project stage. Tools that can be employed to help the stakeholders fulfil their tasks are discussed in the following chapter.

When consulting the tables, one should remember that the four broad categories of ecosan projects represent a generalisation of these project types. In reality any given project of a certain type may include stakeholders who, for the sake of generalisation, are not included in the corresponding table in these guidelines. The four basic types are therefore mainly intended to provoke reflection on who the stakeholders in a given project might be, what their roles and information needs could be, and what tools should be foreseen to encourage their participation.


3.12 Tasks and roles of the stakeholders in project type A: rural upgrade

(I) Users of the sanitation facilities and (II) Users of the recyclates: Here, the rural households are generally both the user of the sanitation facilities and the user of the recyclates. The rural household is the focus of this type of project and it therefore relies upon their continuous involvement in all project phases, including the planning phase and the collection and use of the recyclates. It is the households themselves that decide on the infrastructure investment and are often actively involved in the construction of the facilities. As the households maintain and use the facilities and are responsible for the collection, treatment, storage, transport and reuse of the recyclates, they will almost certainly require training in these aspects.

(III) CBOs, self-help groups: While CBOs may exist in the rural context in the form of village committees, they generally do not play an important role in this type of ecosan projects.

(IV) NGOs are very often the main promoters of ecosan systems in projects of this type. They are therefore actively involved in most stages of the process including raising awareness, formulating requests, and in the establishment of the current sanitary status quo. In the implementation phase their activity is mostly restricted to training and advising the users as a great deal of the necessary activities are being carried out by the users.

TABLE 3 Tasks & roles of the stakeholders in project type A “rural upgrade”

Project Type A: rural upgrade		I	II	III	IV	V	VI	VII	VIII	IX
 <p>Steps (shown in sequence - overlapping in reality):</p>	Stakeholders:	Users of sanitation facilities	User of recyclates	CBOs, self-help groups	NGOs	Local authorities-Governmental Institutions	Service providers	Developers and investors	Financing institutions	Research institutions
	Main tasks in an ecosan project:									
0. Raising awareness	-advocacy, lobbying, inform., demand creation	o	o		o	o	o			
1. Request for assistance	-formulation of request				o	o	o			
2. Launch of planning and consultative process	-facilitation -Information on process and ecosan -active participation in workshop	o	o		o	o	o			
3. Assessment of current status	-participatory development of TORs -investigation of status quo -elaboration of reports	o	o		o	o				
4. Assessment of user priorities	-Present findings of step 3 -correct possible factual errors -establish ground rules for step 5 (priorities, levels of service, cultural acceptability, etc.)									
5. Identification of options	-elaboration of adequate ecosan solutions -elaboration of reports									
6. Evaluation of feasible service and reuse combinations	-participatory determination of feasible service and reuse combinations -elaboration of reports									
7. Consolidated ecosan plans for study area	-assemble / integrate ecosan into broader - water supply, sanitation and reuse framework									
8. Finalising consolidated ecosan plans	-presentation of assembled plans -approval of assembled plans									
9. Implementation	-decision on infrastructure - elaboration of working plans -tendering -grant of financial support/subsidies -hardware investment -provision of equipment -construction -training / advice to users and serv. providers -use of sanitary systems -maintenance -collection treatment -storage transport -marketing of recyclates -reuse of recyclates									
	stakeholder with active role	o								
	stakeholder with passive role	o								
	stakeholder with active and/or passive role	o								



(V) Local Authorities – Governmental institutions. The involvement of the authorities (ranging from local to national governments) very often depends on the level at which the initiative to instigate an ecosan programme has been taken. If the programme is a result of a government initiative, government institutions may be directly involved in awareness raising activities and remain very involved and active throughout the entire process. However, if the initiative has been taken by the users themselves or by an NGO, it is likely that the government will only be very marginally involved in the project. Governments are also responsible for ensuring the creation of a legislative enabling environment making it possible to install and use ecosan systems to their full potential.

(VI) Service providers: In the context of these type of projects the service providers are consultants who may be involved in facilitating the process (participation, meetings, reports) as well as engineering offices and technical professionals. As such, they may have a key role in ensuring that the process remains transparent and open and that communication between the stakeholders occurs smoothly. They are also active in collecting, evaluating and presenting the information necessary for the progress of the project. In collaboration with all other involved stakeholders they elaborate the results of the necessary workshops, write the report on the existing sanitary situation (having worked with the other stakeholders in collecting the information), and may develop the catalogue of technical alternatives to address the sanitary problems of the future users, according to their expressed needs, levels of service, etc.. Manufacturers of prefabricated equipment and local craftsmen may be involved in the construction of the facilities, however, the maintenance, collection, treatment and transport of the recyclates in this type of project will generally not require professional service providers, as these tasks will usually will be carried out by the user household itself.

(VII) Developers and investors, (VIII) Financing institutions, (IX) Research Institutions, As these projects are based in a rural context, they generally tend to be of limited interest to the above stakeholders. However developers may be interested in government initiated regional projects covering a larger zone. Financing institutions may see chances in giving micro credits as ecosan can lead to small scale production e.g. of equipment for ecosan constructions. Research institutions may also become involved, especially if the programme is meant as a demonstration or pilot project, looking into issues such as the adoption of ecosan practices from a socio-cultural perspective, the agricultural implications of using the recyclates or the impact on public health of ecosan systems.

3.13 Tasks and roles of the stakeholders in project type B: (peri-) urban upgrade

(I) Users of the sanitation facilities:

In projects set in an urban or peri-urban context the user of the sanitary facilities are less frequently the direct users of the recyclates. However user households may still have an important role in the process. These households, and thus the user groups, cover a broad range of social conditions, from neighbourhoods of informal settlements, to detached single family homes, to luxury multi-storey apartment or office blocks, in fact anywhere in an urban context where the existing infrastructure is to be upgraded to ecosan systems. Unlike in the rural context, the single households in urban areas are very unlikely to be the sole decision maker with regards to opting for an ecosan solution, as the systems will be implemented for an entire building, neighbourhood or town quarter, requiring a great deal more group discussion and decision than rural projects. Such group decisions may come up against resistance from individuals who may have, for example, just installed a new sanitary installation in their homes and are very reluctant to change to a new system. If the initiative to improve sanitary conditions comes from the prospective users of the facilities, the facility users will first become active in their formulation of a request for assistance. The households have an active role to play in almost all steps of the process, except steps 5 and 7, where



mainly technicians and planners are implicated in developing feasible service and reuse options and integrated the options accepted by the users into the broader urban water supply, sanitation and reuse. Therefore, the households must be involved in a participatory process of approval of the results of both these steps. In the implementation phase the maintenance of the facilities as well as the collection, treatment, storage and transport of the recyclates may be the responsibility of the user of the facilities, but more usually this will be carried out by local authorities or a service provider.

Only when the urban households using the ecosan-sanitation systems are involved in urban-agriculture, service providers marketing the fertiliser and establishing contacts with farmers will not be needed.

(II) Users of the recyclates:

As the reuse of the recyclates is essential to complete ecosan systems the users of the recyclates have an equally important role in projects of type B. These may at times be, the households themselves (if they are involved in market gardening or urban agriculture, are willing to recuperate and use the grey water for other purposes, or to profit from the energy contained in their waste) but may often be groups or individuals engaged in agriculture or market gardening in or around urban areas, municipal authorities that wish to use the products on parkland etc., organisations who wish to recover the energy contained in them or industries or small businesses who wish to reuse grey water or rainwater as service water. The recyclate users may therefore be actively involved in formulating a request for ecosan systems in order to obtain an optimised constitution and a good, reliable quality of the recycled. They may also participate in all those steps in which the users of the sanitation facilities participate.


(III) CBOs, self-help groups:

In urban or peri-urban contexts, community based organisations or self-help groups may assume a large degree of organisational responsibility in the implementation of the project. It is possible that the demand to initiate the project comes from this level, or that local groups form a co-operative to unite their resources (financial, manpower, etc.) which they may place at the disposition of the project. They may supply the workers for the construction and operation of the facilities, or for the collection, treatment, post-treatment and marketing of the recyclates, possibly developing into small scale service providers over time. They may participate throughout the entire process.

(IV) NGOs:

In urban or peri-urban contexts NGOs may prove to be extremely active participants in development processes. They may be actively involved from the very beginning of an ecosan programme by promoting it as a holistic approach to solve sanitary problems, raising awareness among all the stakeholders. They may also contribute their expertise to assist local communities with the formulation of a request for assistance and, depending on their capacities, assist in launching the planning and consultative process. Throughout the process they may play an active consultative role offering their experience and advice in the areas of introducing new ideas, environment issues, etc..

TABLE 4 Tasks & roles of the stakeholders in project type B “(peri)Urban upgrade”

Project Type B: (Peri)Urban upgrade		I	II	III	IV	V	VI	VII	VIII	IX
 <p>Steps (shown in sequence - overlapping in reality):</p>	Stakeholders:	Users of sanitation facilities	User of recyclates	CBOs, self-help groups	NGOs	Local authorities-Governmental Institutions	Service providers	Developers and investors	Financing institutions	Research institutions
	Main tasks in an ecosan project:									
0. Raising awareness	-advocacy, lobbying, inform., demand creation	o	o	o	o	o	o		o	
1. Request for assistance	-formulation of request			o	o	o				
2. Launch of planning and consultative process	-facilitation -Information on process and ecosan -active participation in workshop	o	o	o	o	o	o		o	
3. Assessment of current status	-participatory development of TORs -investigation of status quo -elaboration of reports	o	o	o	o	o				
4. Assessment of user priorities	-Present findings of step 3 -correct possible factual errors -establish ground rules for step 5 (priorities, levels of service, cultural acceptability, etc.)	o	o	o	o	o	o		o	
5. Identification of options	-elaboration of adequate ecosan solutions -elaboration of reports									
6. Evaluation of feasible service and reuse combinations	-participatory determination of feasible service and reuse combinations -elaboration of reports									
7. Consolidated ecosan plans for study area	-assemble / integrate ecosan into broader - water supply, sanitation and reuse framework									
8. Finalising consolidated ecosan plans	-presentation of assembled plans -approval of assembled plans	o	o	o	o	o				
9. Implementation	-elaboration of working plans -tendering -decision on infrastructure -grant of financial support/subsidies -hardware investment -provision of equipment -construction -training / advice to users and serv. providers -use of sanitary systems -maintenance -collection treatment -storage transport -reuse of recyclates -marketing of recyclates									
	stakeholder with active role									
	stakeholder with passive role	o								
	stakeholder with active and/or passive role	o								

(V) Local Authorities – Governmental Institutions.



The authorities, ranging from local to regional and national governments, may have an important role to play. If the initiative for project implementation comes from the macro-level (e.g. informal housing rehabilitation programmes), this may lead to a large degree of participation on behalf of the authorities. The municipal authorities will need to become actively involved if the plans developed for a (peri-) urban upgrade are to be incorporated into city wide urban water supply, sanitation and reuse plans. The authorities may therefore possibly actively participate in all steps of the programme, from raising awareness with regard to ecosan to the reuse of the recyclates in municipal parks etc.. Due to the holistic and interdisciplinary nature of ecosan, many different authorities, with responsibilities in various areas (including water resources management, water supply and wastewater treatment, public health, irrigation, agriculture, forestry and town planning) may participate to guarantee that the system corresponds with the legislative norms, or to adapt these norms accordingly. Different authorities may also have the responsibility to control construction. to monitor and control hygienic and environmental standards to provide various services etc..

(VI) Service providers:

Within projects of type B in urban areas, external service providers are of essential importance. As noted in Chapter 6 there is a wide range of functions that can be filled by service providers. In these type of projects, service providers may be consultants who facilitate the process, and help establish the current sanitary situation, or consultant engineers specialised in the implementation of ecosan technologies and are therefore involved in the identification of options and integrate the agreed system into the existing urban plans. They may also be construction companies or manufacturers of prefabricated parts of the sanitary system, or businesses specialised in the collection, treatment, storage and transport of the recyclates, as well as in marketing them to the end users. In an urban context, this is a vital role as the users may not always be in the position to reuse the recyclates themselves. The service providers may be purely private businesses or part of a public institution or company, for example the local water suppliers may assume responsibility for the operation of the system.

Service providers are of great importance in an urban context for a range of reasons. The ecosan technical installations needed in urban areas tend to be more complex, with installations often being complicated by existing infrastructure, and planning, construction and operation therefore requires more skill and experience. The fact that the users of the recyclates are rarely the users of the facilities also creates a need for service providers to bridge the gap between the two parties, collecting, transporting and possibly treating the recyclates before marketing them. Care should be taken however that the Bellagio Principles are respected in such situations, and that if the recyclates are to be transported, that they are used as near as possible to their source.

(VII) Developers and investors

Developers and investors may have no significant role to play in urban upgrade projects.

(VIII) Financing institutions

These institutions may be approached in the case where a large scale upgrade of urban sanitary facilities is proposed and there is a need for significant funds to finance the activities. In this case, the financing institution will receive a request and possibly wish to actively participate in the workshop to launch the planning and consultative process. They may also become actively involved in the participatory selection of feasible service and reuse combinations and in providing additional financial support in the implementation phase.

(IX) Research Institutions

In an urban context research institutions working on the issues of urban sanitation, urban agriculture or social sciences may be interested in accompanying the process, providing inputs on certain specialist issues. However, the participation of these institutions is not a pre-condition to the success of the programme, and will most likely depend on the availability of research funds and the interests of the institution.



3.14 Tasks and roles of the stakeholders in the project type C: new urban development areas

(I) Users of the sanitation facilities:

In the case of a new urban construction of an ecosan system the future users of the sanitation facilities are usually not known throughout the first 8 steps of the participatory process, and as such have no active role to play. Very rarely users participate from the start of the process for example when a CBO or NGO decides to construct a residential area for themselves. In most cases though the users only enter the equation in the implementation phase of the programme after the construction of the buildings and infrastructure, including the sanitary facilities. The needs of the users must nevertheless be considered throughout the planning process by those actively participating in it, as it is in the interest of the other stakeholders that the users ultimately accept the system. Developers in fact often hope that the use of ecosan systems in new development areas will attract residents, by stressing the environmentally friendly nature of the approach, its reliability, its ease of use etc.. In the implementation phase the users of the sanitation facilities will require a degree of sensibilisation and training regarding the correct use of the facilities, and possibly contamination prevention of the different flow streams and the reuse of the flow streams in the settlement (for example, rainwater use, the reuse of treated grey water, energy production etc..).

The users themselves will most often not be directly involved in the handling, treatment, storage etc. of the recyclates, and therefore service providers may be needed.

(II) Users of the recyclates:

It is crucial for the success of the project to precisely identify and respond to existing demand for the recycled product. It is therefore necessary to include the users of the recyclates in the project from an early stage. They should be involved in the launch of the planning and consultative process and should be consulted in the establishment of the current situation, with the possibility to correct factual errors in step 4. As an important element in the system, the users of the recyclates should also be actively involved in the participatory determination of feasible options and the approval of the finalised plans. These new development areas can prove to be quite complex regarding material separation, the technologies applied and the environmental, social and economic boundary conditions. It may therefore be necessary to carry out a comprehensive study on the available reuse options and the actors involved in it, as the use of the different flow streams, or components of them, can vary enormously. For example rainwater may be used as a source of drinking water, service water or for watering plants and gardens; grey water could be reused to flush toilets, to water plants and gardens, to irrigate private or municipal parks and gardens, for agricultural irrigation, or as service water in industry. Composted excreta, urine sewage sludge etc. may be used in a range of urban agriculture activities, for example directly in the gardens of houses or other green areas, in city farms, allotments, in marketing gardening, or in forestry or aquaculture. It could also be commercially treated and packaged to be sold for domestic use for flowers etc., or transported to farms outside of the city boundaries.

(III) CBOs, self-help groups:

CBOs are not typically involved in this type of project.

(IV) NGOs:

As the future users of the sanitation facilities are not available during most of the project, NGOs may represent them or their interests. Furthermore they may be actively advocating environmental and health aspects, and be active in giving training and advice.

(V) Local Authorities – Governmental Institutions:

Along with the developers and service providers, the local authorities are the most active participants in projects of this type. They are the natural partner of developers and investors providing them with the opportunity to construct by designating certain areas for new



development or imposing the installation of ecosan systems in all new buildings. The local authorities therefore accompany the developers in all stages of the programme, serving as a counter balance to protect the interests of the municipality and ensuring that the systems proposed are compatible with environmental and health considerations, as well as existing systems and standards. These new urban developments are ideal for the development and implementation of innovative concepts and technologies, which are often not adequately addressed by existing legislation, or which offer new reuse options, technologies or organisational structures. An ongoing dialog between the developers and the relevant sectoral authorities (e.g. working with environmental issues, water, agriculture, town planning, or energy supply) is of great importance and should be initiated at an early stage in order to adapt, where necessary, the regulatory framework and standards, or allow for exceptions to these, and thus create an enabling environment for ecosan to establish itself as the new sanitation paradigm. These authorities and institutions will also be involved in the monitoring and control of environmental health standards. Local or perhaps even regional or national authorities may possibly also supply financial subventions for new, environmentally friendly construction, encouraging investors and developers to introduce ecosan systems.

(VI) Service providers:

They also have an essential role in projects of this type. They may be involved as consultants in the planning process providing the developers and investors with advice concerning the technical and social aspects of the system. They may also prove to be necessary not only to ensure the provision of equipment, construction and maintenance of the systems, but also for the collection, treatment, storage, transport and marketing of the recyclates. As new development areas represent the best possible environment for the implementation of very complex ecosan solutions, manufacturers of hardware may play an essential role in further developing, field-testing and applying innovative elements of sanitary technology.


(VII) Developers and investors:

In projects of type C, the role of the developers and investors is of paramount importance as they most often provide the initiative to start the programme, as well as the capital to construct the system. They are therefore involved in creating a market for ecosan systems, and thus contribute to awareness raising through advertising and marketing campaigns. . It is in the developers interest that the final system responds to the demands of the market as their aim is to make a profit on their investment through selling or renting the properties they construct. They are therefore actively involved in almost every step of the process from planning, to implementation, possibly even including the operation and maintenance of the system

(VIII) Financing institutions:

Financing institutions may be involved in the process if the developers (or CBOs) have approached them requesting credit for their activities. These financing institutions may therefore provide credit to enable the implementation of the project and thus become involved in the planning process from very early on. Local, regional or national planning or environmental authorities may also provide financial encouragement to developers and investors with subventions to develop and implement sustainable sanitation systems.

TABLE 5 Tasks & roles of the stakeholders in project type C “New urban development areas”

Project Type C: New urban development area		I	II	III	IV	V	VI	VII	VIII	IX
 <p>Steps (shown in sequence - overlapping in reality):</p>	Stakeholders:	Users of sanitation facilities	User of recyclates	CBOs, self-help groups	NGOs	Local authorities-Governmental Institutions	Service providers	Developers and investors	Financing institutions	Research institutions
	Main tasks in an ecosan project:									
0. Raising awareness	-advocacy, lobbying, inform., demand creation	o	o		o	o	o		o	o
1. Request for assistance	-formulation of request					o				
2. Launch of planning and consultative process	-facilitation -Information on process and ecosan -active participation in workshop		o		o	o	o	o	o	o
3. Assessment of current status	-participatory development of TORs -investigation of status quo -elaboration of reports		o		o	o	o			
4. Assessment of user priorities	-Present findings of step 3 -correct possible factual errors -establish ground rules for step 5 (priorities, levels of service, cultural acceptability, etc.)									
5. Identification of options	-elaboration of adequate ecosan solutions -elaboration of reports									
6. Evaluation of feasible service and reuse combinations	-participatory determination of feasible service and reuse combinations -elaboration of reports									
7. Consolidated ecosan plans for study area	-assemble / integrate ecosan into broader - water supply, sanitation and reuse framework									
8. Finalising consolidated ecosan plans	-presentation of assembled plans -approval of assembled plans									
9. Implementation	-elaboration of working plans -tendering -decision on infrastructure -grant of financial support/subsidies -hardware investment -provision of equipment -construction -training / advice to users and serv. providers -use of sanitary systems -maintenance -collection treatment -storage transport -reuse of recyclates -marketing of recyclates									
	stakeholder with active role									
	stakeholder with passive role	o								
	stakeholder with active and/or passive role	o								



(IX) Research Institutions:

As there is an urgent need for ecosan solution in densely populated urban areas, research and pilot projects as well as the scientific documentation of existing projects is a central task. Research institutions will therefore at this state be involved extensively in projects undertaken in densely populated areas. Need for innovative concepts and technical solutions which fit to cultural and structural realities of today's urban areas have to be developed for collection and treatment, hygienic reuse, storage, transport, marketing of recyclates, development of small enterprises etc.

Research institutions working on the issues of urban sanitation, urban agriculture or social sciences may be interested in accompanying the ecosan projects. Although the participation of these institutions is not a pre-condition to the success of the programme, at the current state of art it would be wise to involve them not only to accompany the project, but also to discover new ways and to get documentation and awareness for scientifically sound project-data.

3.15 Tasks and roles of the stakeholders in project type D: non-residential

(I) Users of the sanitation facilities:

The users of ecosan facilities in projects of type D are not individual households, but - depending on the nature of the system - the people working in or visiting these specific buildings or sites. As a vast range of buildings or sites may implement ecosan technologies, for example individual office buildings, museums, schools, prisons, hotels or other tourist sites, the users will also be extremely varied and may include children, office workers or tourists. The sensibilisation of these users regarding the correct use of the facilities may be somewhat more complicated as they may only use the system on one or two occasions. This may therefore have an impact on the choice of technology and degree of separation of the flow streams..

In the majority of these cases the actual user of the facility is not directly involved in any of the planning steps before the implementation, and even then will probably only be active in the use of the actual system. In some cases however (e.g. in hotels or schools) employees of the institution, and thus users of the system, may be involved in the handling and reuse of the recyclates in the grounds of the building. However this may also be carried out by service providers.

(II) Users of the recyclates:

In projects of this nature it is necessary to analyse the building or site in order to make a specific evaluation of the reuse potential within the framework of the project itself, or at least as close as possible to the source of the recyclables, in accordance with the Bellagio Principles. The reuse possibilities are an essential part of the project and should be well identified and defined at the start of the project and considered in all planning stages. Reuse possibilities could include treated grey water being used to irrigate gardens or plants for tourist facilities, or to flush toilets; biogas could be produced and used for cooking in central kitchens (e.g. in a school or office canteen, or in a hotel); nutrients could be used in school or prison gardens or could be used externally in agriculture. In evaluating the reuse options, it should be borne in mind that the composition of the wastewater may be very different from domestic wastewater – for example in offices buildings there may be lesser volumes of faeces or grey water, but more urine, or in a stadium large volumes of urine should be expected. Where possible the users of the recyclates should be included in the planning process from the start so that their needs are considered.

(III) CBOs, self-help groups:

In projects of type D, these are unlikely to become involved.

(IV) NGOs:



May be active in identifying and preparing such project and may be partner throughout the planning process. However this is not seen as the typical case for this kind of project.

(V) Local Authorities – Governmental institutions:

As this type of projects often have a more public or official character, local-authorities may well be quite involved in them. The participation of the authorities will depend on the type of non-residential area being proposed for an ecosan system. If the building is state owned (e.g. office blocks, schools, or hospitals) and the initiative comes from the authorities to chose a closed loop sanitary system they will be very much involved in all steps of the programme. Another possibility would be if the authorities impose the use of such systems for constructions in a particular area (e.g. on the ground of environmental protection). In this case the authorities will be actively involved to ensure that the established standards for the area are adhered to. The sectoral authorities are also responsible in these cases for creating an enabling environment for the introduction of the ecosan system. These may be achieved by adapting legislation where necessary or granting special status to the project, thus placing it outside of existing legislative requirements. However, these authorities will have to monitor and control the system to ensure that the interests of the municipality are being correctly served.

(VI) Service providers:

In projects of type D, service providers may once again be technical consultants who help develop the system concept, and are thus involved in steps 2 to 8. They may also be businesses who construct, maintain and provide equipment for the system and / or collect, store, treat, transport and market the recyclates – in which they would be actively involved in these activities in the planning and the implementation.

(VII) Developers and investors:

If the non-residential area is privately owned, developers and investors will usually be the group of stakeholders responsible for planning and financing the system. In this case, they would be involved in all the programme steps.


(VIII) Financing institutions:

These may participate in the process if either the authorities request financial assistance (e.g. in a programme to supply all governmental buildings in a certain area with an ecosan system), or if the developers require a credit. Generally, however, the participation of financing institutions will be rather limited.

(IX) Research Institutions:

In this context research institutions working on the issues of sanitation, agriculture or social sciences may be interested in accompanying the process, providing inputs on certain specialist issues. However, the participation of these institutions is not a pre-condition to the success of the programme, and will most likely depend on the availability of research funds and the interests of the institution.

TABLE 6 Tasks & roles of the stakeholders in project type D “non-residential”

Project Type D: non-residential		I	II	III	IV	V	VI	VII	VIII	IX
 <p>Steps (shown in sequence - overlapping in reality):</p>	<p align="center">Stakeholders:</p>	Users of sanitation facilities	User of recyclates	CBOs, self-help groups	NGOs	Local authorities-Governmental Institutions	Service providers	Developers and investors	Financing institutions	Research institutions
	<p align="center">Main tasks in an ecosan project:</p>									
0. Raising awareness	-advocacy, lobbying, inform., demand creation		o			o	o	o	o	o
1. Request for assistance	-formulation of request					o	o	o		
2. Launch of planning and consultative process	-facilitation -Information on process and ecosan -active participation in workshop		o			o	o	o	o	o
3. Assessment of current status	-participatory development of TORs -investigation of status quo -elaboration of reports		o			o			o	o
4. Assessment of user priorities	-Present findings of step 3 -correct possible factual errors -establish ground rules for step 5 (priorities, levels of service, cultural acceptability, etc.)									
5. Identification of options	-elaboration of adequate ecosan solutions -elaboration of reports									
6. Evaluation of feasible service and reuse combinations	-participatory determination of feasible service and reuse combinations -elaboration of reports									
7. Consolidated ecosan plans for study area	-assemble / integrate ecosan into broader - water supply, sanitation and reuse framework									
8. Finalising consolidated ecosan plans	-presentation of assembled plans -approval of assembled plans		o			o	o	o	o	o
9. Implementation	-elaboration of working plans -tendering -decision on infrastructure -grant of financial support/subsidies -hardware investment -provision of equipment -construction -training / advice to users and serv. providers -use of sanitary systems -maintenance -collection treatment -storage transport -reuse of recyclates -marketing of recyclates									
	stakeholder with active role									
	stakeholder with passive role	o								
	stakeholder with active and/or passive role	o								



4 A toolbox for ecosan programmes

With ecosan being a new approach there is currently a great need to develop tools that are specifically tailored to it. There are however a lot of tools that have been developed for a more general context that may be adapted to the needs of ecosan projects. Fortunately there is also a rapidly increasing number of new tools being developed in the increasing number of ecosan projects world-wide, and within international projects such as our GTZ-ecosan project, but also the Swedish EcoSanRes and the new WASTEprogramme being financed by the Netherlands as well as within international Institutions such as the WSSCC, IWA, UNEP etc

In this section of the guidelines we intend to provide ecosan practitioners with a toolbox to help them raise awareness, provide information, support participation and implement ecosan programmes. This toolbox will contain a mixture of specific tools which can be used directly, for example for awareness raising purposes, as well as proven methodologies, for example for participatory information gathering. It is hoped that readers of these guidelines will actively contribute to this toolbox with specific tools and methods that they themselves have successfully applied in ecosan projects.

4.1 Types of instruments available

Depending on the circumstances and the type of the project, the interdisciplinary ecosan approach may involve activities in fields such as hygiene, water supply and sanitation, resource conservation, environmental protection, urban planning, agriculture, food-security, small business promotion etc. The stakeholders involved, their tasks and their information needs therefore differ from project to project, and the identification of these can in itself be a very demanding exercise. Additionally, the same information may have to be presented in various ways and on various levels in order to address the information needs of the different stakeholders, ensuring that decisions are made on an informed basis.

While the stakeholders, their motivation and there tasks do differ according to the project, it is obvious that certain tools, for example specific info-material, technical sheets for the construction or maintenance of certain ecosan facilities etc., will often be needed. We therefore hope that this tool box, which contains these materials, will be helpful.

The toolbox also aims to provide support material, methodologies and information to assist in the process of planning and implementing a participatory ecosan project. For this reason we have attempted to structure the planning and implementation process into a series of ten steps – from initial awareness raising activities to implementation – and to identify the necessary activities in each step.

Your experience and co-operation is needed!

We would now like to identify the tools which may be useful in each of the ten steps of a participatory ecosan project, and make them available to all ecosan practitioners – for this we require your help and input.

We hope that this toolbox will benefit from the vast array of experience and knowledge of the members of the international working group for awareness raising, information and participation in ecosan projects, which was formed at the international ecosan symposium 2003, in Lübeck. For each of the project steps we have given one or more examples of existing tools which could be of used by practitioners. For each tool we have given (where possible) (1) the type of tool that it is, (2) the name of the tool (3) the author and/or organisation that has developed it, (4) the year in which it was developed (where known) (5) a brief description of the tool and how it works (6) the stakeholder groups for whom it may be suitable and (7) the exact details of where this tool, or a description of its methodology may be found (either as a download, as a book, etc.).



When providing information on tools that you have used or would recommend, we would ask you to follow the example that we have given i.e. we would ask you to complete directly into the table:

- state what type of tool it is (poster, participatory methodology, design guidelines etc.)
- the name of the tool
- the organisation who has developed it
- the year in which it was developed (where known)
- a brief description of the tool and how it works
- the stakeholder groups by whom and with whom it may best be used
- the exact details of where the tool is to be found

We look forward to your contributions!!

The tools for each of the ten steps in a participatory ecosan project, along with tools for monitoring, evaluation and feedback, are given in chapters 8.3 to 8.13. We would ask you to add your contributions to the appropriate table along with all the required information. In this way we can ensure that the list of tools remained related to the task required in each step.

4.2 Regarding “missing” tools

As has been often stated in these guidelines, ecosan is a relatively new approach to environmental sanitation and there is a lack of specific tools for many aspects of project implementation, such as for ensuring hygienic reuse of recyclates, or aspects of interdisciplinary work. In order to address this problem, it is necessary to identify the purpose for which these tools are needed. We would therefore ask you to contribute with your experiences of where you feel new tools are needed or if you have developed a tool to help in a certain situation.

In the tables on the following pages, where you believe there is an urgent need for particular tools which are not yet available we would ask you to complete as many of the sections of the table as you can and put “Not yet available” in the section “available / source”.



4.3 Tools for step 0 – raising awareness

In awareness raising we imagine that any measure that serves to raise the profile of the water, sanitation, soil and food crises, ecological sanitation, the wide range of contexts in which it may be applied, the variety of technologies already available to implement it, the health and environmental aspects of all forms of sanitation etc. can be considered as a useful tool. As ecosan is still relatively unknown tools for awareness raising activities must be available for all stakeholder groups. This means for engineers, architects, farmers, developers, constructors, consultants, municipal planners, public health experts, socio-economists, sectoral authorities, politicians and the potential user of the facilities.

This wide range of stakeholders requires a wide range of information available through a range of media. Tools for awareness raising may therefore include mainstream media coverage (such as television, radio or newspaper articles), articles in technical publications addressing specific issue of ecosan, books, films, web-sites workshops and information days, exhibitions, public presentations, posters, guided tours of existing ecosan showcase projects, academic studies of specific aspects of closed loop sanitation etc.. A list of tools for this step is given below in Table "Tools for Step 0".

TABLE 7 "Selected tools for Step 0"

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Poster	"Closing the loop; -shortcomings of conventional sanitation -advantages of ecological sanitation	2001	GTZ ecosan sectoral project	2 posters series presenting (1) the shortcomings of conventional sanitation systems and (2) the advantages of a closed loop oriented sanitation system. Used to draw attention to the problems currently being caused by conventional systems and the principles and advantages of ecosan	All stakeholders.	Copies available: GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Show case project	Vauban – Wohnen und Arbeiten	1999	WEG Wohnen und Arbeiten, For guided tours: Forum Vauban e.V.	A model house with combined vacuum sanitation system. Black water transported from water saving vacuum-toilets to a biogas reactor. The reactor produces liquid fertiliser and biogas used for cooking. Grey water is filtered and reused for flushing the vacuum-toilets and watering the garden. Rainwater flows through open gutters and is collected in two ditches, where it filters down to the groundwater.		For detailed information: http://www.vauban.de/projekt/e/wa/ For online booking of guided tours: http://www.vauban.de/info/fuehrungen.html For paper on the settlement:
Web-sites	Various		Various	Internet pages containing ecosan related news, links, information, upcoming events, contacts etc., often allowing direct contact to be made with organisations involved in ecosan	All stakeholders	Examples: http://www.gtz.de/ecosan/ http://www.ecosanres.org/ http://www.ecosan.nl/ http://www.ecosan.at/
Conference proceedings	Various	2000 onwards		Collected papers from presentations and posters addressing a range of ecosan related topics, form detailed technical issues, to issues of social acceptance.	All stakeholders	GTZ proceedings: http://www.gtz.de/ecosan/english/symposium1.htm http://www.gtz.de/ecosan/english/symposium2.htm Nanning proceedings: http://www.ecosanres.org/Nanning%20Conf%20Proc%20Proceedings.htm
Conference Recommendations	Lübeck recommendations for action	2003	Participants of the 2 nd international ecosan symposium	In April 2003, at the 2nd International Symposium on ecological sanitation in Lübeck, Germany, 350 experts from 60 countries formulated 10 Recommendations for Action, as priorities for the further promotion of ecosan and for bringing ecosan to scale.	All stakeholders	For detailed information: http://www.gtz.de/ecosan/english/symposium2.htm#8



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4.4 Tools for step 1 – Request for assistance

Activities: formulation of request

Output: request formulated and submitted to relevant party

Tools which may prove to be of use to carry out this activity could include standard request procedures, or methods to help those making the request to do so in the best possible, for example a list of

request which have successfully been submitted. Such a list would illustrate the range of stakeholders which could support a request and it could help to get ideas from other projects.

TABLE 8 “Selected tools for Step 1”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Review list	Review of requests for assistance in implementing ecosan		Not yet available	This review could present a variety of requests for assistance that have been made, highlighting the important aspects stakeholders should consider when making such a request, and the various types of assistance available to them	All stakeholders involved in the formulation of such requests (Users of the sanitation facilities, users of the recyclates. CBOs and self-help groups, NGOs, local authorities and governments)	Not yet available
Standard procedures	Standard request procedures		Not yet available	Standard procedures for making a request may make it easier for groups to formulate what they require, as well as making the processing of such demands by the responding stakeholder much easier	Useful for all stakeholders	Not yet available



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4.5 Tools for step 2 – Launch of planning and consultative process

Activities: facilitation; information on process and ecosan; active participation in workshop

Step 2 may have to be carried out in a series of steps in order to ensure that all relevant stakeholders are informed and willing to participate in the process.

Output: start-up workshop; agreement among stakeholders on the working procedure

TABLE 9 “Selected tools for Step 2”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Analytical methodology	Stakeholder analysis		Various	Tool for identifying those people, groups and organisations who have significant and legitimate interests in the project. Clear understanding of the potential roles and contributions of the different stakeholders is a fundamental prerequisite for a successful participatory urban governance process, and stakeholder analysis is a basic tool for achieving this understanding.	Useful for the facilitator of the process	Various sources available: e.g.: http://www.unhabitat.org/cdrom/governance/html/st.htm http://www.euforic.org/gb/sake1.htm#intro
Principles	The Bellagio Principles	2000	Various Adopted by WSSCC in Nov. 2000	Series of principles that can be used as the basis for an agreement for the overall approach of the project. They stress: the central role of the household, the need for participation of all stakeholders, the recognition of waste as a resource, and solving sanitary problems on the smallest practical level	All stakeholders	Download from: www.sandec.ch/EnvironmentalSanitation/Documents/HCES_Kyoto_03.pdf



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4.6 Tools for step 3 – Assessment of current status

Activities: participatory development of terms of reference; *Output:* report on status quo investigation of status quo; elaboration of reports

TABLE 10 “Selected tools for Step 3”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Study	Baseline study	2004	GTZ ecosan sectoral project (in preparation)	These can fulfil a variety of functions depending on the prevailing conditions but most generally are used to gather basic information concerning the existing water supply and sanitation conditions, agricultural practices aspects of urban planning, hygiene, traditional practices and perceptions related to water supply and sanitation, institutional aspects and the legislative framework, the ability of local businesses to engage in sanitary provision, the availability of appropriate materials or the possibility for local production etc.. The process involved in the base line study can also serve to raise awareness of the ecosan philosophy and assist potential users and other stakeholders in deciding on whether an ecosan system could prove to be a viable sanitation alternative for them	Used by facilitator with the active participation of all relevant stakeholders supplying the necessary information	Not yet available. Contact GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de for more information



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Interview	Semi-structured interviews		Various (Here quoted from FAO)	Semi-structured interviews are conducted with a fairly open framework which allow for focused, conversational, two-way communication. They can be used both to give and receive information. Unlike the questionnaire framework, where detailed questions are formulating ahead of time, semi structured interviewing starts with more general questions or topics. Relevant topics are initially identified and the possible relationship between these topics and the issues such as availability, expense, effectiveness become the basis for more specific questions which do not need to be prepared in advance.		Various sources available: e.g.: http://www.fao.org/docrep/x5307e/x5307e08.htm http://www.dep.org.uk/cites/Evaluation/Interviews.htm
Participatory method	Transacts		Various	Tool that helps highlight details concerning the environmental, economic and social resources in a community. It depicts a cross-section of an area along which a number of issues are recorded. The purpose of a transect is to organise and refine spatial information and to summarise local conditions in the area. The information is gathered from direct observation while walking a straight line through the community	Used by facilitators, planners, local authorities etc,	Various sources available: e.g.: http://www.fao.org/Participation/ft_more.jsp?ID=3581

4.7 Tools for step 4 – Assessment of user priorities

Activities: present findings of step three; correct possible factual errors; establish ground rules for step 5 (priorities, levels of service, institutional arrangements, cultural acceptability etc.)

Output: ground rules for the identification of options(including priorities, minimum levels of service, institutional arrangements, cultural acceptability, etc.)

TABLE 11 “Selected tools for Step 4”



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Meeting	Group meeting	2004	various	A meeting is a coming together of people for a specific purpose. Meetings generally have a facilitator who encourages two-way communication. Smaller focus group meetings can be made up of people with common concerns (women, herders, people who are poor) and can speak comfortably together, share common problems and a common purpose. The outputs from focus group meetings can be presented to larger group meetings, giving a "voice" to those in the community who are unable to speak up in a larger meeting	All stakeholders (it may at times be practical to arrange a series of meetings for different stakeholders to attend rather than one meeting for all)	Download information: http://www.fao.org/docrep/x5307e/x5307e07.htm#footnote%201:%20group%20meetings
Interview	Semi-structured interviews		Various (Here quoted from FAO)	Semi-structured interviews are conducted with a fairly open framework which allow for focused, conversational, two-way communication. They can be used both to give and receive information. Unlike the questionnaire framework, where detailed questions are formulated ahead of time, semi structured interviewing starts with more general questions or topics. Relevant topics are initially identified and the possible relationship between these topics and the issues such as availability, expense, effectiveness become the basis for more specific questions which do not need to be prepared in advance.		Various sources available: e.g.: http://www.fao.org/docrep/x5307e/x5307e08.htm http://www.dep.org.uk/cities/Evaluation/Interviews.htm
Participatory method	Brainstorming		Various	Aims at eliciting individual views on a given issue, (e.g. the full range of possible actions that could be undertaken) and is usually followed by a discussion (for instance for the group to work out which suggestions are feasible). The process is usually started by an open-ended question — not suggestive but provocative — from the facilitator about a particular issue	Used by facilitator with groups of stakeholders	Various sources available: e.g.: http://www.fao.org/Participation/ft_more.jsp?ID=620



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source



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4.8 Tools for step 5 – Identification of options

Activities: elaboration of adequate ecosan solutions; elaboration of reports

Output: report on suitable ecosan options

This report should contain information on user priorities, expected levels of service, cultural acceptability etc. (for both the users of the facilities and the recyclates), as well as the priorities of the service

providers, the municipality and sector agencies, the willingness and capability of each of these to pay for or otherwise contribute to the implementation or operation of the project, minimum acceptable levels of service, institutional arrangements, cultural acceptability, etc

TABLE 12 “Selected tools for Step 5”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Data sheet	Technical data sheets		GTZ sectoral project ecosan (in preparation)	These present technical information on various technical components of ecosan systems, their range of applications, preliminary design information, economic data, etc.	Local authorities, service providers, developers and investors, possibly also the users of the sanitation facilities and the recyclates	Not yet available. Contact GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de for more information



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4.9 Tools for step 6 – Evaluation of feasible service and reuse combinations

Activities: participatory determination of feasible service and reuse combinations; elaboration of reports

Output: decision on continuation and service / reuse combinations

TABLE 13 “Selected tools for Step 6”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Data sheet	Technical data sheets	2004	GTZ sectoral project ecosan (in preparation)	These present technical information on various technical components of ecosan systems, their range of applications, preliminary design information, economic data, etc.	Local authorities, service providers, developers and investors, possibly also the users of the sanitation facilities and the recyclates	Not yet available. Contact GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de for more information
Meeting	Group meeting		various	A meeting is a coming together of people for a specific purpose. Meetings generally have a facilitator who encourages two-way communication. Smaller focus group meetings can be made up of people with common concerns (women, herders, people who are poor) and can speak comfortably together, share common problems and a common purpose. The outputs from focus group meetings can be presented to larger group meetings, giving a "voice" to those in the community who are unable to speak up in a larger meeting	All stakeholders (it may at times be practical to arrange a series of meetings for different stakeholders to attend rather than one meeting for all)	Download information: http://www.fao.org/docrep/x5307e/x5307e07.htm#toop%201:%20group%20meetings
Participatory method	Participatory cost benefit analysis		various	Participatory cost-benefit analysis allows participants (with minimal literacy) to make sense of the actual financial value of inputs and outputs of an income generating activity. It can also help to identify organisational, operational or managerial issues, needs and skills required	Used by facilitator with active participation of all stakeholders	Download information: http://www.fao.org/Participation/ft_more.jsp?ID=142



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Participatory method	Preference ranking		various	This tool helps to facilitate decision-making processes. This tool makes the underlying criteria for the priority setting evident. This enables the facilitators to understand the reason(s) for decisions made by stakeholders and it forms a basis for the formulation of a rationale for a prioritised project at a later planning stage	Used by facilitator with active participation of all stakeholders	Download information: http://www.fao.org/Participation/ft_more.jsp?ID=2921
Evaluation tool	The Scenario Manager	2000	M. Reed, J. Coleman and C. Zoppou / CSIRO Land and Water	The Scenario Manager has been designed to enable the evaluation of integrated urban water systems, comprising water supply, wastewater and stormwater treatment and disposal infrastructure. (http://www.cmit.csiro.au/innovation/2000-12/pdf/scenario.pdf)	Evaluation of tools and tool combinations / Decision support	http://www.cmit.csiro.au
Evaluation tool	Hasse diagram technique (HDT)		Ute Simon, Stefan Puden, Rainer Brüggemann / Wasserforschung e.V.	Evaluation of different strategies. http://www.wasserforschung-berlin.de/schrift/band6/6-sim.pdf http://www.criteri-on.de/exposite	Evaluation of tools and tool combinations / Decision support	http://www.criteri-on.de

4.10 Tools for step 7 - Consolidated ecosan plans for the study area

Activities: assemble / integrate the service and reuse combinations Output: Consolidated plan for the entire study area into a broader water supply, sanitation and reuse framework

TABLE 14 “Selected tools for Step 7”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Data sheet	Technical data sheets	2004	GTZ project ecosan (in preparation)	These present information on different projects with information as to how the various elements of the ecosan system have been fitted together in order to satisfy the needs of all stakeholders. Information is also given on reuse practised, number of people served etc.	Local authorities, service providers, developers and investors, possibly also the users of the sanitation facilities and the recyclates to help them envisage possible options	Not yet available. Contact GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de for more information
Show case project	e.g. Vauban – Wohnen und Arbeiten	1999	WEG Wohnen und Arbeiten, For guided tours: Forum Vauban e.V.	A model house with combined vacuum sanitation system. Black water transported from water saving vacuum-toilets to a biogas reactor. Such examples can serve to help stakeholders envisage the possible combinations available to them.	Local authorities, service providers, developers and investors, possibly also the users of the sanitation facilities and the recyclates to help them envisage possible options	For detailed information: http://www.vauban.de/projekt_e/wa/ For online booking of guided tours: http://www.vauban.de/info/fuehrungen.html
Regulations	Planning regulations		Local/regional/national authority or government	Appropriate legislation should allow for the use of closed loop oriented sanitary technologies and the reuse of the recyclates, whilst ensuring	Local/regional/national authority or government should ensure these regulations are in place and planners, service providers, developers and investors should be aware of them	In many cases Not yet available



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4.11 Tools for step 8 – Finalising consolidated ecosan plans

Activities: presentation of assembled plans; approval of assembled plans

Output: approved UESS plans

TABLE 15 “Selected tools for Step 8”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Meeting	Group meeting		various	A meeting is a coming together of people for a specific purpose. Meetings generally have a facilitator who encourages two-way communication. Smaller focus group meetings can be made up of people with common concerns (women, herders, people who are poor) and can speak comfortably together, share common problems and a common purpose. The outputs from focus group meetings can be presented to larger group meetings, giving a "voice" to those in the community who are unable to speak up in a larger meeting	All stakeholders (it may at times be practical to arrange a series of meetings for different stakeholders to attend rather than one meeting for all)	Download information: http://www.fao.org/docrep/x5307e/x5307e07.htm#tooi%201:%20group%20meetings
Show case project	e.g. Vauban – Wohnen und Arbeiten		various	Promotes the visible representation of ideas/ topics while they are being discussed or presented. The visualisation should be done with materials which are locally available and in a way that allows for everyone to follow the path of discussion (e.g. drawings on paper/ ground/ board; symbols/ objects placed in front of people; writing on paper/ ground/ board).	All stakeholders	Download information: http://www.fao.org/Participation/ft_show.jsp?ID=2301



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Participatory method	Visualisation in Participatory Approaches (VIPP)		Local/regional/national authority or government	Appropriate legislation should allow for the use of closed loop oriented sanitary technologies and the reuse of the recyclates, whilst ensuring	Local/regional/national authority or government should ensure these regulations are in place and planners, service providers, developers and investors should be aware of them	In many cases not yet available

4.12 Tools for step 9 – Implementation

Activities: elaboration of working plans; tendering; decision on infrastructure; granting of financial support / subsidies; hardware investment; provision of equipment; construction; training / advice to users and service providers; use of sanitary system; maintenance;

collection, treatment; storage, transport; reuse of recyclates; marketing of recyclates
 Output: sustainable, user oriented closed-loop sanitary system

TABLE 16 “Selected tools for Step 9”

Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Guidelines	"awareness, information and participation in ecosan projects"	2004	GTZ project ecosan (in preparation)	Guidelines to address the needs and interests of initiators, planners, practitioners and other stakeholders in the preparation and implementation of participatory ecological sanitation (ecosan) projects. It aims to supply these groups with methods, material, information and ideas as to how they could raise awareness of ecosan; identify and ensure the active participation of the principal stakeholders; provide the necessary information in an appropriate manner; and structure the working steps of a particular project	All stakeholders	Not yet available. Contact GTZ sector project ecosan GTZ GmbH Postfach 5180 //65726 Eschborn // Germany Fax ++49 - 6196 - 79 - 7458 E-mail: ecosan@gtz.de for more information
Regulations	Planning regulations		Local/regional/national authority or government	Appropriate legislation should allow for the use of closed loop oriented sanitary technologies and the reuse of the recyclates, whilst ensuring	Local/regional/national authority or government should ensure these regulations are in place and planners, service providers, developers and investors should be aware of them	In many cases not yet available

4.13 Tools for monitoring, evaluation and feedback (MEF)

TABLE 17 "Selected tools for MEF"



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Type of tool / methodological approach	Title	Year	Author / Organisation	Brief description of the tool	Target group	Available / Source
Participatory method	Participatory Impact Monitoring (PIM)	mid 90's	various	The objective of PIM is to improve the realisation of projects by: orienting the project along the socio-cultural impact; promoting autonomous activities of the stakeholders improving the flexibility of and interaction between the development organisation/NGO and self-help group.	All stakeholders	Download information: http://www.eldis.org/static/DOC6913.htm



5 Appendices

5.1 The 10-steps process for implementing a HCES programme

As this guideline is seen as an application of the “Draft for the implementation of the HCES / Bellagio Principles” a short description of the suggested “HCES 10 Step implantation guideline” is given along with it.

[This appendix can be found in a separate document “Schertenleib-et-al2003.doc”]

May be replaced according to the suggestions of WSSCC.

5.2 Reviewed Literature

This appendix presents the results to date of the preliminary literature review which was started by the GTZ in March 2003, supported by information from several international institutions, organisations and professionals working in the ecosan sector.

The 1st draft of this literature review, presented at the 2nd International Symposium on ecological sanitation in Lübeck, was the result of a 16-day study of literature available either as hard copies in the GTZ-ecosan office or on the internet. Internet literature searches were performed. Additional important information has been gathered with the support of international ecosan professionals. 114 publications on the acceptance of, and participation in, ecosan projects were initially reviewed. Additional literature has been progressively added to the initial review, so that this 2nd draft of the preliminary literature review contains 144 publications.

This literature and internet research has so far focussed on project implementation tools in the water and sanitation sector. Little ecosan-specific material has yet been found, as either the topic itself is still too new, or experiences to date do not extend beyond single case studies. Nevertheless, several tools applied in the conventional water supply and sanitation sector may be adapted to the ecosan concept. This initial preliminary review is the result of a 16-day study of the literature, available either as hard copies in the GTZ-ecosan office or on internet web pages, and the links given on the GTZ ecosan web page.

However, we recognise that this review is far from exhaustive. We would therefore kindly like to invite you to send your comments and remarks on the current list of publications as well as your recommendations for further publications that should be included in the review .

[This appendix can be found in the separate document “appendix-literature.doc”]

5.3 Some further internet links with information on awareness and participatory tools and methods

[This appendix can be found in a separate document “appendix-participation.doc”]