OVERVIEW OF THE GLOBAL DEVELOPMENT OF ECOSAN

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1 INTRODUCTION TO ECOLOGICAL SANITATION (ECOSAN)

The problems raised by the decreasing quality and quantity of fresh water resources around the world are becoming increasingly serious. All indicators show that the situation is getting worse, and that we now face a serious world water crisis that will affect us all. The poor in developing and emerging market economy countries are already feeling the effects of this crisis, suffering most from a decrease in availability of fresh water resources, from sanitation related diseases and a damaged environment, and will suffer further as the competition for resources becomes ever more intense.

Although the world economy has grown steadily over the last few decades, lifting many millions, particularly in Asia, out of poverty, 1.1 billion people remain without access to a safe water supply and 2.6 billion representing almost half of the world population do not have access to adequate sanitation (WHO/UNICEF JMP 2005), with the vast majority of these people living in developing countries. Currently more than 90 % of wastewater and excreta world-wide is discharged to the environment with little or no treatment. 80 % of all diseases and 25 % of all deaths in developing countries are caused by polluted water (UN 1992). In 2000, the estimated mortality rate due to sanitation related diarrhoeal and other diseases was estimated at around 2.2 million (WHO/UNICEF JMP 2000). Over 200 million people were infected with schistosomes and helminths, most of them children under the age of 5, with 20 million of those infected suffering serious illness (WHO 2003).

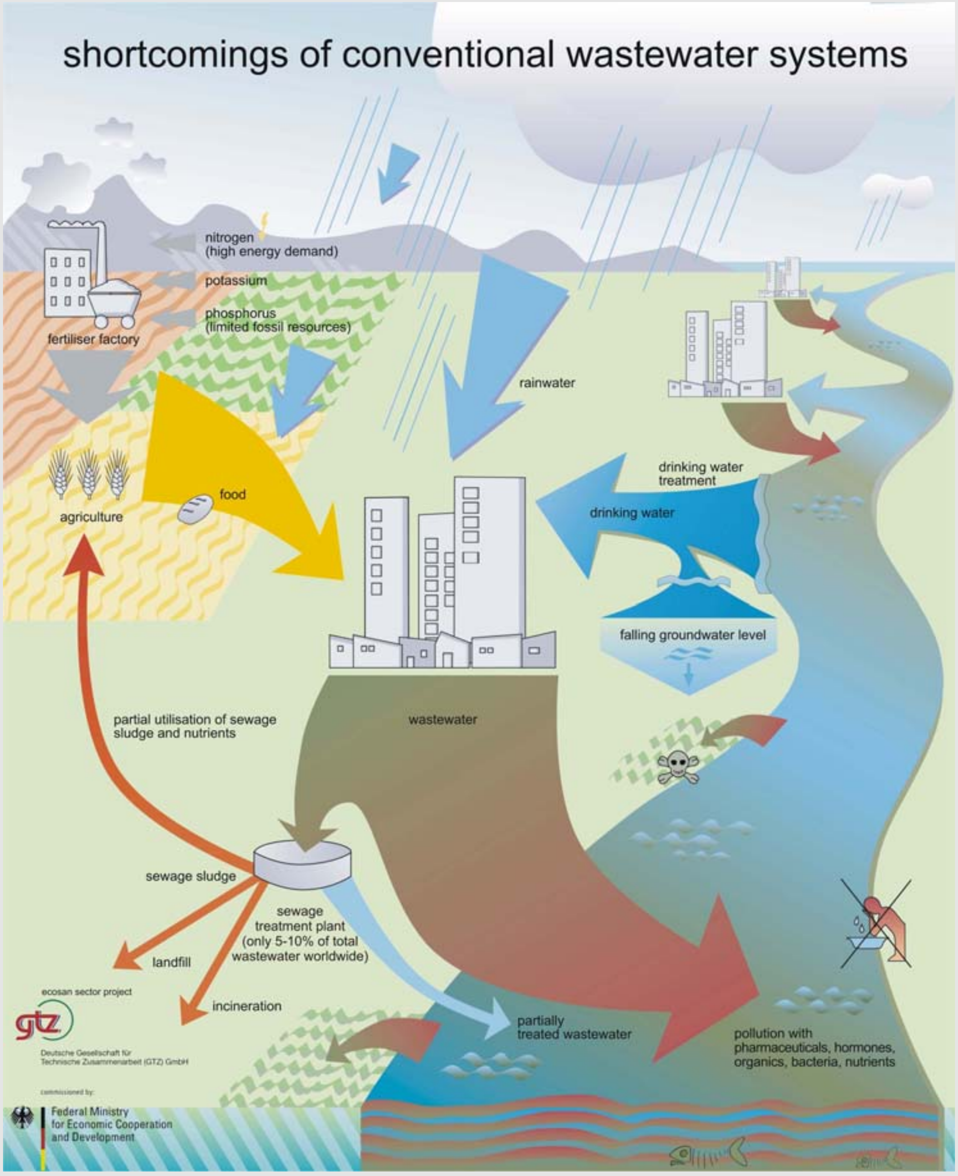
It was against this backdrop that the member states of the United Nations adopted the Millennium Developments Goals (MDGs) that aim to reduce poverty, ensure a rapid increase in access to basic requirements such as primary education, health care, food security, and to protection the environment. With particular regard to water supply and sanitation provision, the target was set to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. Traditionally the international focus has been on providing drinking water treatment, however the health benefits that have resulted from such projects have been limited as hygiene and sanitation issues have been insufficiently addressed. Some of these measures have even proved counter-productive, with the improvement in water supply often resulting in larger volumes of wastewater being produced with no adequate management system in place to deal with it. The Millennium Development Goals however represent a clear commitment to address sanitation with the same priority as water supply. They also represent a huge challenge to the international community and, for both economic and ecological reasons, will require a revolution in our wastewater and excreta management strategies: There is a need to develop cost and resource efficient sustainable sanitation systems, that can be provided at a high enough rate to make the MDGs achievable.

1.1 Shortcomings of conventional solutions

The basic concept of collecting domestic liquid waste in water-borne sewer systems, treating the wastewater in centralised treatment plants and discharging the effluent to surface water bodies became the accepted, conventional approach to sanitation in urban areas in the last century. Although these conventional sewer systems have significantly improved the public health situation in those countries that can afford to install and operate them properly, the large number of people, particularly in the developing world, who still do not have adequate access to adequate sanitation is a clear indication that the conventional approach to sanitation is likely to be unable to meet needs universally.

The conventional sewer system was developed at a time, in regions, and under environmental conditions that made it in many cases an appropriate solution for removing liquid wastes from cities. Today, with increased population pressure, changes in consumer habits and increasing pressure on freshwater and other resources, this human waste disposal system is no longer able to meet the pressing global needs and ideas of recycling have been developed.

The main disadvantages of conventional approaches to sanitation can be seen in Figure 1.



- Unsatisfactory purification or uncontrolled discharge of more than 90 % of wastewater world-wide
  → Severe water pollution and unbearable health risks
- Consumption of precious water for transport of waste
- High investment, energy, operating and maintenance costs
- Frequent subsidisation of prosperous areas, to the detriment of poor settlements
- Loss of valuable nutrients and trace elements contained in excrement through discharge into water bodies
- Impoverishment of agricultural soils, and increased dependence on chemical fertilisers
- Problems with the management of contaminated sewage sludge in combined, central systems
- Linear end-of-pipe technology

Figure 1: Shortcomings of conventional water carriage sanitation

Moreover, even if sufficient investments could be made to ensure that conventional, centralised sanitation systems could be provided to all those who lack access to adequate sanitation, the resulting sanitation systems would not prove to be sustainable.

In many places, sewered sanitation results in polluted ground and surface waters. It can therefore lead to a whole new series of problems. In India, the idea of every person having their own car brought to the public eye vivid images of a social and environmental catastrophe. Today, the idea of every family having access to a flush toilet evokes images of a much greater disaster, as this would both sharply increase drinking water consumption, and lead to increased water pollution and health hazards (Narain 2004; Werner et al. 2003b).

Conventional on-site wastewater disposal systems, such as pit latrines or septic tanks, also do not offer a sustainable answers to sanitation problems, and very often lead directly to groundwater contamination. In many densely populated areas this has led to nitrate concentrations in groundwater, which exceed the maximum level recommended by the WHO for drinking water and which have been linked to serious health problems, particularly for babies. Shallow groundwater is still a major water source in rural and peri-urban areas, particularly in developing countries, and particularly among the poor. The design of the conventional "drop and store" pit-latrine (and of most other on-plot systems) is not compatible with this practice, as they deliberately aim to retain only solid matter in the pit and infiltrate as much of the liquids as possible into the subsoil. There may also be other constraints preventing the construction of pit latrines, for example where the ground is rocky or on sites that are subject to flooding. Many conventional latrines also smell quite badly, are a breeding place for flies, insects and other vectors and are therefore very inconvenient to use, especially for children, women and girls, as they have to be built at a distance from the house. This makes night-time visits highly undesirable and often dangerous due to the threat of sexual harassment.

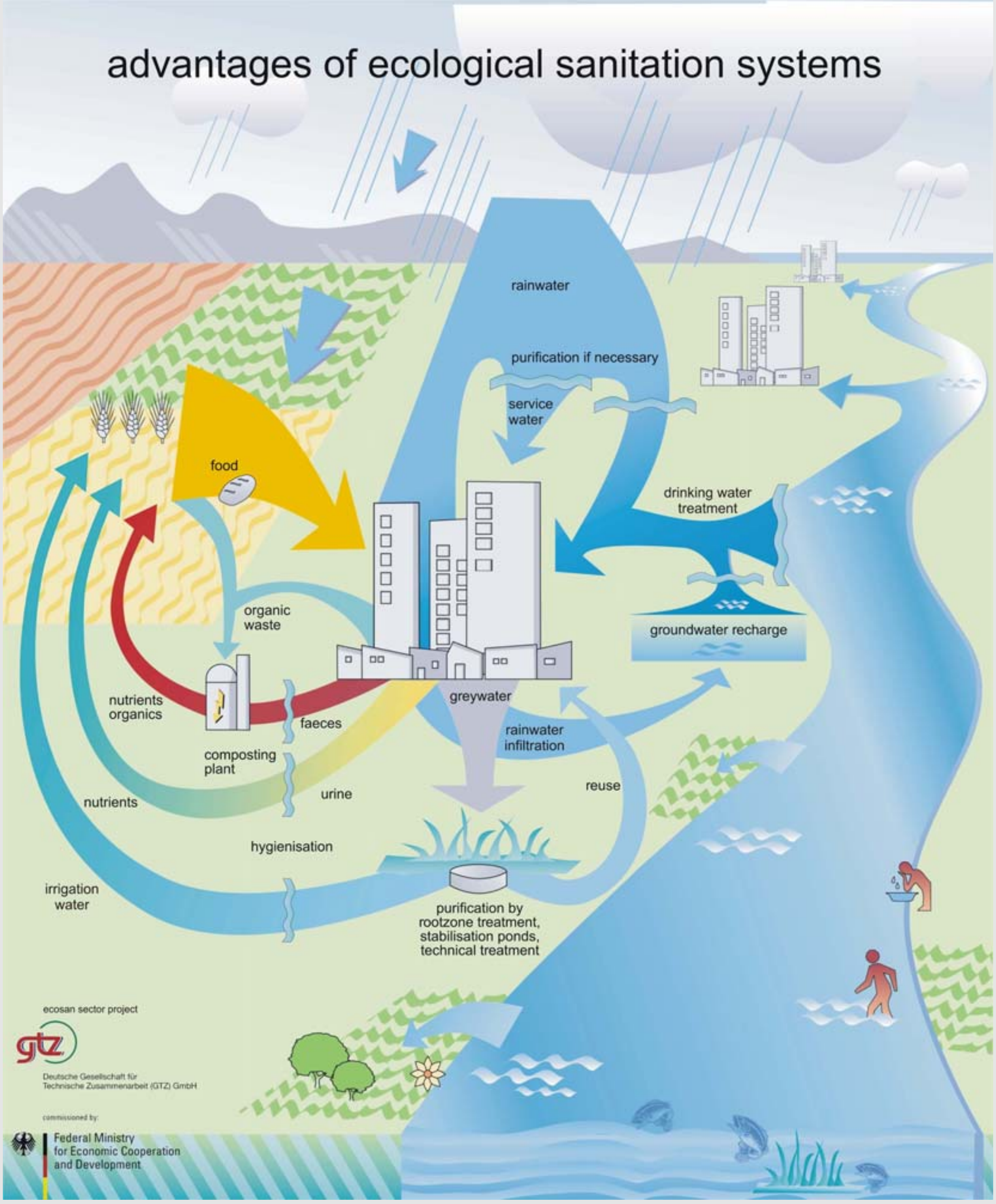
While the above are serious disadvantages of both water-borne and dry conventional sanitation systems, a far more fundamental problem is that they do not facilitate the reuse of macro and micro nutrients present in excreta and wastewater. This lack of nutrient recovery and use leads to a linear flow of nutrients from agriculture, through humans and into recipient water bodies. The valuable organic material, nutrients and trace elements contained in human excrement are very rarely re-channelled back into agriculture in conventional systems. Even when 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 in the treatment process (e.g. by nitrogen elimination) or enter the water cycle, where they pollute the environment, causing the eutrophication of lakes and rivers.

Not returning the nutrients to the soil has led to a situation where there is an increasing demand for chemical fertilisers, to ensure continued agricultural production. To produce the required chemical fertilisers, large amounts of energy are needed, and finite mineral resources, such as phosphorous, must be exploited. Current estimates say that exploitable phosphorous reserves will be exhausted in between 60 and 130 years at the present rate of consumption (Rosemarin 2004). The relatively inexpensive phosphorous used today will almost certainly cease to exist in the next 50 years. Farmers around the world require 135 Mio tons of mineral fertiliser annually for crop production, while at the same time conventional sanitation dumps 50 Mio tons of fertiliser equivalents into our water bodies - nutrients with a market value of around 15 Billion US dollars.

1.2 Ecological sanitation – a paradigm shift to reach the MDGs

The principles of ecosan

Ecological sanitation is a new holistic paradigm in sanitation, which 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 sanitation technology, but is rather a new philosophy in handling substances that have so far been seen simply as wastewater and water-carried waste for disposal. Ecological sanitation introduces the concept of sustainability and integrated, eco-system oriented water and natural resources management to sanitation.



- Improvement of health by minimising the introduction of pathogens from human excreta into the water cycle
- Promotion of safe, hygienic recovery and use of nutrients, organics, trace elements, water and energy
- Preservation of soil fertility
- Contribution to the conservation of resources through lower water consumption, substitution of mineral fertiliser and minimisation of water pollution
- Improvement of agricultural productivity and food security
- Preference for modular, decentralised partial-flow systems for more appropriate cost-efficient solutions
- Promotion of a holistic, interdisciplinary approach
- Material flow cycle instead of disposal

Figure 2: Advantages of ecological sanitation (ecosan)

The basic principle of ecosan is to close the nutrient loop between sanitation and agriculture, thus:

- providing affordable, safe and appropriate sanitary systems;
- reducing the health risks related to sanitation, contaminated water and waste;
- improving the quality of surface and groundwater;
- improving soil fertility;
- and optimising the management of nutrients and water resources.

Closing the loop enables the recovery of the organic material, macro and micro nutrients, water, and energy contained in household wastewater and organic waste and their subsequent productive reuse - following appropriate treatment - in agriculture, or for other purposes. An essential step in this cycle is the appropriate treatment and handling of the materials throughout the entire process, from collection through to reuse, ensuring a series of barriers are erected that will reduce the risk of disease transmission to within acceptable limits, thus providing comprehensive protection of human health.

Fraction	General characteristics
1. faeces	– hygienically critical, potentially containing a wide range of pathogens, leading to water-borne diseases (e.g. bacteria, viruses, protozoa, nematodes, worm-eggs) – consists of organics, nutrients and trace elements – improves soil quality and increase its water retention capacity – consists mainly of organic material, which can be submitted to decomposition processes, and a minor amount of nutrients – average production ca. 50 kg/cap/a
2. urine	– hygienically uncritical – contains the largest proportion of nutrients available to plants – may contain hormones or medical residues – consists mainly of nutrients available to plants and very little organic material, therefore no need for stabilisation – average production ca. 500 l/cap/a
3. grey water	– usually of no major hygienic concern – volumetrically the largest portion of wastewater – contains usually almost no nutrients (simplified treatment) – may contain a vast range of various substances – average production 25 – 100 m^3/cap/a

Figure 3: Characteristics of flow streams

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. It can therefore greatly help to conserve limited resources, preserve soil fertility and safeguard long-term food security. Closing local nutrient cycles by recovering and using the nitrogen, phosphorus, potassium, micro nutrients and organics contained in excrement is therefore not only important because it helps minimise the energy and resource intensive production of mineral fertilisers, but also because it makes such agricultural inputs available even to the poorest farmers in developing countries often engaged in subsistence farming.

Ecosan in practice

As an integrated alternative, the implementation of eco-sanitation projects requires an interdisciplinary approach that goes beyond the narrow disciplines and technological aspects of domestic water supply and wastewater management to address issues such as, for example, agricultural use, sociological aspects of acceptance and cultural appropriateness, health and hygiene, town planning, economic and small business promotion, and institutional arrangements. Such an approach also makes a large contribution to the integrated management of water and other natural resources.

Eco-sanitation opens up a wider range of sanitation options than those currently considered in conventional sanitation planning. To optimise cost efficient, high quality treatment and recycling options, two principles are very often applied in ecosan systems:

- Firstly, flow streams with different characteristics, such as faeces, urine and grey water (see Figure 4), are collected separately. This allows the application of specific, cost efficient treatment processes and optimises reuse.

- Secondly, unnecessary dilution of the flow streams is avoided, for example by using dry, low flush or vacuum transport systems. This minimises the consumption of valuable drinking water and produces high concentrations of recyclables.

Rainwater harvesting and the treatment of organic domestic and garden wastes and of animal manure can also be integrated into ecosan-concepts. Such a separation of the flow streams also allows a more active involvement of the solid waste management sector, where there is already a great deal of experience in the logistics, treatment and marketing of discarded resources.

However, whilst often making treatment easier and less expensive, the separate collection and treatment of the flow streams is not a prerequisite in ecosan systems, and ecological sanitation is also possible in centralised and combined flow systems.

Ecosan systems strive for resource efficiency. In reducing unnecessary water consumption and avoiding the contamination of water bodies, ecosan systems can have an impact on reducing the costs of raw water treatment and drinking water supply. Additionally the recovery and agricultural use of the organics and nutrients contained in wastewater improves soil structure and fertility, increasing agricultural productivity and thus contributing to food security. The recovery of energy through the anaerobic digestion of faeces, organic waste and animal manure may also represent a significant step towards energy efficiency, providing biogas for cooking or possibly for electricity generation.

Ecosan approaches often require marketing strategies for the recovered nutrients, innovative logistics to return them to farmland, and directions for their safe application in agriculture. These requirements often result in new service enterprises being established as a result of new ecosan schemes, which can also serve to kick start other income generating measures, for example in the construction and easy and safe operation of the installations.

Implementing ecosan in developing, emerging and industrialised nations

As ecological sanitation does not prescribe a particular technical solution, but rather tailors sanitary systems to fit the needs of social, economic and environmental sustainability in a given context, a wide range of technologies can, and currently are, being used in ecological sanitation systems. These range from quite simple low-tech systems to sophisticated high-tech solutions. On the low tech side, the use of system components such as simple urine diversion dehydration toilets or composting toilets is common. For such systems, faeces and urine are most often collected and treated on site, with the reyclates being used locally, although an organised central collection and marketing of the recyclates is also possible. High-tech components of ecosan systems can include, for example, the use of vacuum technology to collect either black or brown water centrally with reduced water consumption, struvite precipitation for the recovery of nutrients, and membrane technology for the recovery of water for irrigation, industrial or domestic purposes. These components can be combined with other treatment eco-sanitation technologies, such as constructed wetlands, treatment ponds, anaerobic digesters or humification basins for sludge treatment, to optimally address the treatment and resource recovery needs in a particular area. This flexibility in the choice of system technologies makes eco-sanitation suitable for all countries around the world, whether industrialised, developing or emerging. Figure 4 illustrates the wide range of technological components available to collect, treat, and use the different flow streams.

Whilst centralised ecological sanitation systems are possible and may even be necessary in densely populated urban areas, precedence is normally given to appropriate modular and decentralised facilities. The essential advantage of such decentralised, modular components is their flexibility, their reduced costs, for example, because the size and length of sewers can be reduced, and the availability of recyclates for local use. In ecosan schemes neighbourhoods can become involved in the construction and operation of their own sanitation system, thus reducing costs and increasing the systems suitability to the given context, its acceptance by the users of both the sanitation facilities and the recyclates, and the feeling of ownership for the system.

The design and implementation of ecological demonstration projects, with a particular focus on urban areas, is one of the main focuses of today's innovative ecosan projects. The aim of such pilot projects is to support the development of cost-effective, user-needs-oriented, practical ecosan solutions, and highlight their benefits, as well the development of the concepts needed for the safe agricultural and horticultural application of the recovered products. Cost comparisons with conventional systems are also important parts of these demonstration activities, as are the development of training modules for users, service enterprises and farmers, and health education measures.

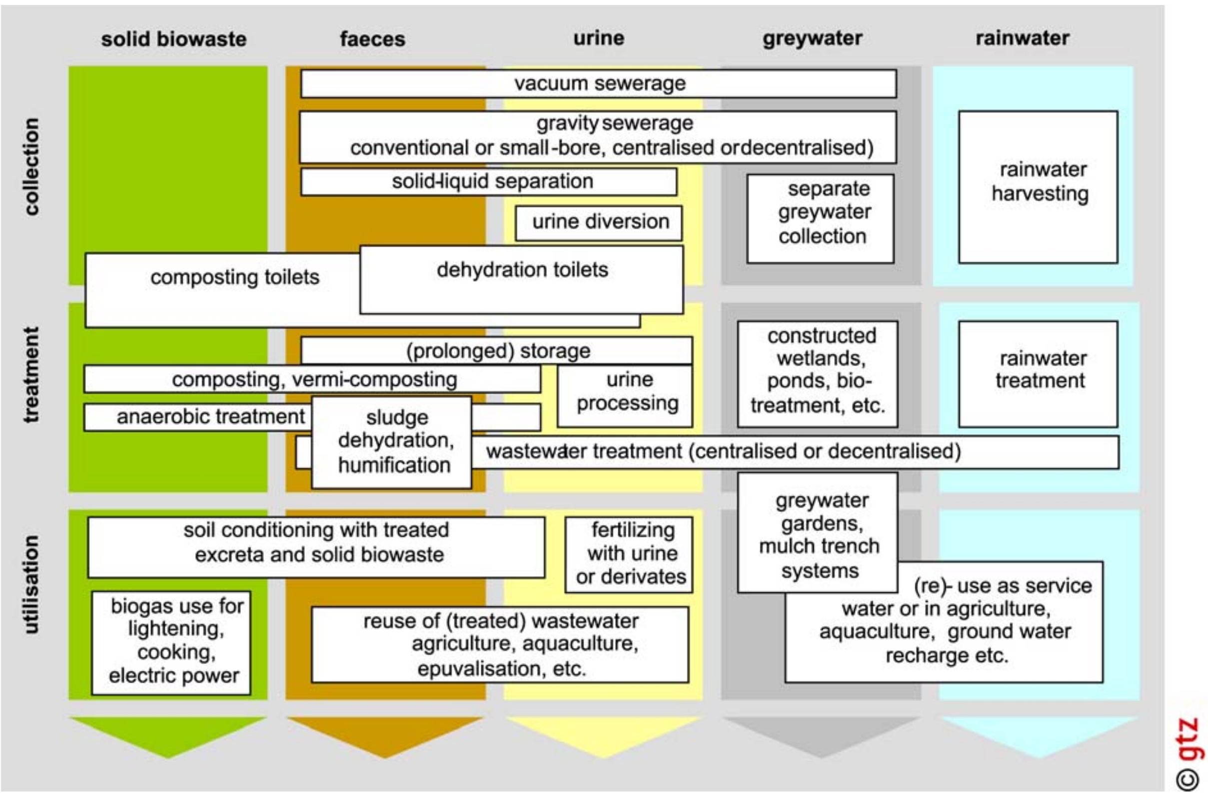


Figure 4: Essential technological components used in ecosan

2 OVERVIEW OF RECENT PROGRESS

In the last few years ecosan is being seen increasingly as a serious, realistic, main-stream alternative to provide safe sanitation, reducing the health risks associated with poor sanitation, protecting water resources and soil fertility, and optimising resources management. The "10 Recommendations for action" from Lübeck (2003) are taken in this paper as a frame to illustrate the progress achieved.

At the 2nd International ecological sanitation symposium in Lübeck in 2003, the 350 participants from 60 countries clearly stated that ecological sanitation should have a key role to play in sustainably achieving the sanitation target of the Millennium Development Goals and the Johannesburg Plan of Implementation. The participants called for a change of paradigm in sanitation, with sanitation systems needing to move away from linear, expensive and energy intensive end-of-pipe technologies, towards ecosystems based approaches and the closure of material flow cycles. They also called for the resource value of human excreta and domestic wastewater to be recognised and that these resources are made available for reuse to reduce health risks related to sanitation, contaminated water and waste, to prevent the pollution of water resources, to prevent soil degradation and to optimise the management of water and nutrient resources.

To advance this agenda, the conference adopted the "10 Recommendations for Action" to accelerate the promotion and up-scaling of ecological sanitation around the world.

In the three and a half years that have passed since the adoption of the 10 Recommendations for Action, ecological sanitation has assumed an increasingly prominent position in the international discourse on sanitary provision and is now recognised as an innovative approach, which could play an important role in achieving the MDGs when scaled up. Much progress has been made, but much more is still needed before ecosan will be recognised as the standard approach to sanitation, and the required paradigm shift results in current conventional systems forming the minority of sanitary solutions on the practical implementation level.

In the following an overview of national and international developments and advances since the adoption of the Lübeck-recommendations is provided. Each recommendation will be considered and progress and positive developments will be highlighted.

2.1 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. In the last three years these have been receiving significantly more attention and successful ecological sanitation systems and larger scale projects for rural and peri-urban areas have been implemented. In China, progress has been extremely rapid with more than 1.02 Million urine diversion toilets having been installed in 17 provinces since 1997. In addition, the well-known 4-in-1 and 3-in-1 closed-loop systems (using anaerobic digestion to produce biogas from human and pig excreta with the resultant nutrient rich sludge and effluent being used in agriculture) are installed in 14.2 million households in north and south China.

Although on a much more modest scale, ecosan systems have also been successfully introduced throughout sub-Saharan Africa (for example in Benin, Botswana, Burkina Faso, Côte d'Ivoire, Congo-Brazzaville, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Mali, Mozambique, Namibia, Niger, South Africa, Senegal, Togo and Zimbabwe) and the positive results obtained should now lead to a much larger scale adoption. The EU-ACP Water Facility has started co-financing larger scale implementations in 2006, for example. in Burkina Faso and Kenya. The EU research-projects NETSSAF and ROSA support the development of up-scaling strategies in east- and west-Africa to come from the existing pilot and demonstration projects to large scale applications.

Figure 5: School toilet (source: WECF), teachers workshop (Source TUHH) and model of a UD-Toilet (source WECF) in an ecosan project in Gala Mare, Romania

Similarly, throughout South-east Asia, particularly in the Philippines, Vietnam and India, ecosan systems are being tested and optimised, and in rural areas in Europe, particularly where a connection to a central sewerage network has proven expensive, there is a growing interest.

2.2 Accelerate large-scale applications of ecosan principles in urban areas

Urban areas with their rapidly growing populations and high population densities are in particular need of closed-loop sanitation systems, not only to protect human health, but also out of an increasing need to use available resources (including water, nutrients, energy and organics) efficiently. In comparison with the situation in 2003, there is now quite a number of ecosan systems either being planned or in implementation in urban areas around the world – several of them presented in the following papers. For example in the Erdos Eco-town project, which is supported by the Swedish EcoSanRes programme and currently under construction in inner Mongolia, northern China, nearly 3000 people in 826 households in 2 and 4-5 storey buildings will be using a dry urine diverting system, with the urine, faeces and greywater being collected separately and recycled. First large-scale feasibility studies have also been carried out in China investigating the possibilities of ecosan systems in large towns and cities.

In Sweden, the European country with most experience in implementing ecological sanitation, urine diversion is used in several urban housing areas for families in Stockholm, for example in Palsternackan (50 apartments), Understenshöjden, (44 apartments), Gebers (30 apartments) and the newest Kullan (250 apartments). In Germany, several new urban systems exist, including a vacuum sewerage system followed by a bio-membrane reactor with anaerobic digestion to produce biogas and electricity, and with pathogen free effluent in Knittlingen near the city of Pforzheim, and, in the course of the renovation of the GTZ's main office building, waterless urinals and urine diversion toilets have been installed, with research being carried out to concentrate the nutrients in the urine prior to its agricultural reuse as well as for the reuse of the brownwater.

Figure 6 Idealised flow scheme from a complex citywide ecosan system: In the less densely settled areas outside of the city centre, flow streams can be collected on-site and

used locally in gardens or urban agriculture. For the more densely settled city centre, urine, faeces and greywater may have to be collected using (semi-) centralised systems and used to irrigate green areas or for food production outside the city limits (source: GTZ)

The University of Oslo is planning to adopt an ecosan approach to gradually up-grade the entire campus infrastructure, and the GTZ will implement ecological sanitation systems within the construction of 15 new universities, on behalf of the Government of Ethiopia.

In India, urban ecosan systems consisting for example of public toilets or school toilets are using different ecosan technologies, such as urine diversion, faeces dehydration, vacuum sewerage, or biogas, and have been developed by several organisations in different parts of the country. In Durban, South Africa, more than 20.000 urine diversion toilets have been built in the last 5 years.

These examples illustrate that ecosan is now being seriously considered for urban applications.

2.3 Promote agricultural use

The acceptance of the agricultural reuse of the fertiliser products of ecosan systems by farmers has proven to be unproblematic, and the need to carefully manage finite resources, particularly phosphorous, has added an extra impetus to the necessity of nutrient recovery. All around the world farmers are, for the most part, open to the ecosan concept and recognise the nutrient value of urine and excreta. Indeed, in research activities in West Africa there were reports of urine theft in farming communities in Benin (CREPA, 2004). In northern Mozambique, a marked improvement in harvests has contributed to the popularity of ecosan systems, and to the project receiving international media attention (Peta, 2004). In some cases however farmers have been concerned about how consumers would view their products if they were fertilised with treated urine and excreta, and the effect this might have on sales. One part of addressing this issue is to keep the risk of disease transmission to a minimum. The readiness to reuse received significant support with the publication of guidelines for the safe use of urine and faeces in ecological sanitation systems, and guidelines on the use of urine and faeces in crop production in 2004 by the SIDA supported EcoSanRes programme. The series of four newly published WHO guidelines on the safe use of wastewater in agriculture, and in aquaculture and the safe use of excreta and greywater will further help to promote safe agricultural reuse, providing national governments with a clear basis to develop their own legislation.

In light of the dwindling phosphorous reserves, the fertiliser industry has also begun to get involved in discussions on nutrient recovery in ecosan systems, with recent contacts with ecological sanitation professionals taking place in the Netherlands (as part of a multi-stakeholder dialogue on sanitary systems) and in China.

Agricultural reuse of ecosan bio-fertiliser has therefore seen a huge amount of progress in three short years.

Figure 7: The ecosan concept has been successfully integrated in pro-poor peri-urban and urban agriculture programmes in Cagayan de Oro, the Philippines. (Source: Robert Holmer)

2.4 Raise awareness and create demand

The increasing number of ecosan systems being installed around the world is testament to the fact that there is an increased awareness amongst many different groups, leading to a greater demand. On an international level, ecosan was discussed at the 2004 WASH forum of the Water Supply and Sanitation Collaborative Council where it was recommended as an innovative approach which could be used to help reach the MDGs. Ecosan has also been recommended as relevant approach for reaching the MDGS at the 2006 World Water Forum in Mexico, in the Hashimoto action plan of the UN-Secretary Generals advisory Board (UNSGAB) on Water an Sanitation. It has been prominently discussed in the recent annual sessions of the United Nations Commission for Sustainable Development (CSD) at the UN Headquarters in New York, and closed loop approaches to sanitation are recognised by the WHO in the newly published guidelines and by UNDP in their latest 2006 Paper of the “Poverty and Environment Partnership (PEP)” as a recommended sanitation approach for reducing poverty. More international organisations are also becoming engaged in ecosan, including UNESCO, UNICEF and the European Space Agency. International awareness raising is supported by the GTZ ecosan newsletter, which appears every three months, is published in Chinese, English, German, French and Spanish and has a readership of over 10 000 people.

Initial information workshops at national level have lead to the establishment of intra-disciplinary ecosan networks in several countries including Vietnam, the Philippines and India, EU and West Africa, with these national initiatives resulting in further awareness raising. Recent multi-stakeholder meetings in the Netherlands have also served to highlight the potential of ecosan.

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

The adoption of a household or neighbourhood-centred approach in ecological sanitation received great support with the publication in 2004 of guidelines for implementing the Bellagio Principles in urban sanitation. These guidelines promote the use of the Household Centred Environmental Sanitation Approach (HCES, as developed by the WSSCC), which responds to the knowledge, needs and demands of the users (EAWAG 2005). The draft ecosan source-book, published by the GTZ ecosan team in 2004 (Werner et al. 2003), adapts the steps given in the Bellagio Principles guidelines to the specific issues that involve ecosan projects. The publication of “Open planning of Sanitation Systems” (Kvarnström and af Petersen, 2004) also provides some information to ensure participation throughout the planning, design, implementation, and monitoring process.

The latest publication in this field is the “Planning and implementation guideline” of the Philippine-GTZ Water and Sanitation Programme, in which the experiences from the several Philippine ecosan projects is reflected. (GTZ-Philippines, in press)

2.6 Provide for decisions on an informed basis

In order to help users, planners, decision makers and other stakeholders to make an informed choice, a lot of work has been carried out in the last three years. At a local level numerous workshops with presentations from both local and international practitioners have helped in starting a dialogue about sanitation options, as well as encouraging the use of a holistic approach to sanitation. Such workshops have taken place in Benin, Botswana, Burkina Faso, Chile, China, Costa Rica, Ecuador, Eritrea, India, Iran, the Netherlands, Syria, and many other countries. Through these workshops people have been encouraged to become involved in assessing a range of sanitation options addressing their needs, including ecosan options, thus placing decisions for the type of system they wish to use directly in the hands of the stakeholders. There is now a wealth of experience and material available for such workshops that can be used and adapted for similar events. (UNESCO/GTZ 2006)

To further assist stakeholders in informing themselves on 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, a range of data sheets on specific ecosan technology modules and interesting case studies has been prepared and published on the internet by the GTZ. An increasing amount of information material has been developed for specific regional contexts in diverse local languages for supporting the information base of the user, and local decision makers.

Figure 8: National multi-stakeholder ecosan workshops (left, Zambia, right, Burkina Faso)

2.7 Promote education and training for ecosan

In most universities and technical training colleges for sanitary engineers, as well as in most courses for agriculturalists, ecological sanitation is not yet present on the curricula. However, individual instructors have added ecosan to their lectures and several initiatives have begun to introduce ecosan to the curricula of universities, schools and vocational training centres, examples of which are the regular courses of the Swedish EcoSanRes Programme and the course on “ecosan in the developing world” for both students and professionals at the Norwegian University of Life Sciences. At the UNESCO-IHE in Delft, ecosan has been introduced onto the course for sanitary and environmental engineers, and the web-based myNetworks platform has offered a course on ecological sanitation via the internet. Professional training has so far been limited to the international courses organised by EcoSanRes, and in francophone West Africa by CREPA, who offer training courses for sanitary professionals from across Africa.

A major capacity building initiative has been started by UNESCO and GTZ resulting in a comprehensive publication on “Capacity building for ecological sanitation” and in the production of a resource material CD-ROM with a large collection of educational material for ecosan contributed by a range of organisations. (UNESCO/GTZ 2006)

2.8 Adapt the regulatory framework where appropriate

The adaptation of existing regulatory frameworks to accommodate a closed loop-approach to sanitation is expected to be a slow process with many technical and regulatory bodies tending to wait until all the evidence on ecological sanitation is submitted before they begin to change existing legal frameworks. However, since the Lübeck symposium there has been an impressive amount of movement on this front. In 2004 the Swedish EcoSanRes programme published a set of five different guidelines, ranging from the safe use of excreta to a guide to norms and attitudes towards ecosan and other sanitation systems. Much of the work carried out for these publications was incorporated this year into the four volume series of guidelines from the World Health Organisation on the safe use of wastewater in agriculture and aquaculture and the safe use of excreta and greywater. These guidelines have transformed the results of pilot-projects into up-to-date reuse recommendations reflecting the interdependencies of water supply, sanitation, waste management, health, hygiene, environment, agriculture and energy supply. It is hoped that these guidelines will form the basis for the development of new regulatory frameworks in countries where these are lacking and that they will provide an impetus for change in other countries where the framework is outdated and not geared towards resource efficiency.

In Germany the Association for Water, Wastewater and Waste (DWA) has also formed a working group that will look into what changes may be necessary in German technical standards and regulations to accommodate ecosan systems. The technical data sheets published by the GTZ may help to form a base line against which standards for ecological sanitation can be set, and work carried out by the GTZ, EcoSanRes, WSSCC, Urban Water, Stockholm Water and the Mexican NGO CECIPROC on criteria to assess the sustainability of sanitation systems could be used to help define new technical and treatment standards for sanitation systems. (Bracken et al 2005)

2.9 Finance ecosan

International development co-operation has seen the need to increase financing for ecological sanitation, and budgets have been increased accordingly to support ecosan projects. The 2005 launched European Water Facility for African, Caribbean and Pacific countries stated clearly in the call for proposals that project proposals containing ecosan would be particularly well received, and two relatively large projects are currently being supported under this initiative. The EU has also started a number of research programmes which are expected to developing sustainable sanitation solutions for various contexts and to support up-scaling initiatives. The MEDA-, ROSA-, and the NETSSAF-Projects are among the research projects working in this area. Other bilateral donor agencies have also increased their budgets for ecological sanitation. The Netherlands and Sweden are among those clearly increasing their support to sustainable sanitation programmes. The German government also supports sustainable sanitation via the Ministry for Economic Cooperation and Development, and through the Ministry for Education and Research with several new research projects starting in the last years, looking for example at the use of anaerobic digestion of wastewater to produce energy (in Knittlingen in southern Germany) at the reuse opportunities for source separated urine and brown water (in the GTZ-headquarter in Eschborn and in Vietnam), or at the effects of medical residues in urine when applied as a fertiliser.

2.10 Apply ecosan principles to international and national Action Plans and Guidelines

With the UNSGAB Hashimoto action plan (UNSGAB 2006), the latest UNDP-PEP (2006) paper, the new set of WHO Guidelines for excreta use, and the UNESCO-GTZ (2006) publication on “Capacity building for ecological sanitation”, there have been several publications this year alone, which are recommending the ecosan approach on UN-level. China and The Philippines are among the countries, which are integrating the ecosan approach into national and regional legislation. However, it must be clear that the most important task will be to give the decision makers on infrastructure on the regional and communal level not only guidelines that recommend ecosan, but also the knowledge and capacity on all levels to put the approach into practice.

3 CONCLUSION

In the three and a half years since the formulation of the 10 Lübeck-Recommendations for Action for the further promotion and up scaling of ecosan there has been quite some progress on all the issues the recommendations addressed. Ecosan is being seen increasingly as a serious, realistic, main-stream alternative to provide safe sanitation, reducing the health risks associated with poor sanitation, protecting water resources and soil fertility, and optimising resources management.

However, despite this positive development there remains a huge amount of work to do before a real paradigm shift in sanitary provision can occur. On one hand there is still a pressing need to develop a higher number of rural and urban large scale ecosan programmes and to showcase with these real case studies that it does make economic and environmental sense to follow the ecosan approach. On the other hand, an immense capacity building initiative is needed to enable all actors to provide cost and resource efficient sustainable sanitation systems, at a high enough rate to make the MDGs achievable. With 9 years to go to reach the MDGs by 2015, and with 2.6 billion people world-wide still without access to adequate sanitary facilities, the need for these sustainable, holistic approaches is greater than ever. We must therefore continue to use the 10 recommendations as a basis to help guide our work, aiming to have ecological sanitation recognised as the state of the art approach to sanitary provision as soon as possible.

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