

UNESCO-GTZ PUBLICATION ON CONCEPTS FOR ECOLOGICALLY SUSTAINABLE SANITATION IN FORMAL AND CONTINUING EDUCATION AND ACCOMPANYING CD-ROM

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ABSTRACT

With ecological sanitation – or ecosan – being recognised in several high level policy papers as a valuable strategy to reach the MDGs (Millennium Development Goals), the current lack of capacity is a crucial limiting factor in meeting the increasing demand for its implementation.

Several initiatives and working groups are currently active to address this lack, and one of the outcomes of this work is presented in this paper: the UNESCO-GTZ publication entitled “Capacity building for ecological sanitation - concepts for ecologically sustainable sanitation in formal and continuing education”, which comes together with an ecosan resource CD-ROM. For the latter, GTZ, together with several other organisations has collected, assembled and made available published material relevant for education and training purposes on ecosan. The publication is the result of a substantive collaborative effort between UNESCO’s International Hydrological Programme (IHP) and the German Technical Cooperation Agency GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH, Eschborn), as well as a number of international experts in the field.

The UNESCO-GTZ publication aims to provide support for academic institutions, training organisations and individuals in developing training and education material for ecological sanitation, and to therefore help close the gap between existing knowledge of professionals, scientists, technicians and school pupils regarding sanitation and what is actually necessary to move towards sustainability. The publication is a clear commitment of UNESCO to ecosan and gives an introduction into the ecosan approach and how to include it into education, and an overview on ecosan research results and research needs.

The paper presented here gives suggestions for a global capacity building strategy for ecosan, by drawing the respective key messages from the UNESCO-GTZ publication on ecosan capacity building in formal and continuing education.

Keywords: awareness raising, planning, implementation, capacity building, education

1. INTRODUCTION

Ecological sanitation – or ecosan for short – is a new paradigm in sanitation that recognises human excreta and greywater from households not as a waste but as resources that can be recovered, treated (sanitised), if necessary, and safely used again [1], [2].

Ecological sanitation systems offer a range of low cost to high tech sanitation options which are hygienically safe, comfortable to use, environmentally friendly and often more economic than conventional systems. In addition, they ideally enable a complete recovery of nutrients in household wastewater and their reuse in agriculture. In this way, they help preserve soil fertility and safeguard long-term food security, whilst minimising the consumption and pollution of water resources.

Ecosan projects have proven themselves around the world in a wide variety of application [3]. Environmentally friendly settlements in the temperate climates of northern Europe have employed closed-loop sanitation systems, treating their greywater locally and providing agriculture with fertiliser from urine diversion or from the sludge of biogas plants, as can be seen, for example, in Germany, Norway and Sweden. In China, the combined treatment of human excreta and animal manure in small scale bio-gas plants is common, and from 1997 to 2005 around 1 million urine diverting dry toilets have been constructed in a project that started in Guanxi province [4].

Box 1: An example for a large scale ecosan implementation is the “Urine diverting dehydration toilet dissemination programme, Guanxi province, China” (comp. project data sheet no. 5 in [3])

The “Urine diverting dehydration toilet dissemination programme, Guanxi province, China” was initiated in 1997 by the Chinese Government in co-operation with Sida and UNICEF. The initial demonstration project began with just 70 toilets. There are now more than 1 million installed double vault urine diverting dehydration toilets spread across several provinces.

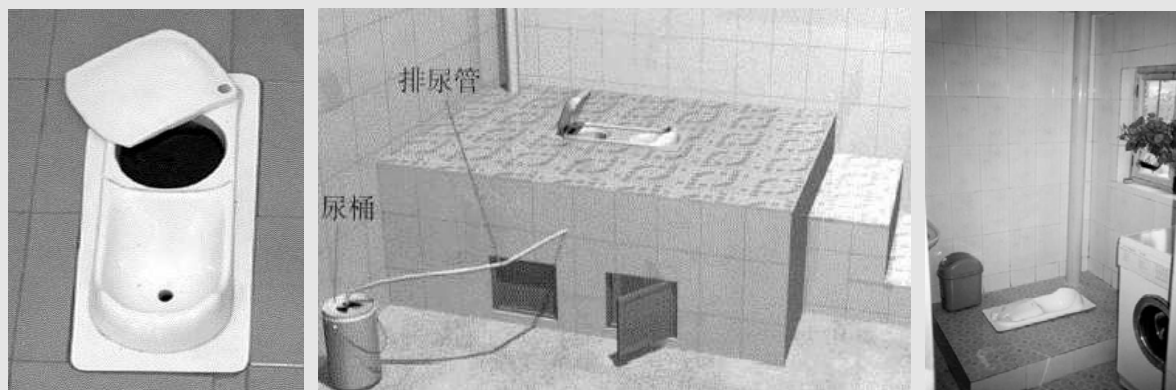


Figure 1: ecosan urine diversion squatting pan (left); ecosan in-house toilets (middle and right) (SIDA)

A plastic urine-diverting squatting pan is produced locally for approximately 8 EUR.

To improve the dehydration and sanitisation of the faeces, a shovel full of ash is thrown onto the faeces chamber after defecation. When the first chamber of the double vault is full, the squatting pan is turned round, and the second chamber is used. The dried faeces from the vault are removed once or twice a year, depending on the chamber filling cycle. They are applied by digging them into the roots of plants. Urine is collected once or twice a week and applied directly to crops.

The basis of the success and acceptance of this system is the traditional use of urine and excreta in agriculture in China, and the absence of prejudices and questioning of their agricultural value. Other advantages noted by the users include: the system is simple and easy to construct, can be easily adapted to local needs and is affordable. In addition water consumption is reduced, the toilets are clean, do not smell, and have no flies. This allows the toilet to be directly constructed inside homes, making them more comfortable, convenient and safe for families to use, particularly for women and children, and resulting in savings for the construction of an external superstructure, and in a better operation and maintenance.

During the course of 2006 and 2007, an urban ecosan project with urine diversion dehydration toilets, greywater treatment, logistics for transport and reuse etc. has been installed for 7000 people in Erdos City in Inner Mongolia. This project will be subjected to international scrutiny at the “International Conference on Sustainable Sanitation – Eco-Cities and Villages” (August 2007). There are other examples of large-scale implementation of ecosan projects, e.g. in Mexico (Tepoztlán) and South Africa (Durban area). Based on the collected experience of the GTZ-GATE programme for biogas technology, 20 000 biogas digesters for animal dung and household wastewater are being built annually in Nepal with the support of the KfW, producing biogas and liquid fertiliser.

Each one of these projects employs different technological components, tailored to the needs of the user and the local market. The mix of different framework conditions, technical options, stakeholders involved and motivations, means, that in general no two ecosan projects are alike. For the moment, there is in fact no such thing as a “typical ecosan project” and a lot of experience and a profound understanding of the ecosan approach is needed to help finding the most sustainable set of measures in a given situation.



Fig. 2: 20 000 biogas digesters for animal dung and household wastewater are being built annually in Nepal with the support of SNV and KfW, producing biogas and liquid fertiliser [14]

Until recently, ecosan projects were seen as important pilot-projects only, but it is becoming more and more obvious that the ecosan approach is fast moving into the main stream: A high number of full-scale rural and urban projects will aim to apply the ecosan approach in the near future. And to do so successfully, the stakeholders involved will need knowledge and skills in ecosan-related subjects.

Apart from the increasing number of successful demonstration projects, a clear indicator for the fast mainstreaming of the new approach is the increasing number of high level policy papers which are advocating using the ecosan approach when implementing sanitation projects.

The World Health Organisation has now updated its guidelines on wastewater reuse standards from 1989, and has published guidelines for “the safe use of wastewater in agriculture and aquaculture”, and to “the safe use of excreta and greywater”, using recent research findings and results from practice [5].

Along with the UNESCO-GTZ publication [1] discussed here, two other UN publications were presented to the public, at the World Water Forum 4 in Mexico 2006:

- UNDP published a PEP paper called “Poverty Environment Partnership Joint Agency Paper on Poverty Reduction and Water Management” [6], in which the authors try to show, that effective and sustainable solutions are not only possible but that in most cases they are a good investment. This is the core message: investing in water and sustainable sanitation is not a drain on the national exchequer: it positively contributes to it. It is in this publication of the “Poverty and Environment Partnership” (PEP) on “Water and Poverty” that the ecosan approach is appreciated as a new poverty reducing strategy.
- The highest body of the UN concerned with sanitation, the “UN Secretary General Water and Sanitation Advisory Board” (UNSGAB), presented in Mexico a "compendium of actions" [7] on the World Water Forum, which contains recommendations on actions to the UN institutions and the public as well as to the board members.

In the "compendium of actions", the ecosan-approach is recommended in chapter 4, together with the WASH campaign as main strategy for achieving the sanitation MDGs. The Board announced that it will “*appeal to regional and international organizations to go into action for achieving the sanitation MDG in collaboration with existing initiatives and campaigns such as WASH and ecosan. Each Member will take responsibility for a specific region and specific organizations to make*

approaches.” This clear commitment to an integrated approach towards sustainable sanitation will further increase the momentum of the work of all regional ecosan initiatives – but will at the same time increase the need for people that are well trained in this approach.

The demand for sustainable sanitation solutions will be further strengthened by the decision of the UN assembly to declare 2008 as the UNs “International year of sanitation” (IYS 2008). Currently countries around the globe prepare their contribution for this year. In the beginning of 2007 a network called “Sustainable Sanitation Alliance” [13] has been started by more than 30 organisations to promote that the IYS 2008 helps to spread sanitation solutions that are sustainable in a broad sense.

2. PROPOSED IMPLEMENTATION STRATEGY FOR MODERNISING THE EDUCATIONAL AND TRAINING SYSTEM IN SANITATION

The UNESCO-GTZ publication on “Capacity building for ecological sanitation” [1] summarizes that the knowledge of ecosan-related issues has increased considerably over the last decade, as has the number of ecosan pilot projects and the number of high level policy papers promoting the ecosan approach. Hence this period can be seen as a phase of primary advocacy which now needs to move towards a phase of wider dissemination of the latest scientific research results, capacity building and training for a new generation of professionals in order to prepare them for jobs in the sustainable sanitation sector.

Whilst the academic resource base is currently very limited around the world, it can still be geared towards an effective leverage function for sustainable sanitation activities in institutions in both industrial and developing countries. The academic and professional resource base should focus on inspiring local and national authorities, institutions and other interested parties in both the North and the South to engage in training and research, involving itself intensely with research collaboration and providing inputs to training given by these institutions.

This can be done e.g. through:

- (1) North-South: Research Partnerships for Mitigating Syndromes of Global Change [8]
- (2) Capacity building and knowledge management through the development of regional nodes in the South. This means working with a series of dynamic institutions that have good regional networks that can provide support in training, research and development, knowledge management, demonstration and pilot projects in order to build regional capacity. [9]
- (3) Funding Programmes (compare box below)

Box 2: Funding programmes for sustainable sanitation related research

Funding programmes

An important way to increase capacity is to develop funding programmes for research in the new field. A funding programme for ecosan related research has been started in 2005 by the Swedish International Development Cooperation Agency (Sida), the Stockholm Environment Institute (SEI) and the International Foundation for Science [10]. Its design, topics, and target group of researchers show what are currently seen as the promising fields for young ecosan researchers in southern countries. The topics funded are:

(A) Ecological Sanitation: monitoring the reduction of environmental impact; pathogen destruction; secondary treatment of excreta and organic waste; safe agricultural reuse; identification of pollutants(e.g. pharmaceuticals); perceptions/attitudes related to excreta reuse in food production; economic value of nutrients and humus; other forms of sustainable sanitation; development of other sustainable sanitation methods; monitoring the reduction of environmental impact.

(B) Reuse of grey-water for irrigation: monitoring improved availability of water for agriculture; identification of geographical areas where re-use of grey-water is feasible; development of treatment

systems; identification and reduction of pollutants (e.g. detergents, pesticides, pharmaceuticals); public acceptance and management of systems.

In the programme up to US\$ 12,000 (EUR 9,600) are being offered in research support for projects on Sustainable Sanitation and Grey-Water Reuse. Grants are intended for citizens of developing countries carrying out research in a developing country, attached to a university or non-profit making research institution in a developing country. The age limit for this programme is 40 (for Chinese applicants 30, for applicants from Sub-Saharan Africa 45).

3. HOW TO ACCELERATE ECOLOGICAL SANITATION EDUCATION AND TRAINING?

An implementation strategy for ecological sanitation education and training will involve intensive work with educational and training institutions. However - as the lack of capacity is presently considered as a crucial limiting factor in meeting the increased demand for the implementation of ecological sanitation projects - all actions aimed at encouraging regional, national and local institutions are limited by this lack of capacity.

Some institutes have already included or are planning to include ecological sanitation in their regular educational programmes. A non-exhaustive list of examples is given below:

- Sida/EcosanRes (Sweden): Annual course for professionals in two regions alternating between Latin American countries, Africa and Asia
- Norwegian University of Life Sciences: Summer school and courses for students and professionals
- UNESCO-IHE: on-line ecosan course module [12]
- Technical University of Hamburg-Harburg (Germany) and University of Weimar (Germany): ecosan integrated in university degrees
- CREPA: Training courses for sanitary professionals in the West Africa Region
- My Networks: Internet courses on ecosan
- UNESCO-IHE (The Netherlands): Integration into MSc programmes, e.g. Municipal Water Infrastructure MSc programme (in preparation)
- UNESCO endorsed network of centres for urban drainage / urban water (IRTCID/CUW network)
- German Water Association (DWA): Training courses for professionals (in preparation)
- Order of Syrian Engineers and Architects (OSEA): creating an inter-institutional professional network (IPN) on ecosan for the advancement and dissemination of knowledge and training
- Indian Innovative Ecological Sanitation Network: Regular capacity building workshops and joint pilot case studies
- Centre for Science and Environment, India: Training on water pollution & water-waste management
- Philippines Ecological Sanitation Network: Regular capacity building workshops and joint pilot case studies (e.g. Center for Advanced Philippine Studies: Capacity building and training with Ecosan pilot projects and research; Xavier University: Integration of ecosan into various MSc programmes and into special courses, e.g. on urban ecosan).
- GTZ (Germany): Local capacity building workshops in the start-up phase of ecological sanitation projects for decision makers, professionals and other stakeholders (several countries); ecosan "Training of trainers" courses adapted to the needs of NGOs (Philippines), large capacity building programme (together with seecon International and the ecosan service foundation, India)
- WASTE (The Netherlands): Local capacity building workshops in the start-up phase of ecological sanitation projects for decision makers, professionals and other stakeholders
- World Toilet Organisation / World Toilet College: Training of trainers in ecological sanitation

3.1 Training of Trainers

Whilst these initiatives are to be welcomed and further encouraged, it is also clear that alone they will not be able to meet demand as long as they continue to reach only a fixed number of participants (e.g. reaching several hundred people per year and courses). An exponential increase in capacity is now required, with training being aimed at trainers, who in turn can pass their knowledge on, establishing a large network for capacity building.

An important target group should therefore be trainers at professional training institutions such as schools of public health, departments of water and sanitation for civil engineers, agriculture and horticulture training institutions, schools of architecture, university departments for social and economic development, etc.

This new direction of capacity building activity requires well designed materials for the training of professionals and students soon to become professionals.

Some material has already been developed for such courses [2], [11], [12]. Most of the materials are to some extent e-based, and many of the courses are divided into two, with one section done by the students in their home countries (preparatory activities, case studies, collection of local background data, introduction into the topic) and another section being carried out with the trainer in a face to face situation (including discussions of the case studies, group work, etc.).



Fig. 3: ecosan can be included into education on all levels. Here the pupils of a boarding school in Ahmedabad, India, have constructed a model of the sanitation system of their school, and won the first prize in the “Ahmedabad School Science Fair 2006” with this project (comp. gtz project data sheet no. 22 under [3])

3.2 E-learning

E-based learning material has particular advantages when being used in Training of Trainer (ToT) schemes: It can be made informative, up-to-date, and presented in a way that catches the teachers’ interests. It can include “Power Point” presentations with accompanying text / instruction, film clips, video-taped interviews and lectures, and an extensive reference list. E-learning material can be made available on the web or on a CD for teachers and instructors in recognised institutions for training of

professionals in various ecosan-related subjects. Teachers are free to choose the sections which he or she deems relevant for courses they are conducting. The material is thus easy to adapt to the needs of the individual teacher, from a full course to parts to be included in some lectures. The CD / website is easy to update on a periodic basis.

E-learning material is already available that covers the major ecosan management issues, policy, household routines, hygiene and sanitation systems, primary treatment/handling, secondary treatment, reuse in agriculture and energy generation, selection criteria for sanitation systems and systems analysis. It can also include suggestions on how to use the material in learning and give examples of syllabi for a variety of courses [2], [11], [12].

3.3 Starting a knowledge base for ecosan training and education

As a contribution to the currently available e-learning resources and ecosan knowledge dissemination, GTZ together with several other organisations have collected, assembled and made available published material relevant for education and training purposes on a “ecosan resource CD” [2], which is in parallel available as virtual ecosan library for capacity building material (visit: link under [2]).

The CD-ROM and the growing web-site should both be of use to teachers interested in developing their own teaching material for formal and continuing education and vocational training, to those planning awareness raising activities, and to those who need educational material during the planning and implementation of an ecosan project. To provide inspiration for the development of their own ecological sanitation capacity building activities, a range of examples of ecological sanitation syllabi, workshop contents and awareness raising presentations are included along with the most relevant existing basic literature on ecosan. The CD-ROM and web-site are seen as the core of the current ecological sanitation knowledge base, and will be further developed as a support to the international ecosan capacity building initiative.

4. CONCLUSIONS AND OUTLOOK

Education has a clear role to play, both in acknowledging the paradigm shift in sanitation and in incorporating the interdisciplinary theme of innovative sustainable sanitation systems into teaching curricula. Education on ecosan should enable the people to develop, plan and implement eco-sanitation systems that are hygienically safe, socially acceptable, economically feasible, environmentally sound and technically appropriate.

Educational institutions, universities, and technical schools can contribute to the mainstreaming of the new sanitation paradigm by fully integrating the discourse and criteria for sustainability into their curricula. They should make clear that defining criteria for sustainable sanitation is a political act.

In response to satisfying especially the health needs of unserved, mostly poor population groups, education and research has to add resource conservation and waste reuse into the taught sanitation paradigm, as this “closing the loop” has the potential to improve economic conditions and the health of the population served, as well as the quality of the environment and the long term availability of natural resources.

Sanitation engineers and practitioners, policymakers, managers, and operators get their ideas and information during their education. Therefore the curricula of universities, continuing education programmes, technical schools, research institutes and training centres have to include the ecosan philosophy. Thus several objectives, such as the improvement of human health, poverty reduction in developing countries, the conservation of natural resources and sustainable water and sanitation

management systems in both, industrialised and developing countries may be addressed. Those responsible for the content of curricula should be informed about the new developments in this field.

The education system has to prepare students to think about urine and faeces and grey/black water as resources. Emphasis has to shift from the simple disposal to the hygienisation of contaminated flow streams, and to resource conservation and safe reuse. Teaching must make clear that health and a healthy environment is a prerequisite for human productivity, and productivity determines economic well being.

Many proven technical elements are available for ecological sanitation systems and the number of pilot demonstration and research projects, and of large scale applications, is continuously increasing. However, given the broad variety of local framework conditions and the large number of open questions in this complex interdisciplinary field, there is still a great need to further develop technical and operational solutions and to enlarge the knowledge base with respect to public health, risk management, economics, logistics, material-flow-streams, socio-cultural and many other aspects. Research in these disciplines will require trans-sectoral and interdisciplinary co-operation and inputs from a range of research fields.

Development and applied research should concentrate on a series of large research and demonstration programmes which can serve as laboratory for developing and field-testing a broad variety of technical and operational sanitation systems. The research and demonstration programmes should showcase innovative solutions in a variety of climatic, social, cultural, economic and geomorphological contexts. They should enable the development of a series of model solutions covering the whole range of sanitation needs, which in turn can be up-scaled and used as model-solutions for mainstream projects.

The achievement of the sanitation MDGs is one of the major challenges for sustainable development in the next decade. Putting emphasis on education and research for ecologically sustainable sanitation may largely contribute to reaching this goal.

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