

# DT2006 Conference Summary and Future Prospects



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## Foreword

This document summarises the outcome from the 2<sup>nd</sup> International Dry Toilet Conference 2006 as reported by the session Rapporteurs. The conference gathered together 147 delegates from 34 different countries for three days to discuss various issues related to dry toilets. You will find the programme, presenters and presentation titles at <http://www.drytoilet.org/dt06>. The International Scientific Committee wishes to once more extend their warmest regards to all Key Note speakers, presenters, Chairpersons and Rapporteurs for making the DT2006 a successful and fruitful event.

On behalf of the International Scientific Committee,

Dr Eeva-Liisa Viskari, Chairperson of the International Scientific Committee

Ms Sanna-Leena Rautanen, Secretary for the International Scientific Committee

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## Session 1: From Past to Future

*Chair: Dr. Petri Juuti*

*Rapporteur: Mr. Pekka Pietilä*

Toilets, dry toilets or otherwise, are not a subject to popular talk or, indeed, even serious research. The research literature on dry toilets is extremely limited. In many cultures sanitation is generally a difficult topic to discuss, even a taboo. Attitudes towards dry toilets are typically negative, based on earlier negative experiences with the pit latrines and other rather uncontrolled systems. Work has been done to change attitudes but unfortunately the idea of water-based flush toilets is deep rooted in most parts of the world, except perhaps where water scarcity has hit the hardest.

There have been countless pilot and demonstration projects implemented throughout the world. To some extent people are fed up and criticize these pilots: we want something real to happen! Yet, there is still need for pilot and demonstration projects for two reasons: firstly, the situation and circumstances vary from place to place even within the same country (climatically, geographically, culturally etc.), and secondly, to change the attitudes and gain acceptance people need to see and experience good and working examples. Yet, the pilots should not be too perfect – there are examples that pilot latrines were much better structures than the houses people were living in. Thus the solutions should be made to fit local circumstances.

An aspect of all this is also continuity: project-based approaches are not likely to be the most sustainable ones. When the project period is over, the people are left on their own in the belief that they will automatically keep on using and maintaining the facilities. An example was given from South Africa where one of the reasons standing out was that the dry toilets had a number of technical problems due to poor workmanship, eventually making the latrines unacceptable to their users. Thus, projects should include a proper follow-up stage, so that the reasons for un-use or misuse of toilets could be understood at an early stage, and the situation then improved. To raise the profile of sanitation in the political agenda, and that of dry sanitation more specifically, it is vitally important that the central government, regional and local governments have sanitation high in their own agenda. This may not be possible without providing reliable real-life examples: dry sanitation can work.

## Session 2: Architecture & Construction

*Chairs: Dr. Margriet Samwel (Session 2 A) and Mr. Antero Luonsi (Session 2 B)*

*Rapporteurs: Professor Tuula Tuhkanen and Ms. Eija Vinnari*

*Key note speech: Dr. Andreas G. Koestler - "Sanitation for Life" in Natural Disasters*

Sanitation has an essential role in the emergencies. It is the first barrier between the possible pathogens (excreta) and the receptors (human beings). Local population and organizations are the primary actors in disasters, and the NGOs can empower the local stakeholders and provide feasible solutions and equipment to different scenarios and conditions. Yet, the challenge for developing sustainable and appropriate sanitation systems for crisis situations is the diversity and uncertainty: it is difficult to get financing to a catastrophe, which has not happened yet. The real life examples from e.g. Iran highlighted how rapid actions crucial to prevent spread of diseases: even if the environmental health staff arrives in less than 24 hours, people already had to begin to defecate in various open areas, thus endangering public health. The importance of safe excreta disposal is exacerbated by an often-forgotten consequence of living in chaotic surroundings, namely stress-related diarrhoea. Yet, even rapid action should not override cultural considerations: large refugee camps are built but people preferred to stay close to their homes. Cooperation between government, foreign NGOs and local volunteers has proven to be successful.

It was noted that lack of appropriate sanitation is only one of the multitude of problems that prevail in a refugee camp. However, it was emphasized that a refugee camp forms a dynamic entity which is not even meant to be permanent; therefore, any attempts to build permanent infrastructure are futile. Complex situations call for simple solutions, of which the dry toilet concept is a prime example. In the rapporteur's opinion, it is often neglected to consider those refugee camps that have been in place for several years and where some young people have spent all their lives, such as on the south coast of Spain. In camps like these, more permanent solutions might be in order, but they could still be based on sustainable sanitation.

In order to be better prepared for emergency situations it would be important to have plans and facilities ready. It is very difficult, however, to get money to a catastrophe that has not happened yet.

A number of other real life examples of dry sanitation in every day life were presented from various parts of the world, both from the pilot systems and the real life applications. Attention was also paid to sustainability: technical, economic and social sustainability. Furthermore, one of the presentations also acknowledged the gender dimension by paying attention to the differences between sexes in accepting the new (urine diversion) system: women tended to be satisfied with what is practical and easy to implement, whereas men prefer more technological solutions. Making dry toilets ubiquitous demands international and national institutional guidance and also innovative financing schemes to overcome the barriers related to affordability. If people cannot afford to pay 75 euros for connecting to a conventional sewer system, how are they going to be able to pay for a dry toilet system?



## Session 3: Attitudes & Advocacy

*Chair: Dr. Christine Werner*

*Rapporteur: Mr. Mika Korkeakoski*

*Key note: Mr Ron Sawyer, Mexico – A tale of two systems: Obstacles & incentives for implementing ecological sanitation in a periurban town - Tepoztlán, Mexico.*

It is evident that ecologically sustainable sanitation options including dry sanitation have several advantages to conventional waterborne systems. Often though human perceptions, attitudes or even legislation can hinder the progress of dissemination of information and implementation of ecological sanitation (ecosan). This session focused on attitudes and advocacy. It called for a more holistic and sustainable way of thinking, having identified a number of challenges. Ecosan is a new concept, not only to communities of implementation but, to government officials and authorities, and consequently it requires efficient promotion, education and training in various levels. Government support in terms of incentives and support to ecological sanitation and other alternative solutions is critical, and therefore there should be established governmental bodies to investigate and promote ecologically sustainable solutions. Sustainable sanitation programmes should also be considered as long-term sustainable solutions that need long term commitment, also in funding. Small-scale community projects may lead to less corruption, more sustainable and more commitment than the large-scale projects and therefore should be encouraged.

In many occasions human perceptions, attitudes and beliefs (many times more of feeling than rational thinking) hinder the use of products from dry toilets, and therefore it is vital to develop strategies to change the attitudes of the users i.e. sell the concept of ecological sanitation. To reach this goal awareness raising and training in ecological sanitation principles and practices is needed amongst the community as well as the local authorities (often the decision-makers). It is important to involve the local actors (E.g. NGOs, youth groups) at once to secure the sustainability of the ecosan projects and ecological sanitation education and training. Without training, the efforts made can be lost and forgotten. On many occasions the problems that arise reason from lack of sufficient community involvement, unwillingness of handling human excreta or due to poor design and construction of the facilities.

Education and training on ecological sanitation should give all the people ability to develop, plan and implement eco-sanitation systems that are hygienically safe, socially acceptable, economically feasible, environmentally sound and technically appropriate. To achieve the objectives we need to modernize current educational and training systems to inspire not only professionals and academics but local and national authorities, institutions, and other interested parties. Trans-sectoral and interdisciplinary co-operation and inputs from a range of research fields and well-designed educational materials are of great importance to secure successful education, training and capacity building.

Financing mechanisms to users, including inexpensive credit in favour of ecosan, need to be established. In agriculture-based communities, reuse of ecosan toilet products as fertilizers, can gradually become a significant motivating factor. Incentive system for research and entrepreneurs may also encourage to enhancement of ecological sanitation solutions and raise public awareness and interest in ecological principles and practices among the "ordinary citizens". Technical failures could be prevented by using good materials and design as well as correct implementation, operation, maintenance and monitoring practices. These can be reached through education, training and community involvement.



## Session 4: Separation & Re-use

*Chairs: Mr. Pertti Keskitalo (Session 4 A) and Dr. Helvi Heinonen-Tanski (Session 4 B)*

*Rapporteurs: Dr. Eeva-Liisa Viskari (Session 4 A) and Ms. Suvi Holm (Session 4 B)*

*Key note: Professor Joachim Behrendt – Appropriate de-central wastewater technologies for low income regions*

The session gave a holistic view to the benefits and also problems and open questions to the concept of separation of dry toilet excreta. First of all, dry toilets are only part of the solution, there also grey water and rain/storm water to be taken care of. If everything is mixed, other technical solutions are needed to separate and manage the wastewater again. There are many technical solutions and possibilities to treat and use grey water and rainwater onsite. Centralized treatment systems are not seen to be neither sustainable, nor flexible, nor cheap. Decentralized or semi-centralized systems are more flexible, often cheaper and definitely more sustainable, since the reuse is often more efficient. From the technical point of view urine separation reduces significantly the ammonia losses from the dry toilet compost and on the other hand urine can be used also for other purposes than just diluted fertilizer.

Urine is worth or even essential to separate, because dry faeces are much easier to treat. "Dry toilet material should be dry" (Joachim Behrendt). Faecal material needs though a thorough thermal composting and/or after treatment or storage in order to be safely used. Several growth experiments show that when used in irrigation to the soil urine alone, urine (ecofert) + composted faeces or faecal compost alone (humanure) have shown remarkable increases in yields when used in sufficient amounts and right time. Successful experiments and results have been gained with maize, cucumber, carrot and barley and are ongoing with cabbage and potatoes. Care should be taken, however, in how much, when and how fertilizer is added in order to gain good yield safely. There are other uses for separated urine as well: it can also be used to treat green composts, like straw and corncob, to balance the C/N ratio and irrigate the compost. In Thailand for example irrigation of the compost is needed and corncob compost needs additional N to work properly. On the other hand urine has been tested to act as a source for P recovery as struvite. We will see, what future brings us in this regard. We have basically passed peak phosphorus where new sources and more efficient recycling of nutrients, especially, P is needed.

Risk of spreading diseases is real but not necessary very high if the composted faeces and urine are correctly used. Normally urine is almost sterile and risk of spreading diseases is low. In tropics, however, there might be a risk of spreading very dangerous diseases, e.g. schistosomiasis. Long term storage destroys most disease causing agents in urine, if there are any. Also timing of use and using urine in right plants and places is essential. For example urine should not be spread on the plant, but in the soil. In addition the risk is very low if urine is used for fruit trees than for root plants. Very rarely the food is eaten without any processing and the processing also destroys many pathogens.

Dry toilet compost and urine use is not entirely problem-free. There are open questions in attitudes, education, logistics, management and post-treatment of the excreta. The amounts of impurities, like heavy metals, hormonal and pharmaceutical residues, that can be tolerated should be considered. WHO will publish new guidelines regarding the use of human excreta in agriculture. Research about the safe management and reuse is, however, still needed.



## Session 5: Dry toilet technology & Monitoring

*Chairs: Adjunct Professor Tapio Katko (Session 5A) and Professor Naoyuki Funamizu (Session 5B)*

*Rapporteurs: Ms. Elina Järvenpää and Ms. Annalena Sjöblom*

*Key note: Professor Naoyuki Funamizu, University of Hokkaido, Japan – Dry toilet: An important system for controlling micro-pollutants from our daily life*

This session focused in monitoring dry toilet compost process and how composting can be used in controlling micro-pollutants, like antibiotics, hormones and micro-organisms. In the session also an energy analysis of dry toilet and an entire pilot project where ecological sanitation is implemented in an office building was presented. It was highlighted that environmental safety is of utmost importance, and that the recycled material has to be free of pollutants. In order to degrade pollutants of the human excreta, the waste should be treated at that phase where the pollutants are most concentrated. In other words, dry toilets are the ideal solution, preferably with the urine diversion and with a right kind of matrix soil.

The research had been done both in laboratory and in the real life situations, with the attention to such micro-pollutants as estrogens, pharmaceuticals, especially amoxicillin antibiotics and bacteria. These studies have shown that most of these residues degrade during storage (for separated urine) and composting. Estrogens need further studies though, because a part of them, show to remain in compost and may accumulate into the soil when reused. A significant reduction of amoxicillin antibiotics occurred within 30 minutes during composting process. Several pharmaceuticals in source separated urine were oxidized by ozone. Compared with sludge from sewage water treatment plants human composted waste has less risk for the environment.

In Japan there has been made many studies on sawdust use as a matrix soil in dry toilets. The high porosity of the sawdust is an essential factor for the aerobic conditions in compost. The lignin of sawdust is essential for controlling the formation of ammonium and thus for the odour of compost. It has also antibacterial effect. Essential for the use of sawdust as matrix in dry toilet is the amount of it in relation to the waste. No odour will form when the volume ratio is one part excreta and 80 parts sawdust. Essential is also the mixing of them. In best way the sawdust is effecting in compost when it is well mixed so that there is no water "pockets" in the matrix soil of the compost.

The session was concluded with an example where a separating toilet system was built in the GTZ office main building, including waterless urinals and urine separating toilets. There are separate pipelines for urine (yellow water), for faeces (brown water) and for gray water which was partly reused for flushing of toilets. Urine is collected into tanks where it is stored for prolonged times in order to control magnesium, ammonium and phosphorus before recycling for fertilizing.

During the discussions it was also acknowledged that laws on building of toilets and systems is equally important than functional technology.



## Session 6: Integrated Approaches

*Chair Mr. Bhim Malla*

*Rapporteur Ms. Sanna-Leena Rautanen*

The Global Water Partnership defines Integrated Water Resource Management (IWRM) as “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.” (GWP 2000, TAC 4). Yet, the mainstream debate on IWRM still focuses on water resources, and “land and related resources”, including also wastewater management and sanitation related difficult questions are entirely underrepresented. Yet, ecological sanitation could contribute to IWRM in a number of ways, being a much broader concept in itself.

There is an urgent need to look beyond the conventional systems and broaden the thinking. Ecological sanitation and more specifically, dry sanitation, are not competing with other options. Rather, they add into the options available for solving the sanitation crisis in a diversity of situations, both rural and also urban. The presentation concerning the state of the Bagmati River and Katmandu Metropolitan area in general, clearly illustrated how conventional, centralized and water-based systems cannot solve the sanitation crisis alone. There are ancient traditional practices which would deserve more serious attention in solving both the water supply and sanitation crisis in Katmandu Valley.

Ecological sanitation, and dry sanitation as an option, are based on long traditions of managing human urine and excreta, but at the same time, represent something novel for those already used to water closed systems. The traditional way of urinating and defecating “in the bushes” is challenged by sheer number of people. To make the modern dry sanitation options something desirable, convenient, technically sound and hygienically reliable needs more systematic follow up in the real life context. Two case studies were presented, one from a small number of dry toilets in European context in Belgium, and the other case in a low-income community in dry and hot weather conditions in Mexico.

The Belgium case studied Traiselect system which is based on the idea to treat black wastewaters and grey wastewaters on a selective manner. It was noted that when a conventional system considers sewage treatment “good” if C, N, P mineralization are complete, the new approach introduced by the EC directive is rather to protect the environment as best as one can. The Mexican case introduced a research process which included monitoring of 90 composting latrines in a low-income peri-urban community utilizing US-EPA guidelines for the end product. Users were satisfied with their latrines, double vault gave a clear separation & more room for urinal but increased cost & space. Dehydrating system was consistently the better choice over the biodegrading system in this study area (very hot desert area, good for dehydration). A research component included also a study on hygiene behaviour, and paid attention to hand washing. The research process had also a strong component for community participation, focusing especially in the youth and general public awareness concerning health, hygiene and sanitation. As attitudes matter for the future sustainability and continuity of the learned behaviour, this is certainly positive news!

All in all the session highlighted the importance of integrated approaches, both from the conceptual point of view and from the practical point of view. Ecological sanitation, and more specifically dry sanitation, faces a number of challenges, and at the same time, have a number of opportunities. Where there is a challenge, there is also an opportunity. Yet, gaining real life performance experience to influence the attitudes and practices in a diversity of situations, climates, cultures and socio-economic situations is of utmost importance.

## Session 7: Sustainability & MDGs

*Chair: Mr. Kari Silfverberg*

*Rapporteur: Ms. Sari Huuhtanen*

*Key note: Dr. Christine van Wijk-Sijbesma "Where softness matters most: scaling up dry toilets in developing countries"*

*"The Human excreta index"- video, documentary, 60 min. Produced by Dutch NGO, WASTE - Adviser on Urban Environment and Development, See: <http://www.waste.nl/> and <http://www.thehumanexcretaindex.com/>*

The presentation began with a private experience about introducing a dry toilet in the office. They tried to inform people who were using that toilet how to use, maintain etc, but also realised that too much information on the wall was not efficient way to inform people. So the introducing would have needed more selective information and better communication and also participation from those who are using and maintain the toilet. These kinds of problems also are typical in project in developing countries. In spite of many sanitation projects around the world, it is predicted that there would be still 2 billion people without sanitation facilities by the year 2015. Projects so far have been small scale or pilot project and not so many larger-scale programmes. Much has been learned from them but quite often they remain isolated islands of success.

Replication, local adaptation and scaling up of lessons learnt remain limited. One important reason is the limited collective learning between researchers, development workers, donors, policy makers and private enterprise. As a result, useful research does not inform programmes, lessons learned do not influence research, donor or policy agendas are less relevant than they could be – and development falters. So from now on it would be time to scale up dry toilet programmes for a real impact.

- ▶ Strategy I: Implosion or dense coverage in areas particularly suited for dry toilets: High water tables; rocky soils; shortage of water; low soil fertility, high fertilizer prices and low farmers' incomes.
- ▶ Strategy II: Explosion; planning and implementing larger programmes where pilots have shown potential for spread.

Learning Alliances can help in the next stage of development and application of dry sanitation. They are a series of interconnected multi-stakeholder platforms at different institutional levels aiming to speed up the identification, development and scaling up of innovations. To make an impact, it is high time to start large programmes of consolidation and spread in the field, in institutions and in policies on the basis of what is currently known!





## Concluding remarks

*Chair: Dr. Marjukka Dyer, Chairperson of the Local Organizing Committee*

*Concluding remarks: Dr. Harri Mattila and selected parts from the Rapporteurs' reports*

Water closet (WC) is viewed by many as the best option, the most desirable option, the option, towards which the other options are moving. Yet, one of the traps making innovative thinking difficult is the thought: "*This is it. The problem is solved!*" If the conventional WC would be the final solution of the proper sanitation, it would be the very first time in history having something really finalized. There is the requirement to use the best available technology to avoid pollution and deterioration of the environment in the environment legislation. That will hopefully speed up the product development (Figure 1) and promote the sustainability of sanitation.

The present statistics show that 2.6 billion people lack basic sanitation. This does not mean that at present the rest 4 billion would have safe and sustainable sanitation available. The sanitation may be adequate from the individual person point of view, but on the other hand, if the excreta is flushed directly to the waterways, it is not adequate from the other individuals or environment point of view. Therefore, we should be careful when reading the statistics; is it done from human point of view or from the environment point of view, or what does it mean. If only about 10% of all wastewater collected by sewers in all the countries is treated properly, we can add quite a number in the figure of the commonly used 2.6 billion people without proper sanitation!

### In search of a new paradigm: from Water Closet to Sustainable Sanitation

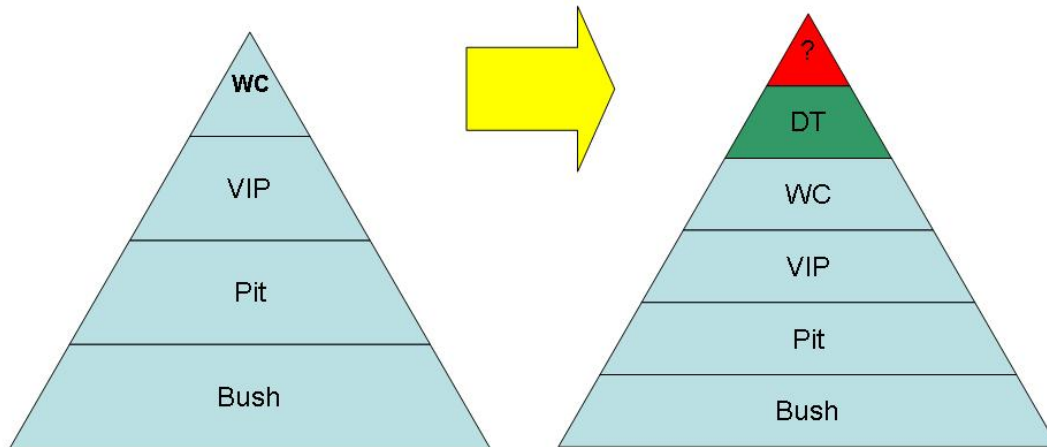


Figure 1. From water closet sanitation to sustainable sanitation.

Human excrement and urine are in present times often considered as a waste instead of a resource or opportunity. Ecological sanitation or ecosan changes this way of thinking. Ecosan has a deep rooted long history in time, where excreta, both of animal and human origin, were appreciated as a valuable resource in agriculture. It is an approach and a new philosophy, rather than a technology per se. It focuses on closing the loop, not only on the end-of-pipe-solutions. Ecosan has a lot to offer and one essential part in these solutions is dry toilet technology. It has also been recently well conceptualised.

Dry sanitation and dry toilets will need the same to find its due place within the number of options and approaches to solve the burning sanitation problem. Dry toilet products are not seen attractive neither beneficial in some cases. Dry sanitation should try to raise its profile and get rid of its reputation as the last resort and old fashioned. The challenge is to make it a brand which at the same time is adaptable to a diversity of conditions, is fancy yet approachable and achievable. The importance of human perceptions, beliefs and attitudes is evident for the success of dry sanitation. It needs to provide same comfort and service level as the conventional water closets before it can be widely accepted.

In order to take the nutrients of human excreta into reuse i.e. close the nutrient loop safely and make sanitation sustainable, attention should be paid to functional dry toilet technologies and safe management of the excrement. Thermal composting is efficient method in degrading harmful micropollutants in the excreta. Research data also strongly supports source separation of urine, faeces and grey waters for the safe management and reuse. And finally the experiences of using human excreta as fertilizer are very encouraging. Why aren't dry toilets then more common?

Progress in promoting the use of dry toilets and ecological sanitation is very slow. At present financial mechanisms and legislation do not promote or support dry sanitation principles and practices. More awareness is needed among the people, more training, education and capacity building is needed, new attractive ecological sanitation systems are needed as well as incentive systems on research and entrepreneurs. And finally, long term commitment and dedication, monitoring and follow-up is needed to ensure step-by-step mind shift towards dry toilets.

