



Overview on the global development of ecosan - Introduction, guidelines, technologies and financing

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gtz

commissioned by

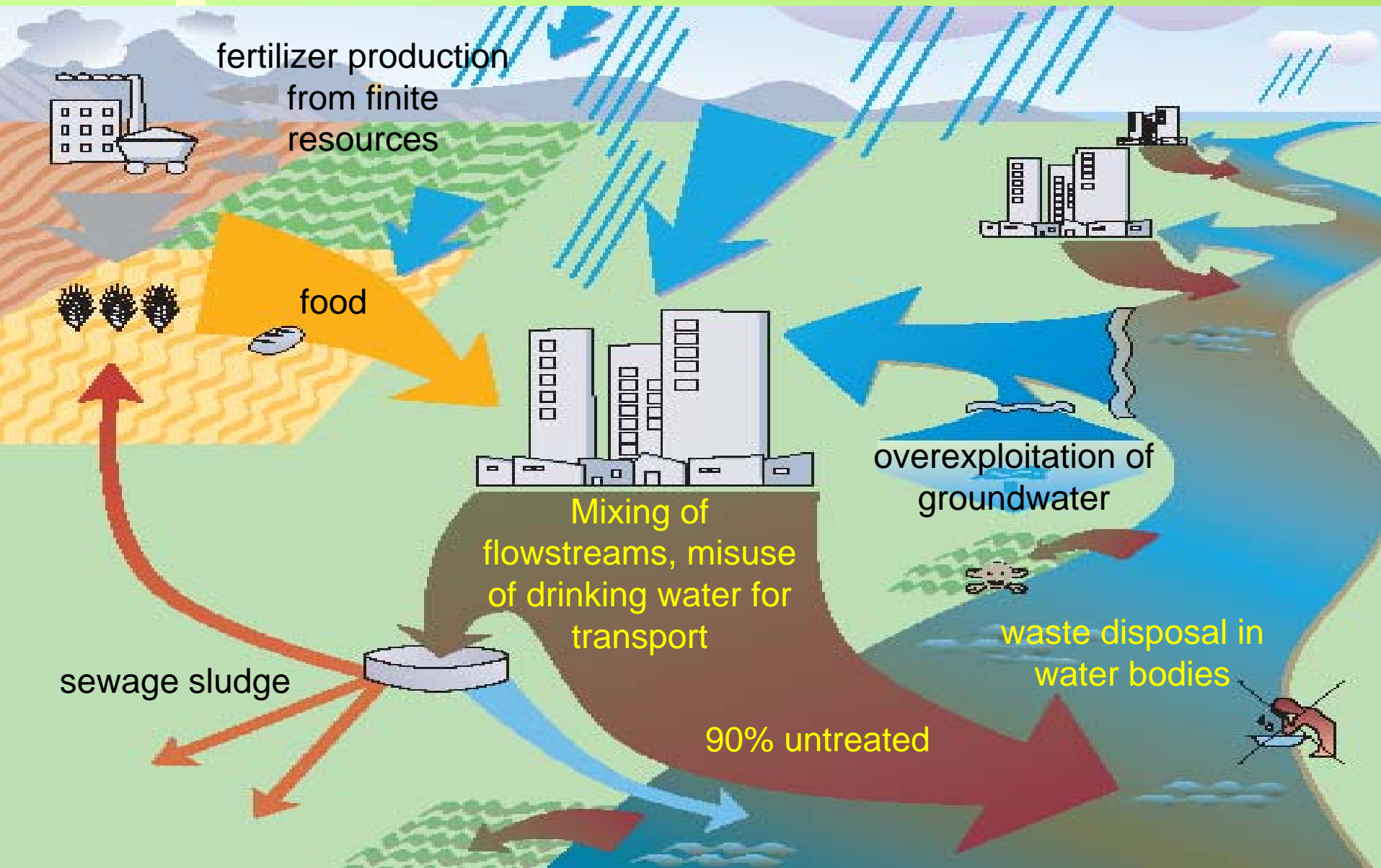


**Federal Ministry
for Economic Cooperation
and Development**

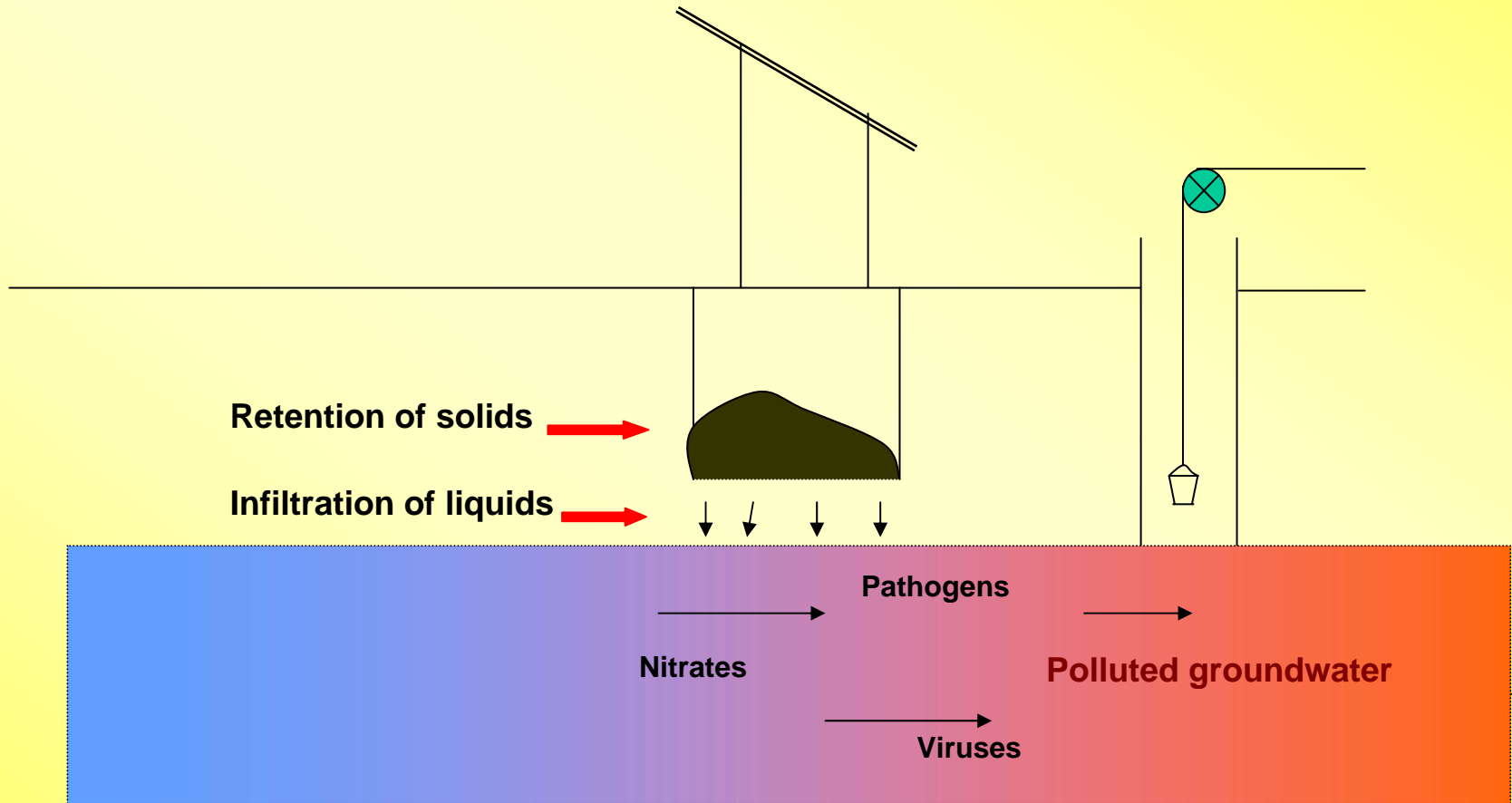
Overview

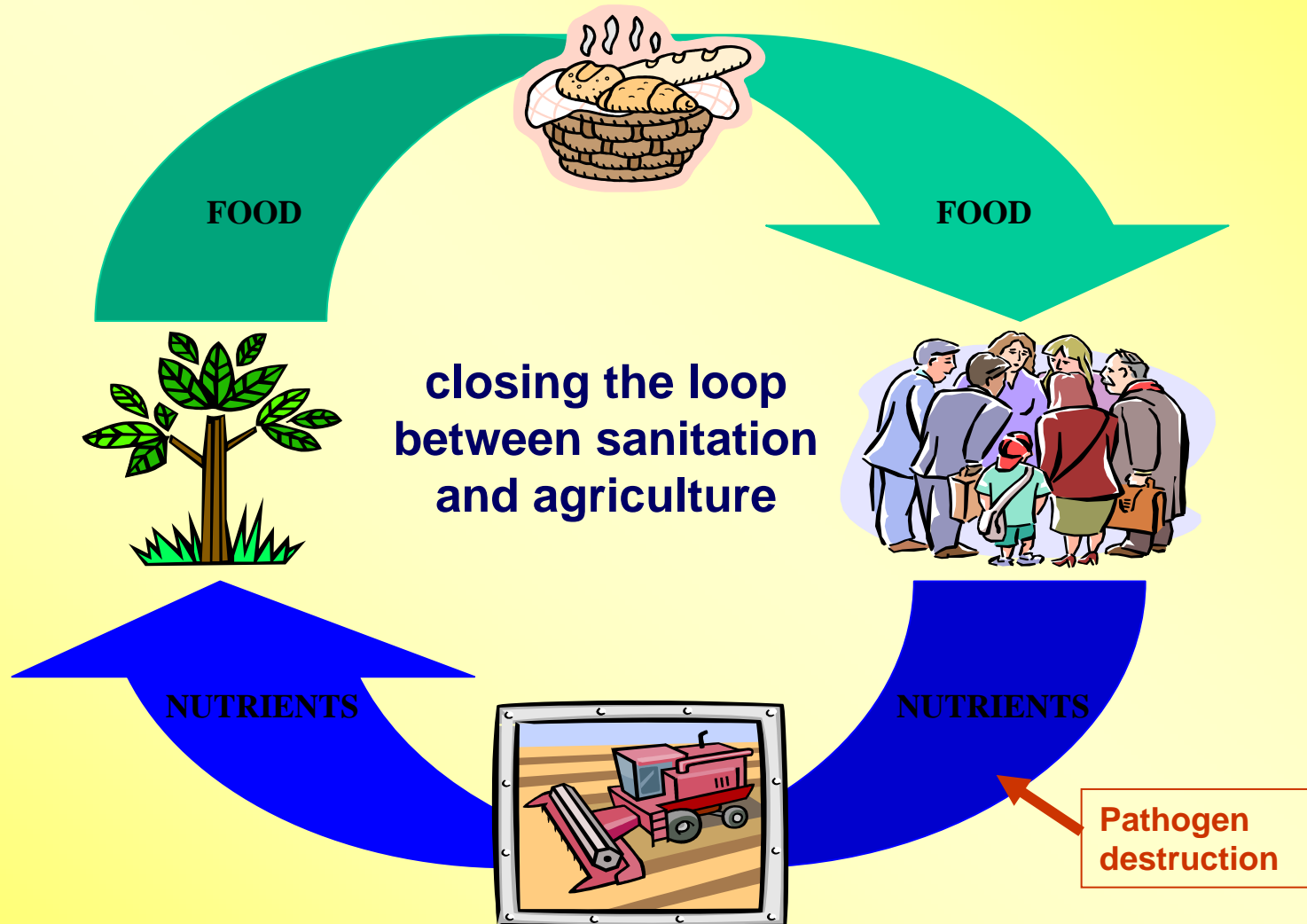
- **Short introduction to “ecological sanitation”**
- **Refreshment on the “10 Recommendations for Action” from Lübeck 2003**
- **Progress on the recommendations for action – overview on national and international developments and advances**
- **Conclusion**

Introduction to ecosan shortcomings of conventional watercarriage sanitation

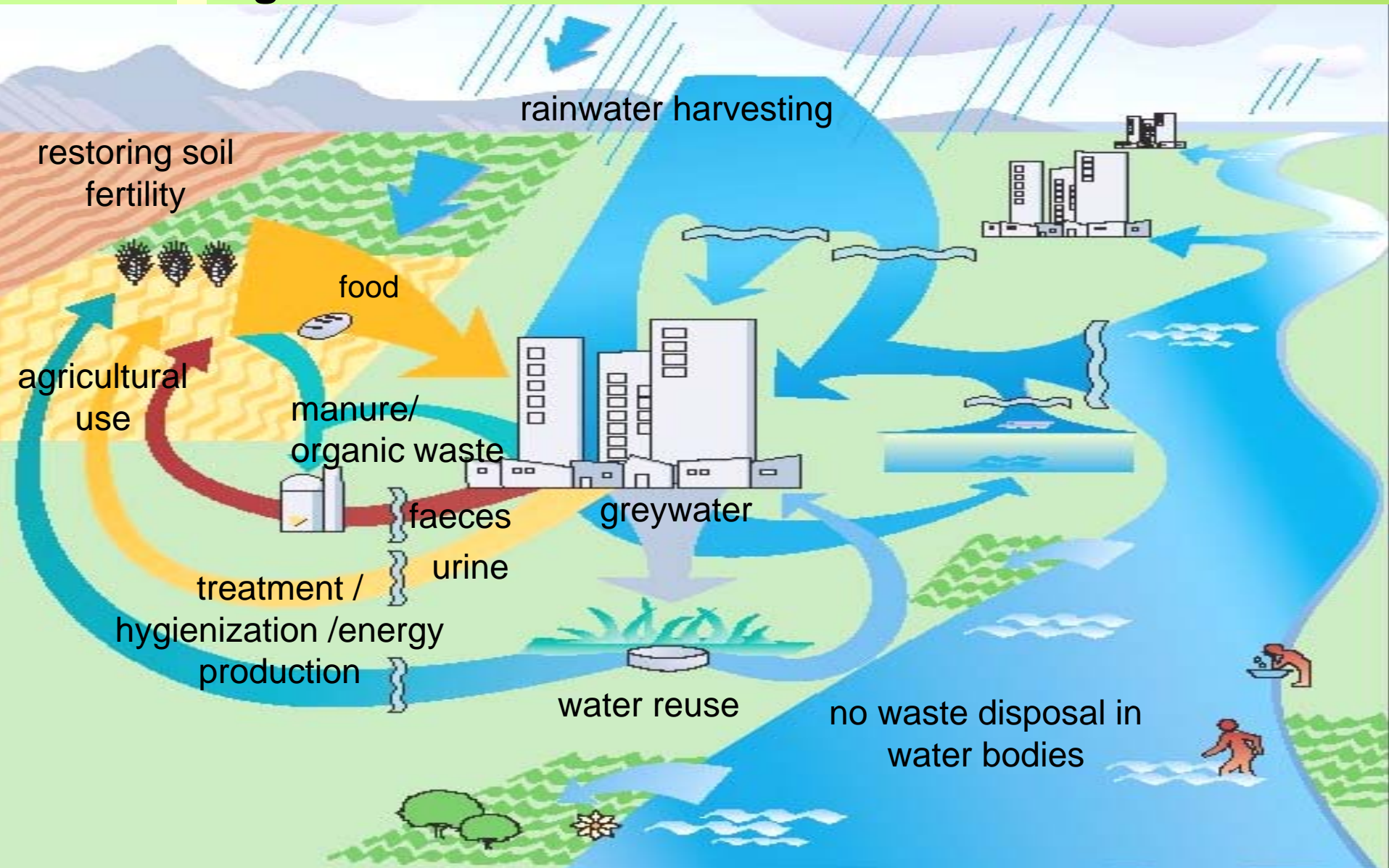


Introduction to ecosan shortcomings of conventional „drop and store“ sanitation

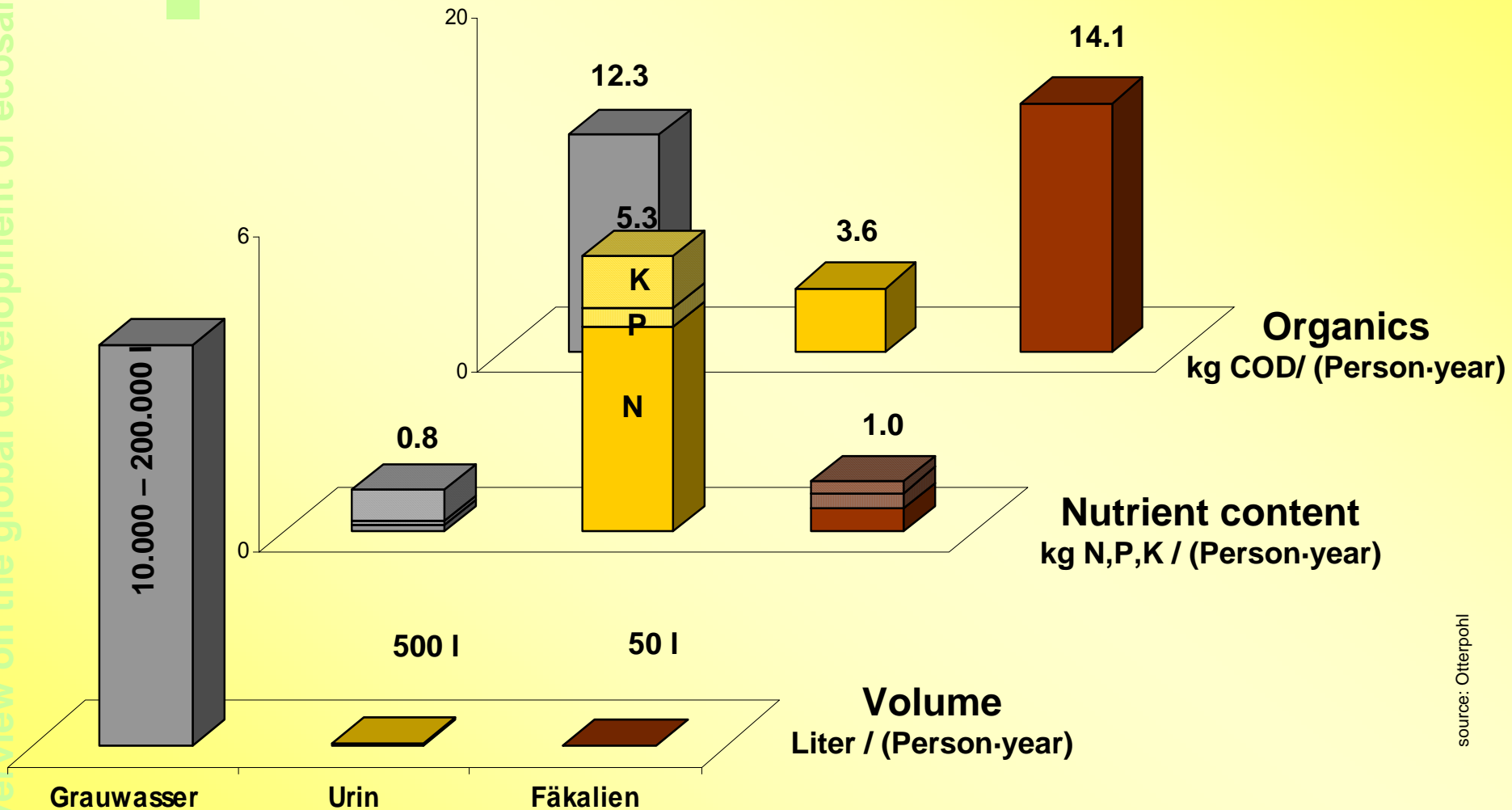




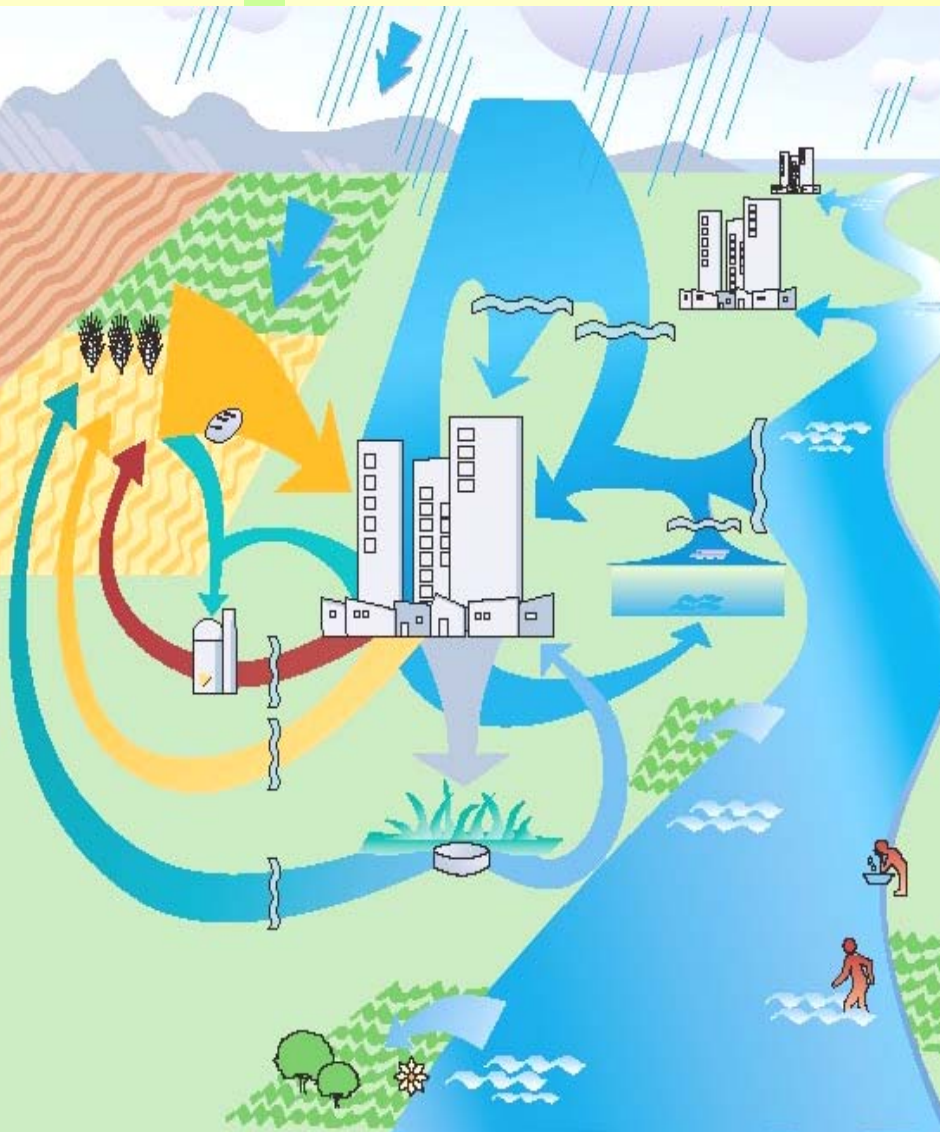
Introduction to ecosan closing the loop between sanitation and agriculture



Overview on the global development of ecosan



source: Otterpohl



- *Improvement of health by minimizing the introduction of pathogens from human excrements into the water cycle*
- *Promotion of safe, hygienic recovery and use of nutrients, organics, trace elements, water and energy*
- *Preservation of soil fertility, Improvement of agricultural productivity*
- *Conservation of resources*
- *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***

ecosan is not a specific technology, but a new philosophy - based on an eco-system-oriented view of material flows.

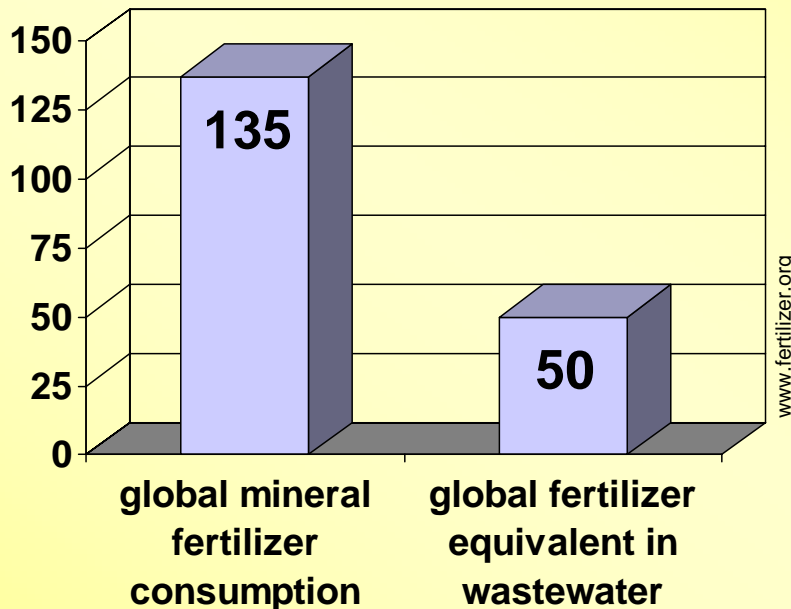
It considers human excreta and waste water not as wastes but as natural resources

It applies the basic natural principal of closing the loop by using modern and safe sanitation and reuse technologies

excreta are a valuable resource

Overview on the global development of ecosan

million tons
per year
(as N + P₂O₅ + K₂O)



- *more than 1/3 of global mineral fertilizer consumption can be covered by the reuse of human excreta*
- *over 15 billion US\$ fertilizer equivalent are annually flushed down the toilet*



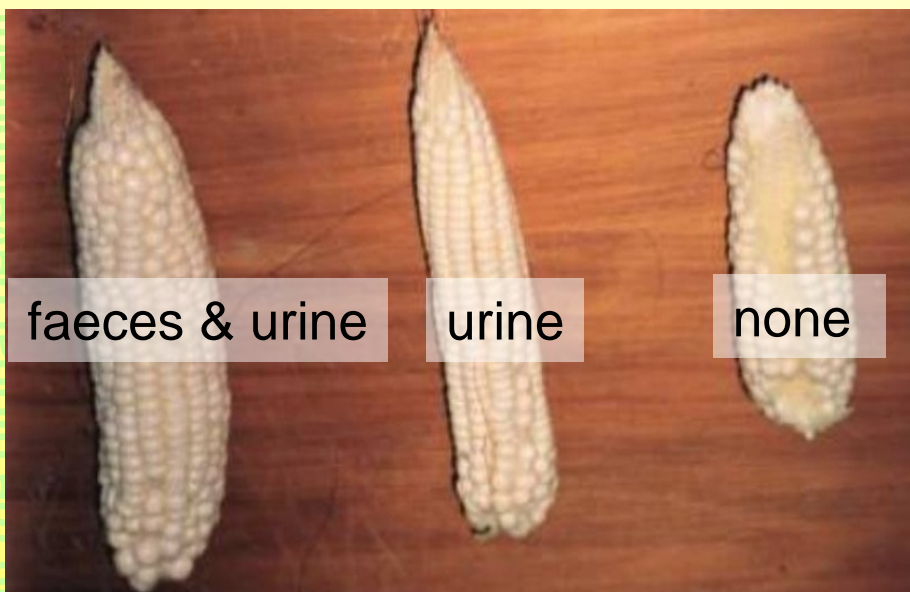
source: Petter Jenssen

- recovery of energy content
(covering about 20% of cooking energy needs for a typical family in a developing country)
- energy savings in fertilizer production & wastewater treatment

- reuse of water

benefits of ecological sanitation

- restored soil fertility through nutrient reuse



source: Vinnerås, 2003

- improved soil quality through reuse of organics



source: Petter Jensen

after one week without water

- *safe sanitation*



source: Johannes Heeb

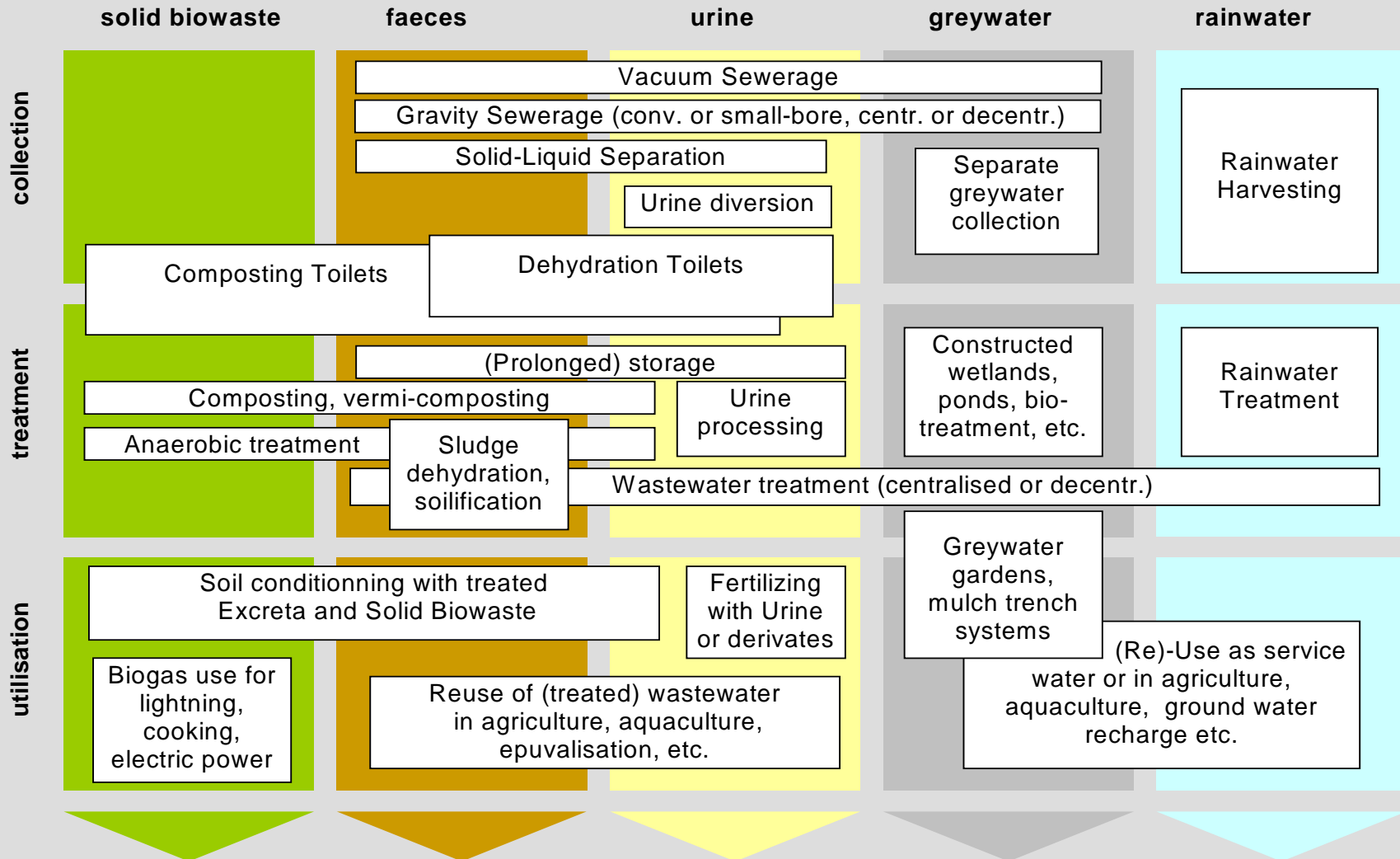
ecosan-toilets in Bangalore, India

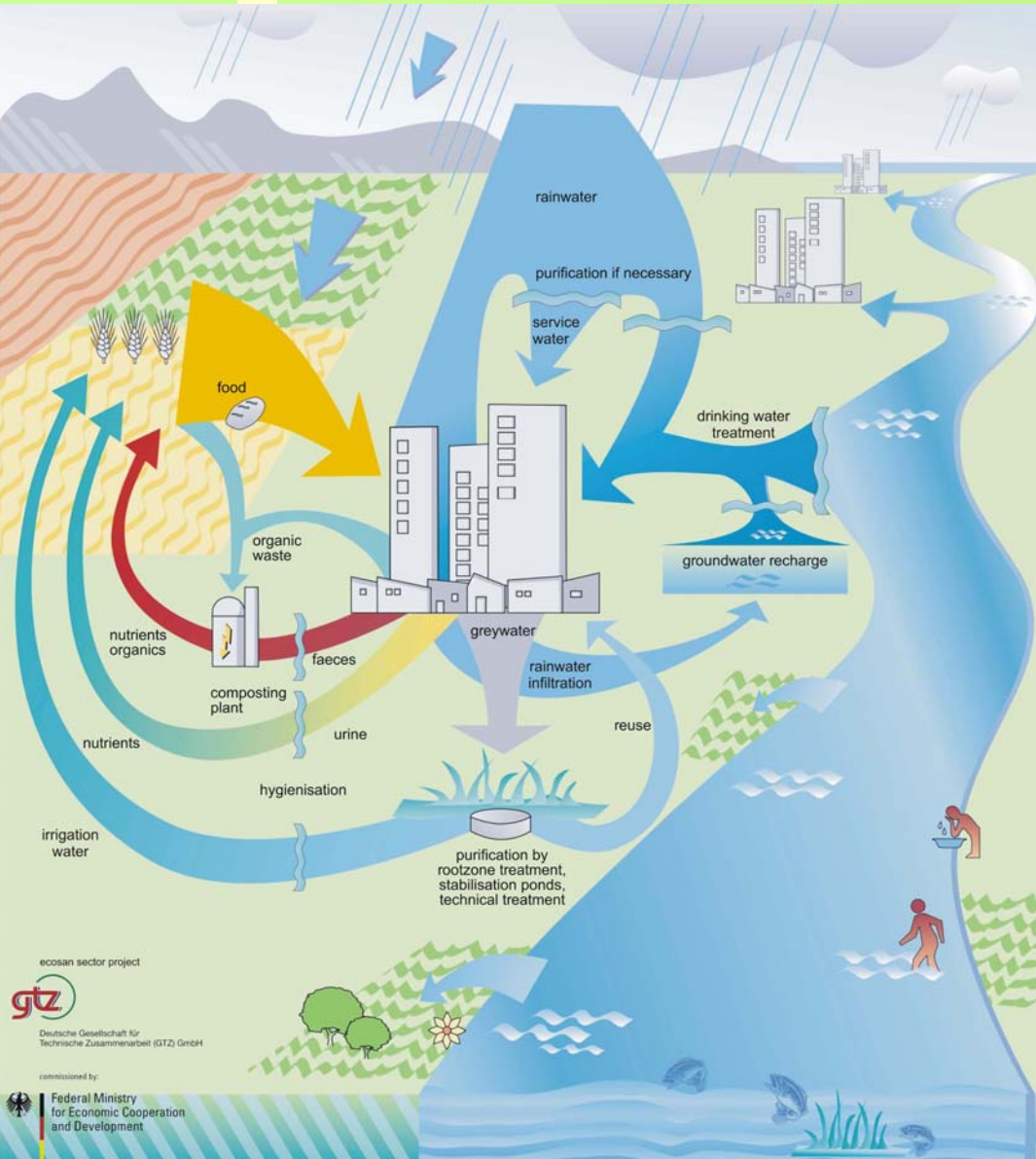
- *healthy environment*



source: www.virtualmuseum.ca

overview of ecosan technology-components





IWRM (Integrated Water Resources Management)

is a process which promotes the co-ordinated 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**.

Definition of the GWP

Refreshment on the “10 Recommendations for Action”

“10 Recommendations for Action“from 2003 Lübeck conference to accelerate the promotion and up-scaling of ecosan :

10 Recommendations for Action
from the Luebeck Symposium
on ecological sanitation, April 2003



1. Promote ecosan-systems as preferred solutions in rural and peri-urban areas
2. Accelerate large-scale applications of ecosan principles in urban areas
3. Promote agricultural use
4. Raise awareness and create demand
5. Ensure participation of all stakeholders in the planning, design, implementation and monitoring processes
6. Provide for decisions on an informed basis
7. Promote education and training for ecosan
8. Adapt the regulatory framework where appropriate
9. Finance ecosan
10. Apply ecosan principles to international and national Action Plans and Guidelines



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

ecosan toilet pedestal and squatting pan



(source: SIDA)

China

1,02 million urine diversion toilets have been installed since 1997 [1997: 70; 1998: 10.000 2003: 650.000 UDDTs]

Four in One closed loop systems



Biogas 4-in-1 and 3-in-1 closed loop systems are installed in more than 10 million households. Currently a total of 14,2 million biogas-sanitation units exist (equal to 5,7% of country side toilets in China)

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

Europe

- On site ecosan systems get increasingly popular where a connection to a centralised network is too expensive



Farm with ecosan-biogas system, Germany



Source: Waldmichelbacherhof

Latin America

- Ecosan-systems being planned or implemented in Bolivia, Chile, Costa Rica, Cuba, Ecuador, El Salvador, Nicaragua, Mexico, Peru...

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

Rural upgrading at Paje, Botswana



Source: gtz-ecosan

Africa

- Ecosan urine diversion toilets successfully introduced in sub-Saharan Africa - Benin, Botswana, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Mozambique, Senegal, South Africa, Togo, Uganda, Zimbabwe.....
- EU-ACP and EU-Research programmes assist in up-scaling

Public Toilet, Bangalore, India



Source: Petter Jenssen

Asia (other than China)

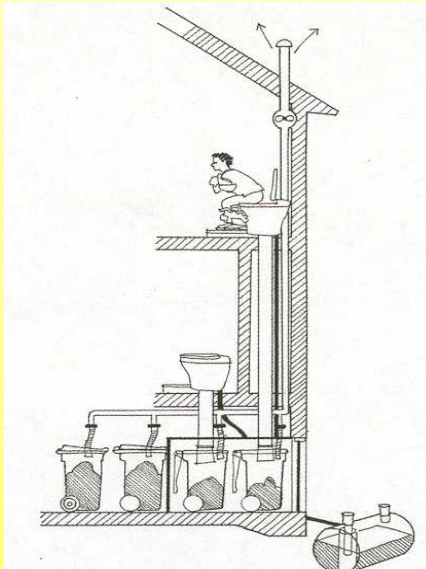
- A variety of ecosan systems being tested and optimised in the Vietnam, Philippines, India etc.

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

Sweden: urine diversion has been used since the 1980 in several urban housing areas for families in the Stockholm area:

- Palsternackan (50 apartments)
- Understenshöjden (44 apartments)
- Gebers (30 apartments)
- Kullan (250 apartments)

Gebers Building and system sketch, Sweden



Gebers system sketch
(Graphic: SEI)



Gebers Building
(Photo.: VERNA Ecology Inc.)

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

In the last three years several large-scale ecosan systems have been planned or implemented in urban areas



Source: EcoSanRes



Source: EcoSanRes



Source: EcoSanRes

The ERDOS Project

- 800 households in 1-, 2- and 4-story buildings completed in 2006
- dry urine-diverting toilets
- urine collection and recycling
- dry faecal collection, sanitisation and recycling
- greywater collector, treatment & reuse
- kitchen organics collection, composting and recycling
- ECO STATION

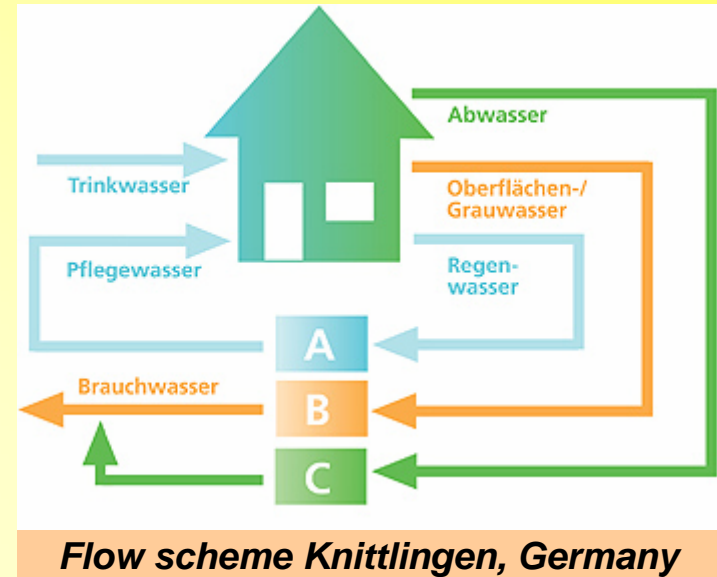


Source: EcoSanRes

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

Germany:

- Knittlingen (100 homes) with semi-centralised bio-membrane treatment and reuse
- KfW office buildings (7 storeys, 300 workplaces and 13 apartments) on downtown Frankfurt with vacuum blackwater collection, greywater bio-membrane treatment and reuse



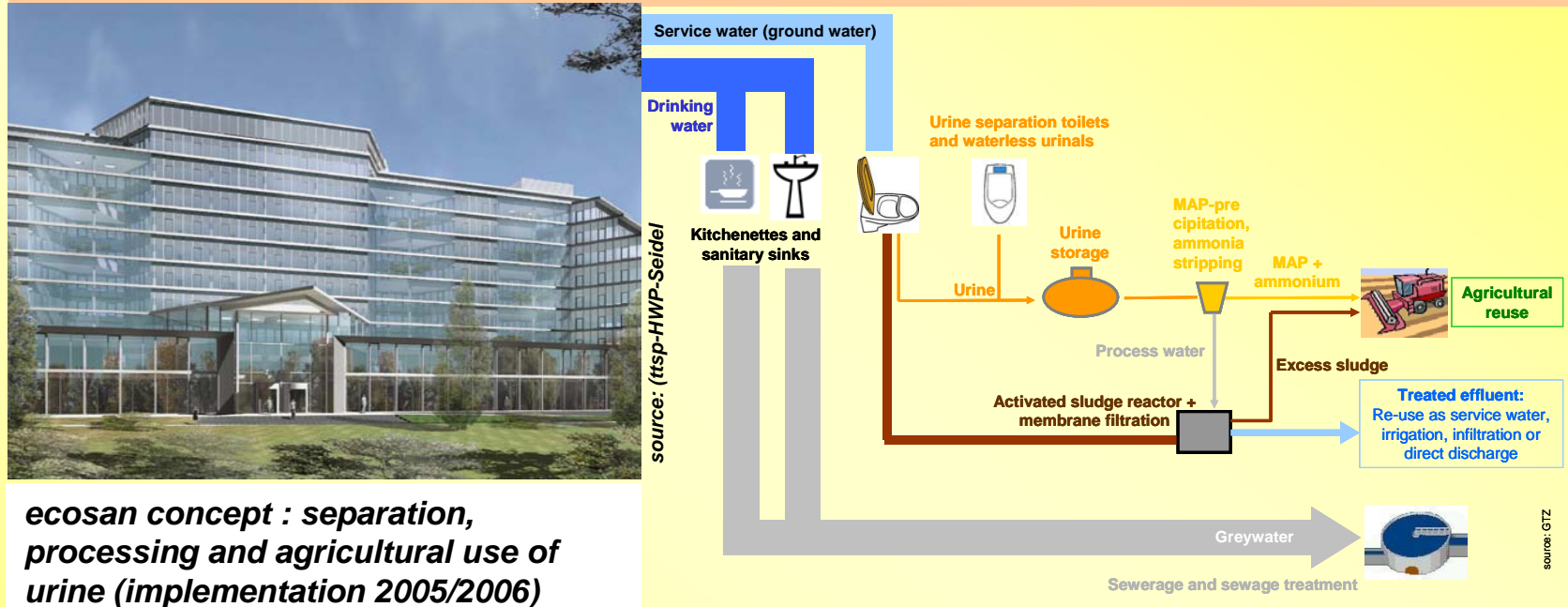
Elements from the sanitation system, KfW offices, Frankfurt, Germany



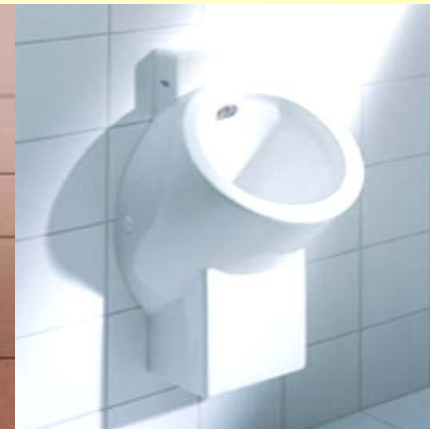
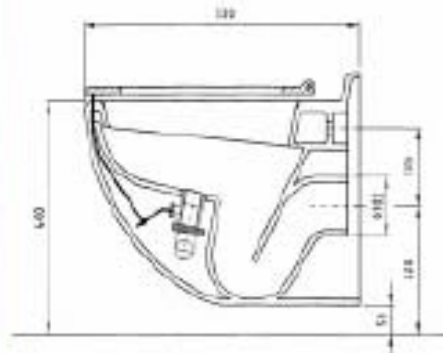
Source: KfW, GTZ-ecosan

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

GTZ's office main building, Eschborn, Germany



ecosan concept : separation, processing and agricultural use of urine (implementation 2005/2006)



urine diversion toilets and waterless urinals

Source: Roediger, GTZ-ecosan

Overview on the global development of ecosan

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

Solar City Linz, Austria

- *New constructed urban setting for 3500 inhabitants*
- *Separate collection of urine and brownwater*
- *Onsite treatment of brownwater*
- *Agricultural reuse of urine*



Urine tanks (photo: Otterwasser GmbH)



Buildings (photo: Otterwasser GmbH)

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

Huber Company, Berching, Germany

- *Huber company: manufacturer of wastewater treatment technology*
- *Office building of Huber company, 200 staff,*
- *Urine separation toilets, waterless urinals*
- *Separate collection of urine, brownwater and greywater*
- *Development of technology for treatment of urine, brownwater and greywater*

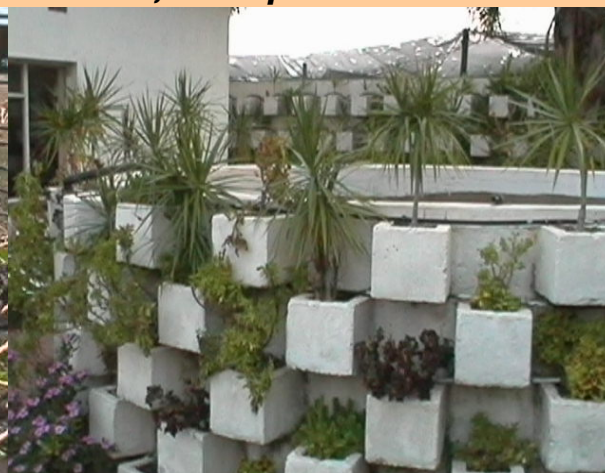


2. Accelerate large-scale applications of ecosan principles in urban areas

Ethiopia:

- Ecosan systems to be designed and implemented as part of a low cost housing programme where 10.000 homes are to be constructed per year

Low cost housing and urban agriculture, Addis Abeba, Ethiopia



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

Urine Diverting Public Toilets in Bangalore, India

Ecosan public toilet, separate collection of urine, washing water and faeces, co-composting of faeces with paper and organic waste, urine and anal cleansing water for fertilizing and irrigation of a banana plantation



Overview on the global development of ecosan

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

- Further examples exist e.g. in the Philippines and Shanghai
- Urban applications of ecosan are now receiving more attention



3. Promote agricultural use

- Farmer acceptance for agricultural use has proven unproblematic, but sometimes consumer perceptions are being a concern
- The need to carefully manage the finite resources (part. phosphorus) has added an extra impetus to the necessity of nutrient recovery
- The resulting increase of agricultural production is the best promotion of the use of ecosan products

Havana, Cuba



Study of options for reuse of urine and faeces in existing urban agriculture in Havana

Source: GTZ-ecosan

3. Promote agricultural use

Philippines



Allotment gardens cum ecosan system for 100 poor families in Cagayan de Oro, Philippines

Source: Robert Holmer, Xavier University, Ph.

Construction and inauguration of the UDD-Toilet



3. Promote agricultural use



One part of addressing consumer concerns is to minimise the risks of disease transmission when using treated excreta in agriculture

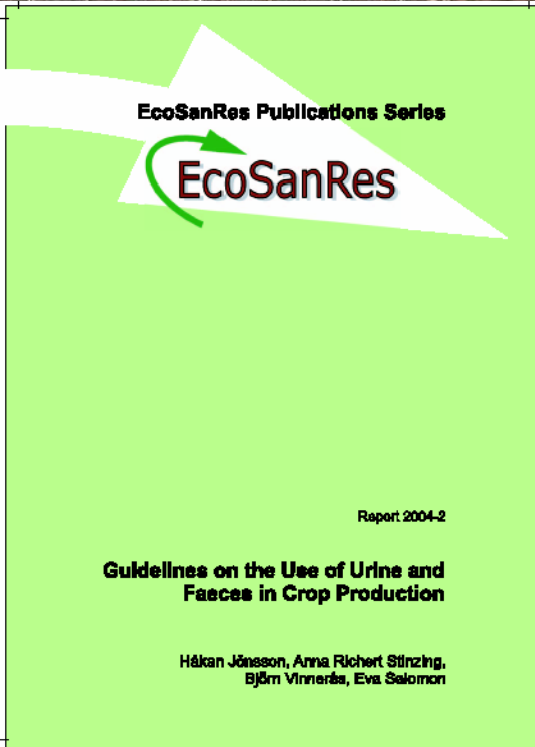
Technical support

- Guidelines on the safe use of urine and faeces in ecological sanitation systems (SIDA/EcoSanRes, 2004)
- Guidelines on the use of urine and faeces in crop production (SIDA/EcoSanRes, 2004)



Set of new WHO guidelines

- ... on the safe use of wastewater in agriculture (2006)
- ... on the safe use of wastewater in aquaculture (2006)
- ... on the safe use of excreta and greywater (2006)



Overview on the global develop

4. Raise awareness and create demand

Increased awareness has led to greater demand for ecosan systems

At International Level

- Recognised by UNSGAB and in recent WHO guidelines as a sanitation approach which can reduce poverty
- Recommended in the recent annual sessions of the United Nations CSD meetings at the UN Headquarters in New York



WASH Forum, Dakar

Source: wsscc

- Included e.g. in the Dakar statement from the Global WASH Forum, 2004, and in the UNSGAB - Hashimoto Action Plan, 2006
- More international organisations becoming involved in ecosan (e.g. UNESCO, WHO, UNDP, EuropAid)

4. Raise awareness and create demand

GTZ ecosan newsletter

(Published in Chinese, English, German, French and Spanish, Readership of over 10 000 people)

ecosan – newsletter – no. 16 – 5/2005 – deutsch

Dies ist ein regelmäßiger news-Service des GTZ-ecosan Projektes für ein Netzwerk von Freunden und Fachleuten, die in Initiativen und Projekten zum Thema kreislauforientierten Abwassermanagements arbeiten.

Willkommen beim GTZ-ecosan-Newsletter, Ausgabe Nr. 16!

Diese Ausgabe wird nur in der englischen Version per e-Mail im Nur-Text-Format verschickt. Zusätzlich bieten wir Ihnen aber wieder die Möglichkeit, eine Version im komfortablen PDF-Format auch auf Spanisch, Französisch, Deutsch, Englisch wie auch auf Chinesisch von unserer Webseite herunterzuladen.

!!! Downloads:

- Deutsch: <http://www2.gtz.de/ecosan/download/n16dt.pdf>
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- Englisch: <http://www2.gtz.de/ecosan/download/n16eng.pdf>
- Chinesisch*: <http://www2.gtz.de/ecosan/download/n16cn.pdf> [ab ca. Juni 2005]

* Die of

Articles in magazines, newspapers, television programmes etc.

Internet sites and web-based discussion fora

Liebe Kolleg/inn/en, liebe Freunde!

Overview on the go

4. Raise awareness and create demand

At National Level

- Initial information workshops lead to the establishment of interdisciplinary ecosan networks in several countries including e.g. Vietnam, the Philippines and India
- Multi-stakeholder meetings have highlighted the potential of ecosan (e.g. by WASTE in The Netherlands)
- Pilot demonstration projects have served to create demand all around the world



Source: Akbar Talebi

Awareness raising exhibition at a fair, Iran

Overview on the global development of ecosan

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



Water, Sanitation and Hygiene

Implementing the Bellagio Principles in Urban Environmental Sanitation Services:

Provisional Guideline for Decision-Makers

Prepared for SANDEC/WSSCC by
Kalbermatten Associates, Inc. Washington, D.C.



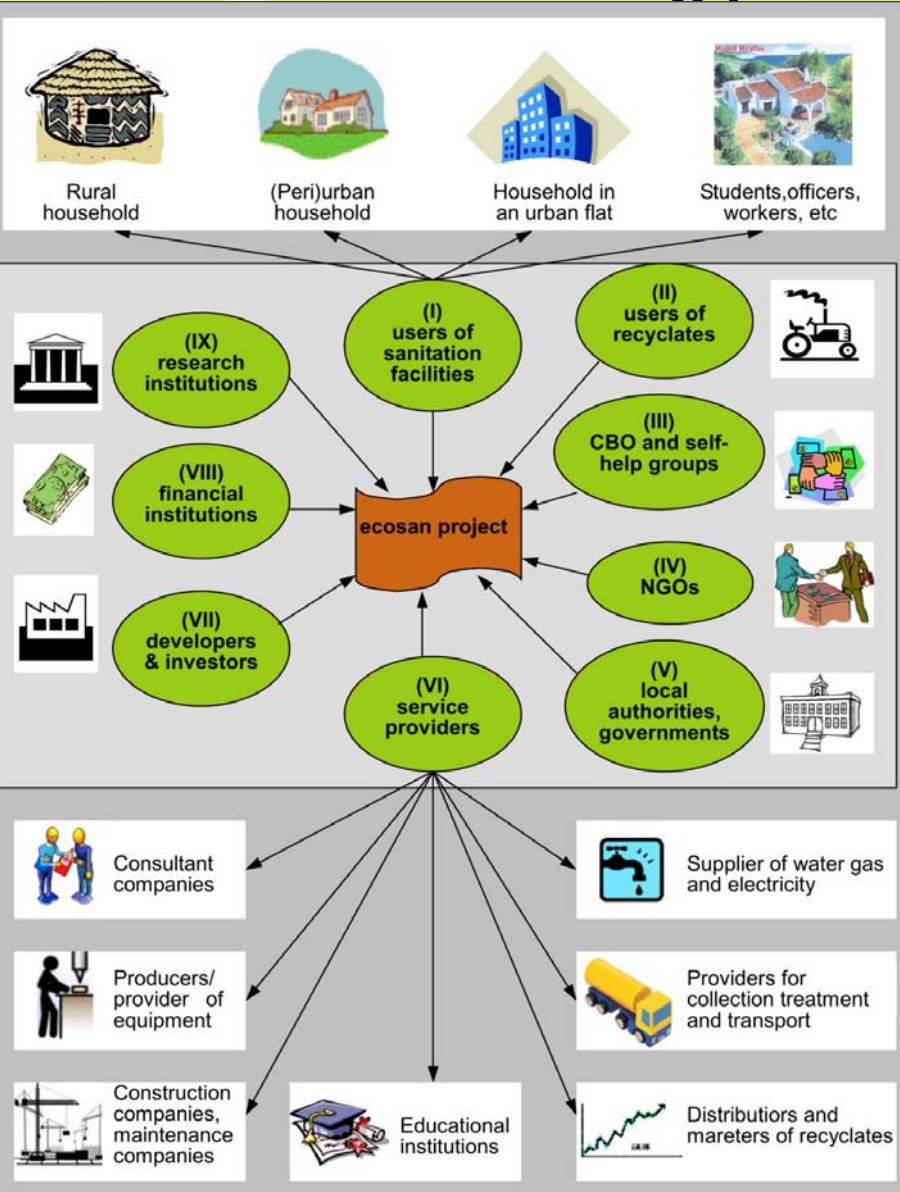
Water Supply and Sanitation Collaborative Council
May 2004



Publication support

- Guidelines for implementing the Bellagio Principles in urban environmental sanitation services - (HCES, as developed by the WSSCC, 2005)
- The ecosan source book (GTZ ecosan sector project, 2004)
- The publication “Open planning of Sanitation Systems” (Kvarnström and af Petersen, 2004)

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



Stakeholder analysis with a focus on the household level

- Adoption of participatory approaches is useful in almost all ecosan projects and programmes

workshop on a village level, Botswana



Source: GTZ-ecosan

6. Provide for decisions on an informed basis

At local level

- At local level numerous workshops with presentations from both local and international practitioners have helped get ecosan activities off to a start (Benin, Botswana, Burkina Faso, Chile, China, Costa Rica, Ecuador, Eritrea, the Netherlands, India, Iran, and many other countries)
- Experiences and material for such workshops are available



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

6. Provide for decisions on an informed basis

Overview on the global development of ecosan

data sheets for ecosan projects
sector project: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

KfW office building, Germany

Vacuum sewerage and greywater recycling
Office building of the KfW Bankengruppe
Frankfurt am Main, Germany

1 General Data
Type of Project: New office building in urban area
Project Period: Start of operation: November 2002
Project Scale: 300 workstations and 13 apartments
Address: Parkhausstraße 5-9, 60325 Frankfurt am Main, Germany
Planning Institution: Bankengruppe Frankfurt AG
Executive Institution: KfW Bankengruppe, Frankfurt am Main

2 Objective of the project
Improvement of KfW's in-house environmental balance
Reduction of operation and maintenance costs through water saving and recycling
Demonstration of innovative technologies in technology concepts of wastewater management

3 Location and general conditions
The KfW, among other activities, is a financial institution and accompanying consulting services in developing countries in behalf of the German Ministry for Economic Cooperation and Development (GIZ)

4 Technologies applied
60 vacuum toilets, 20 vacuum urinals, vacuum pipes and a vacuum pumping station are installed in the building
Greywater from hand washing, cleaning and showers is collected in a separate greywater system
Greywater is treated in a compact sewage sludge reactor combined with membrane filtration. The membrane is...

12/01/2005

data sheets for ecosan projects
ecosan sector project: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Ecological housing estate Lübeck - Flintenbreite

Lübeck, Germany

1 General Data
Type of Project: Urban upgrading of an ecological settlement project
Project Period: Start of planning: 1995, Start of construction: 1999
Project Scale: 1171 apartments in 5 main houses, terraced houses and blocks of flats, approx. 350-360 inhabitants
Address: Hinterstraße 4, 23554 Lübeck
Planning Institution: Oltmanns GmbH, Engelstraße 81, 23552 Lübeck
Executive Institution: Hansradt GmbH & Co KG, Flintenbreite 4, 23554 Lübeck

2 Objectives of the project
To serve as a demonstration project for the German Federal Ministry of the Environment and as a pilot project for the Hansradt Lübeck for ecological, social and economical sustainable urban development

3 Location and general conditions
The settlement is not connected to the public wastewater system. The wastewater is collected and treated in an internal cycle
The sewerage of roofs and sealed areas is collected in small gutters and distributed to the groundwater in decentralized sewers
In the nonvacuum sewage toilets with a very low water consumption (0.7 - 1.2 l per flush) are installed

4 Technologies applied
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12/01/2005

technical data sheets for ecosan components
sector project: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Draft version: Dehydration toilets

Dehydration toilets

- Wastewater toilet systems
- Treat excreta by creating dry conditions, increasing pH, ventilation and addition of dry absorbents
- Produce a material easy and safe to handle
- Allow use of faeces and urine as fertilizer soil conditioner
- Suitable for most climatic conditions, best in dry and/or hot climates

A.1 General description
Types of dehydration toilets:
B.1 Double vault with urine diversion
B.2 Single vault with urine diversion
B.3 Without urine diversion
B.4 With movable containers
B.5 Traditional dish, pot in Yemen

A.2 Available technology
Many alternative ways of dehydration toilets exist. Of course, the choice of a certain system depends on the local conditions. Several modifications can be made to enhance the process and to adapt it to the local conditions. The main technical data sheets for each system are listed in the technical data sheets for ecosan components.

Box 1 Favourable application conditions for vacuum technology

- Spatially populated urban areas
- High water prices
- Seasonal settlements
- Water scarcity
- Flat terrain
- Rocky soil, high groundwater table
- Shallow basins
- Not dependent on topography

Vacuum sanitary installations:

- High water prices
- Water scarcity
- Difficult construction conditions
- Nutrient and energy recycling is desired
- Lateral reconstruction should be possible

12/01/2005

technical data sheets for ecosan components
sector project: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Draft version: Vacuum Technology

Vacuum Technology (Low pressure systems)

- Sewage transport in low pressure system
- Water savings up to 80%
- Possibility to collect concentrated backwater for further treatment (biogas production)
- High flexibility of the system

A.1 General description
Types of vacuum technology:
B.1 Vacuum sewer systems
B.2 Vacuum sanitary installations

A.2 Available technologies
Vacuum technology is mainly applied in decentralized sewerage schemes and for sanitary installations in building sewage engineering

Box 2 Favourable application conditions for vacuum technology

- In urban drainage systems technology is a possible alternative to separate sewer systems, where stormwater is collected separately in a central chamber, sewers and a vacuum station. Vacuum sanitary installations consist of vacuum toilets, urinals, water closets, showers, bidets, washbasins, sinks and sumps. In case of large scale application there also has to be a central vacuum station, for small scale application a special kind of vacuum pump is absolute sufficient
- Keep the high standard in urban drainage and bathroom equipment. Thus the users don't need to change their habits. Of course it requires correct construction, maintenance and changeover. If these conditions can't be guaranteed, the system appears problematic
- Vacuum sewerage systems are not likely to replace gravity sewers in general, because of their necessity to be operated and cleaned in a sophisticated way
- Mechanical installations are more liable to break down than simple sewerage structures. Nevertheless, in many situations, the advantage offered by vacuum sewer systems will justify their applications. (see Box 1)

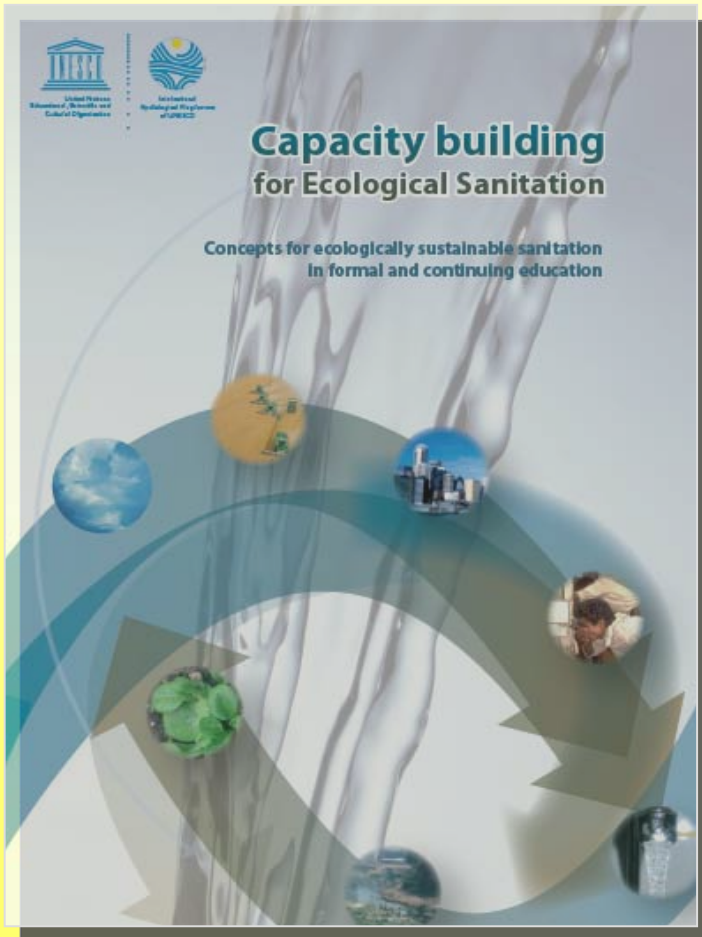
12/01/2005

ecosan project data sheets
available information gained from the existing wide range of pilot projects and interesting case studies

ecosan technical data sheets
a range of data sheets on specific ecosan technology modules with detailed practical information

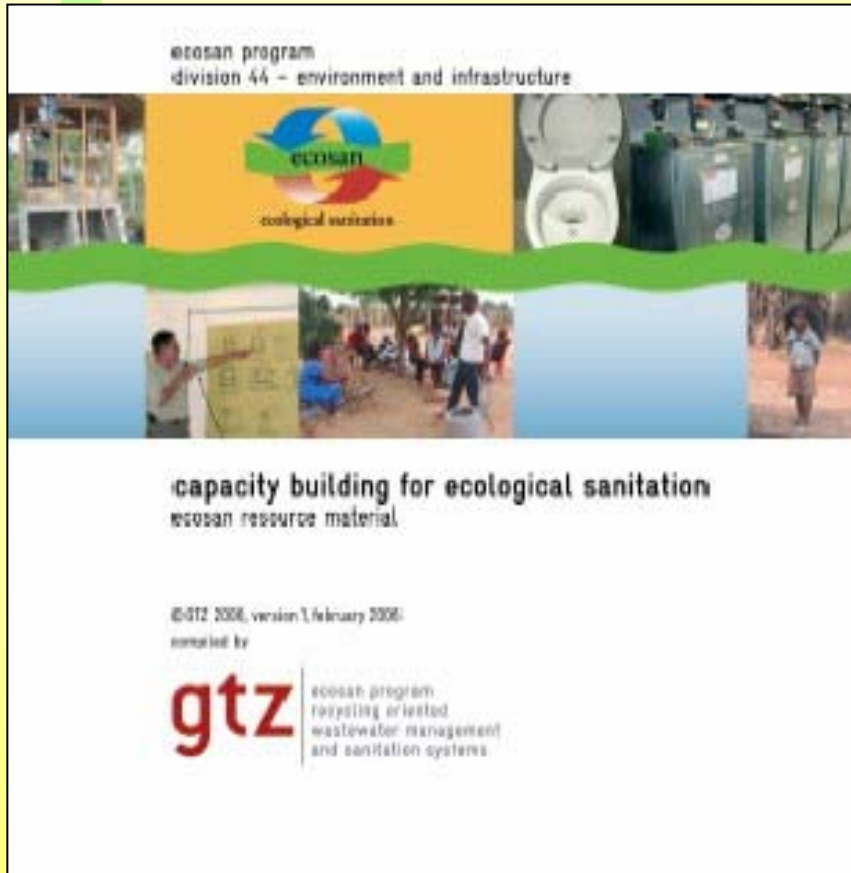
7. Promote education and training for ecosan

Lack of capacity is presently regarded as a crucial factor to meet the increasing demand for implementation of ecosan systems! To joint initiatives are to be mentioned:



- Published in 2006 by the International Hydrological Programme (IHP) of **UNESCO** and Deutsche Gesellschaft für Technische Zusammenarbeit GmbH 
- can be downloaded from **www.gtz.de/ecosan**
- can be ordered from BMZ/GTZ ecosan programme
E-mail: ecosan@gtz.de

7. Promote education and training for ecosan



The CD-Rom „capacity building for ecological sanitation“ is the result of the **joint effort of many institutions** and provides support for academic institutes, training organisations and individuals in developing training and education material for ecological sanitation.

7. Promote education and training for ecosan

In most universities, vocational trainings and schools, ecosan is not yet present on the curricula –

however some institutions have included or plan to include ecosan in their education programmes or are offering special courses on ecosan – e.g.:

- SIDA/EcoSanRes: Professional Training at International Courses
- Norwegian University of Life Sciences: ecosan summer school and courses for students and professionals
- CREPA: ecosan training courses for sanitary professionals in francophone Africa
- Philippines Xavier University: ecosan training courses for students and sanitary professionals
- UNESCO-IHE: ecosan training and e-courses
- German Water Association DWA (training courses for professionals in preparation); TUHH, Bauhaus Univ. Weimar, ...; BMZ/GTZ ecosan programm
- India IESNI; WASTE, ..., ..., ...



8. Adapt the regulatory framework where appropriate

The adaptation of existing regulatory frameworks - a slow process!

- **Recent developments....**
 - WHO Guidelines on the safe use of wastewater, excreta and greywater
 - EcoSanRes set of ecosan related guidelines
 - German Association for Water, Wastewater and Waste (DWA) working group that will look into what changes may be necessary in technical standards to accommodate ecosan systems
 - GTZ ecosan technical data sheets help to form a base line against which standards for ecological sanitation can be set
- ...can form basis for new or updated regulatory frameworks**



9. Finance ecosan

- Budgets for ecosan have been increased e.g. in German, Swedish and Dutch bilateral **development co-operation**
- European **Water Facility** for African, Caribbean and Pacific (EU-ACP-WF) welcomed particularly proposals containing ecosan
- MEDA, ROSA, NETSSAF are **EU-Research projects** which aim in further developing and up-scaling ecosan approaches
- Some **private companies** (e.g. the German based Hans Huber AG and Roediger Company) having recognised market potential - are investing in the development of innovative systems for the international market
- Several **private manufacturers** of dry toilets, waterless urinals or biogas plants, based for example in South Africa, China, Philippines, Germany or Sweden have also been selling their products and consultancy overseas

Global development of ecosan



Wost-Man, Sweden



CAPS, Philippines



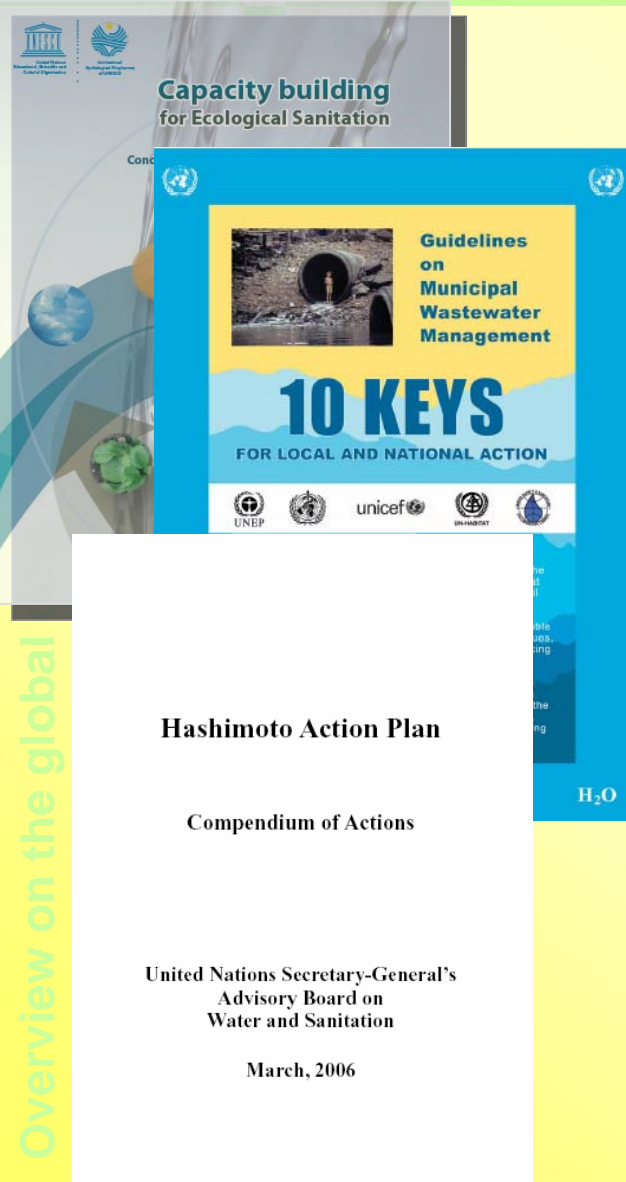
Roediger, Germany



Dubletten, Sweden

Source: Dan Lapid

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



- Ecosan strategies are now recommended by several UN-organisations and action plans.

They still have to be integrated into many national and international action plans including the Implementation Plans for the MDGs (Millennium Development Goals), PRSPs (Poverty Reduction Strategy Papers)

- It is hoped that with continuing high profile recognition of ecosan (e.g. UNSGAB, UN CSD, UNDP-PEP, new WHO guidelines) its integration into national strategies and up-scaling of existing projects will be accelerated

Conclusion

- Progresses have been achieved on all of the 10 Recommendations for Action
- Ecosan is seen increasingly as a serious, realistic, main-stream alternative to provide safe sanitation, improve health, protect water resources and soil fertility, and optimise resource management

Conclusion

- 9 years to go to reach the MDGs, and 2,6 billion people still without access to adequate sanitary facilities - the need for 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 sustainable sanitary provision

Participants of the 2nd international ecological sanitation conference, 2003



Thanks for your attention & interest!!!

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