ecosan experiences in German development cooperation – examples, obstacles and opportunities

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gtz ecosan program recycling oriented wastewater management and sanitation systems

commissioned by

Federal Ministry for Economic Cooperation and Development

Content

- need for alternative sanitation solutions
- objectives and activities of the BMZ/GTZ ecosan program
- ecosan in German development cooperation
- ecosan project examples
- Obstacles and opportunities

Source: Akbar Talebi

ecosan experiences in German DC

Bedarf an alternativen Lösungen für die Sanitärversorgung

- Das UN-Ziel der Halbierung der Zahl der Menschen ohne geregelte Sanitärversorgung kann mit herkömmlichen Lösungen alleine kaum erreicht werden.
- Alternative Ansätze werden dringend benötigt
- Die deutsche EZ betrachtet ecosan als einen Ansatz mit einem hohen Potential, zur Lösung der globalen (Ab)Wasserprobleme und zur Erreichung der MDGs beizutragen, und gleichzeitig positive Wirkungen auf Gesundheit, Bodenschutz, Ernährungssicherung, Umwelt- und Ressourcenschutz zu erreichen.
- Im Auftrag des BMZ führt die GTZ seit 2001 ein überregionales Programm für die Entwicklung und Verbreitung von ökologischen Sanitärsystemen durch.
- Neben dem überregionalen BMZ/GTZ ecosan Programm setzen vor allem regionale Projekte der GTZ, aber ebenso InWent, DED, und KFW, sowie integrierte CIM-Fachkräfte ecosan Maßnahmen um

aims of the BMZ/GTZ – ecosan program

- To promote the development and pilot application of holistic ecologically, economically and socially sustainable recycling- based wastewater and sanitation concepts in developing countries

- To contribute to the global dissemination and application of ecosan approaches and establish these as state-of-the-art techniques – in both, developing and in industrialized countries

key activities

BMZ/GTZ – ecosan sector program

Knowledge management and networking

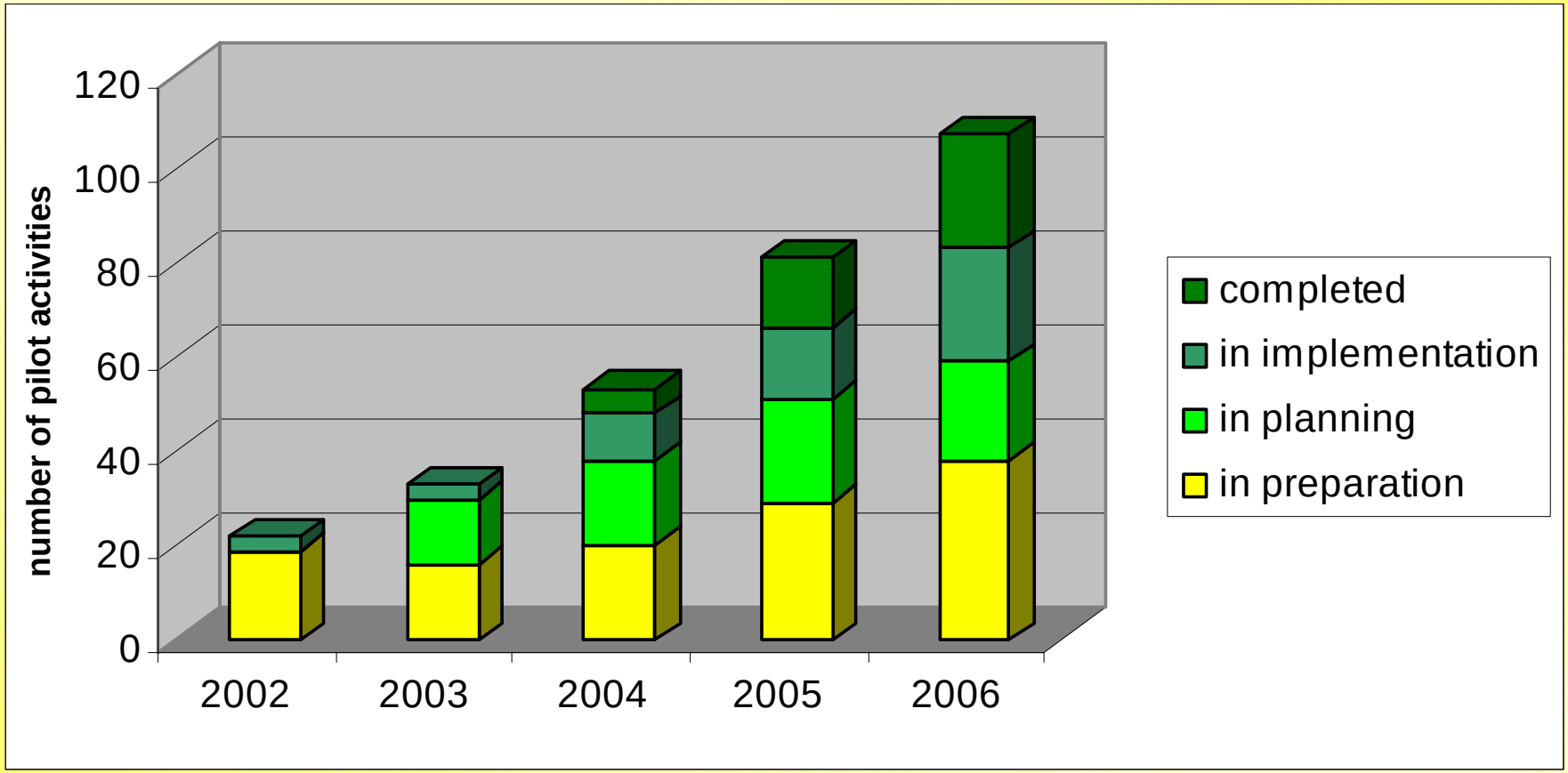
- ecosan e-newsletter (in 5 languages, readership of >10.000 people)
- ecosan web-site (www.gtz.de/ecosan)
- ecosan on-line literature data bank
- Publications: “Capacity building for ecosan”, brochures, posters, articles, films etc.
- Info-CD (material for teaching and training)
- ecosan project data sheets
- ecosan technical data sheets
- Conferences and workshops
- Contributions to German and international working groups

Support to ecosan implementation projects

- Awareness raising and information for closed loop sanitation systems
- Baseline and feasibility studies
- Detailed project planning
- Participatory decision making
- Training and capacity building
- Advisory services during project implementation
- Accompanying research
- Upscaling of projects and dissemination of experiences

milestones: pilot activities

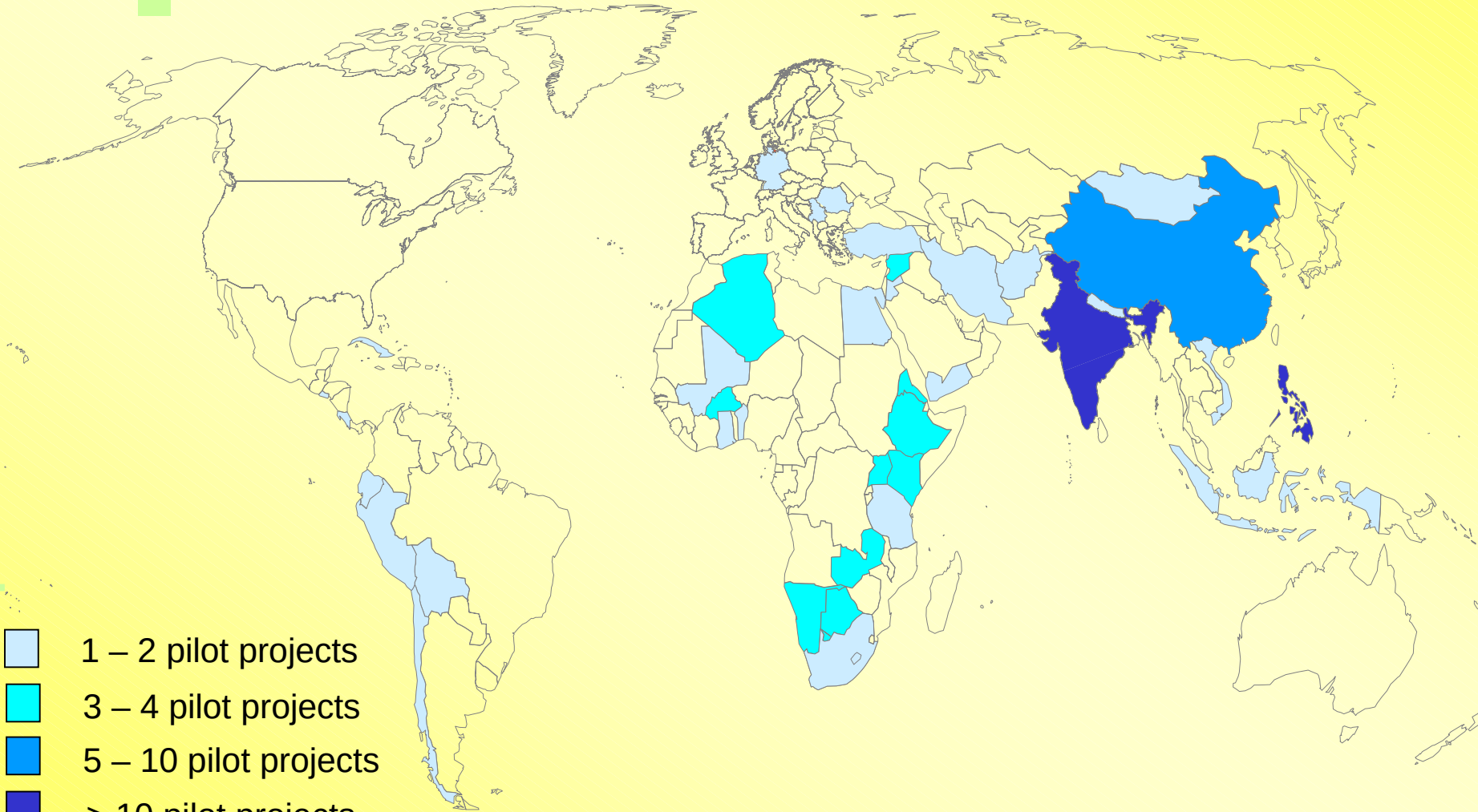
Status of ecosan pilot activities in German DC



15	26	38	39	41

number of countries with pilot projects

number per country of ecosan pilot activities supported by German DC



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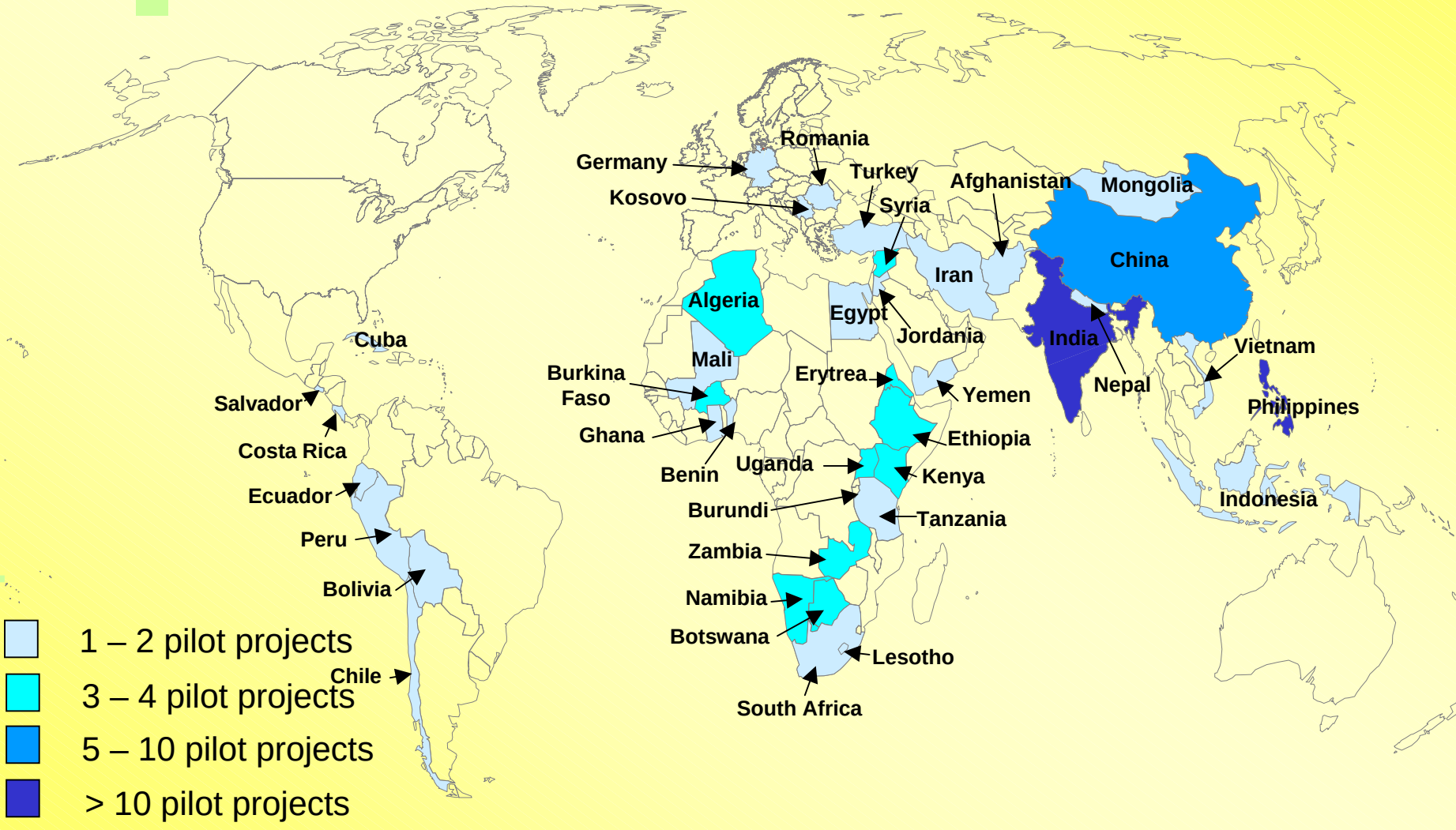
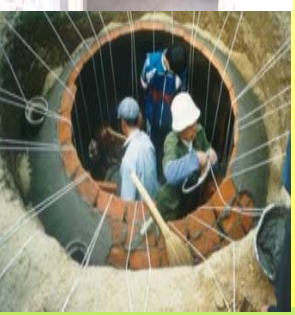


ecosan experiences in German DC

German DC and IC organisations active in the field of ecosan



German Federal Ministry for Economic Cooperation and Development (BMZ)

- GTZ (sector programme ecosan, regional projekts)
- KFW
- DED
- CIM
- InWent

German Federal Ministry for Education and Research (BMBF)

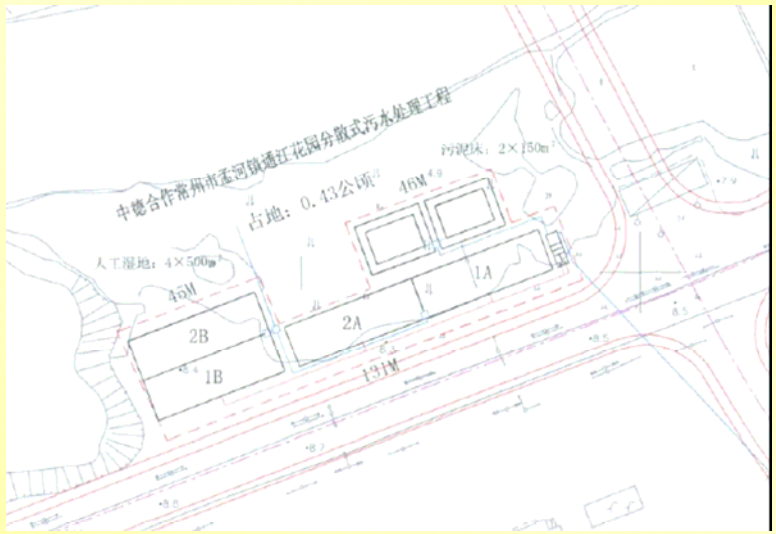
- Decentral water and wastewater program (e.g. Vietnam, Ghana)
- IWRM program (e.g. Namibia, Iran)

German Embassies

- Small Projects Fond (e.g. The Philippines, Syria)

ecosan in the eco-city program in Changzhou, China (supported by GTZ)

- Solid waste management
- Night soil treatment
- Constructed wetland for new housing area



ecosan project examples

Wastewater treatment ponds & reuse for irrigation, Peru (supported by KfW)

Treatment in wastewater stabilisation ponds (60 ha)

Wastewater from the City of Chiclayo (84.000 m³/a)

Irrigation of rize, forage crops etc. (2000 ha)

constructed wetland Haran-Al-Awamied, Syria (supported by GTZ)

Wastewater treatment with constructed wetland system:

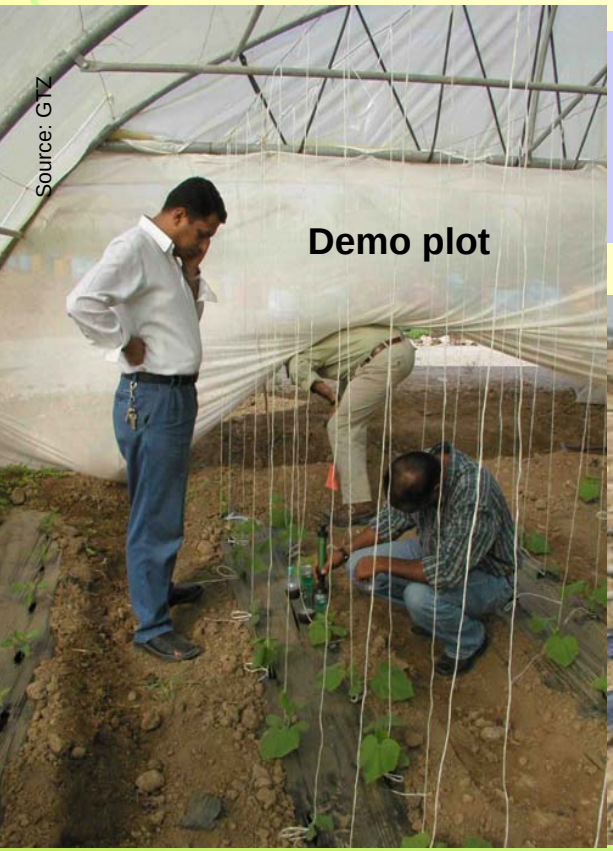
- Wastewater treatment through reed beds
- Sludge treatment through reed beds
- Treated wastewater used for irrigation purpose
- High efficiency for hygienization
- Small surface required: 0.5m$^{2/}$ per capita
- Low cost: 13.7 euro/person (construction), 1 euro per person every year (running cost)

Source: Mohamed

ecosan project examples

reclaimed water project in the Jordan Valley, Jordania (supported by GTZ)

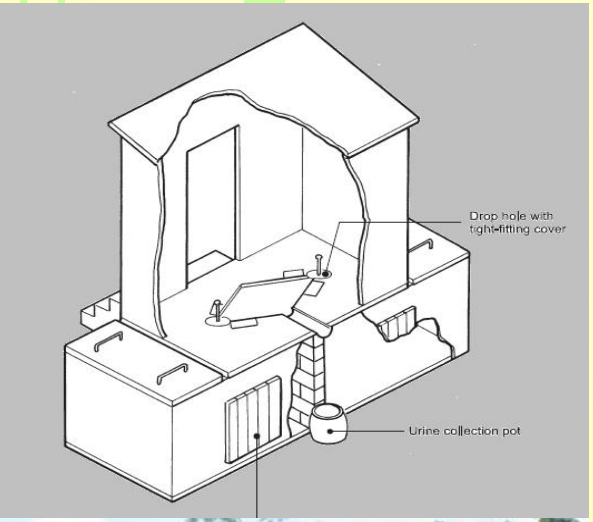
- Encouragement of the use of treated wastewater (reclaimed water) for irrigation as subsitute for freshwater
- Research on environmental and health impact
- Development of guidelines for safe use of the reclaimed water



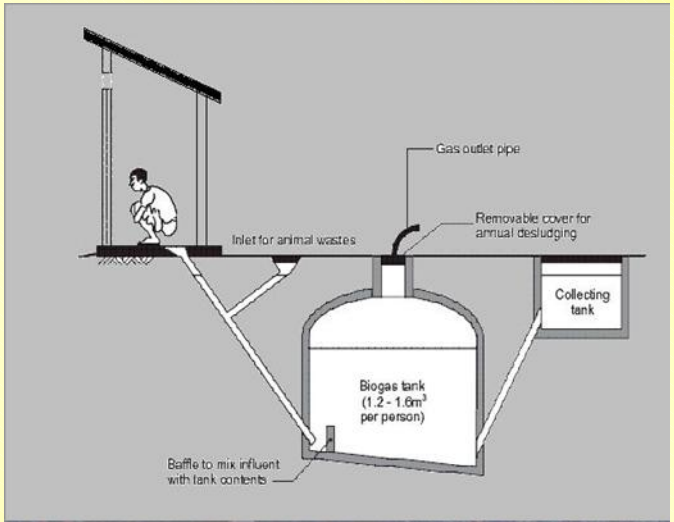
The Reclaimed Water Project monitors & evaluates agronomic and irrigation practices on 20 selected farm units

UDD-toilets, biogas systems, constructed wetlands and water reuse in the Phillippines (supported by GTZ)

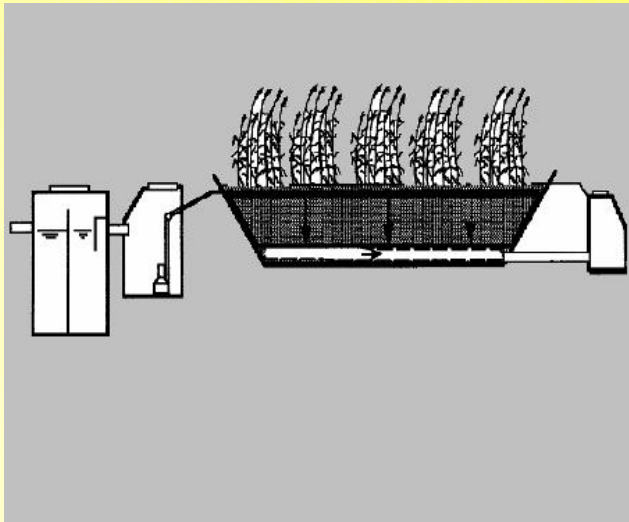
Urine Diversion Dry Toilet with Reuse



Anaerobic Treatment with Biogas Production



Constructed Wetland with Reuse Option

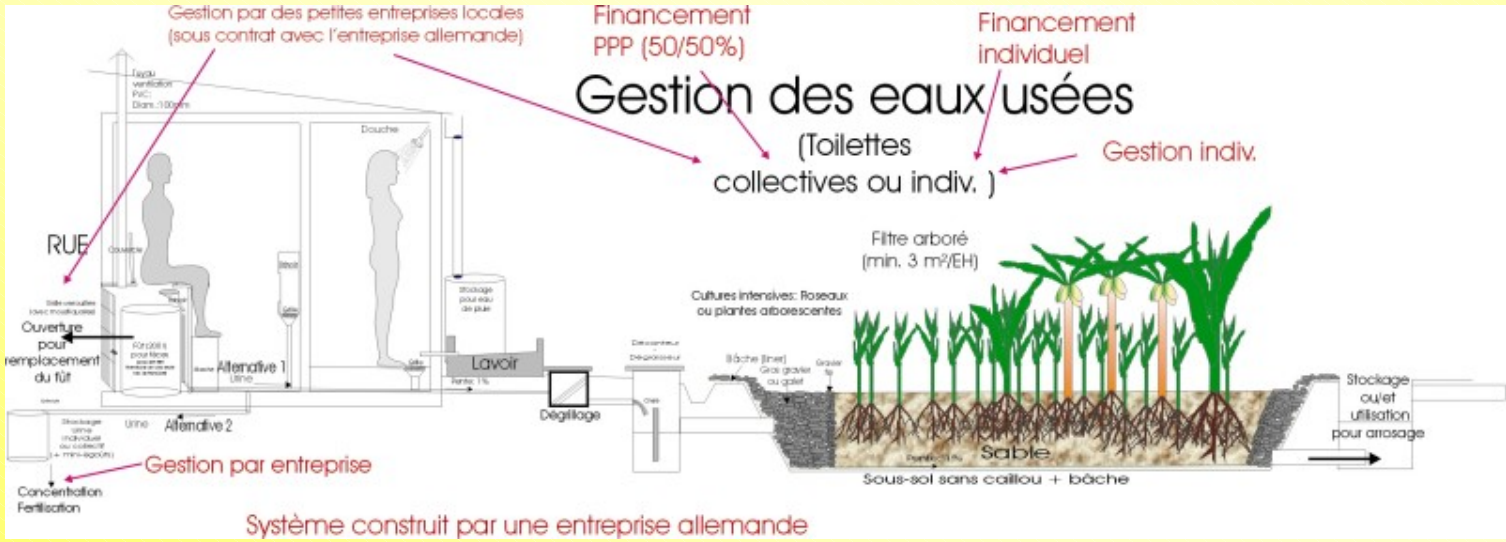


experimental on-site sanitation in Koulikoro, Mali (supported by GTZ)

experimental on-site sanitation module consisting of a urine diverting dehydrating latrine, shower and greywater garden

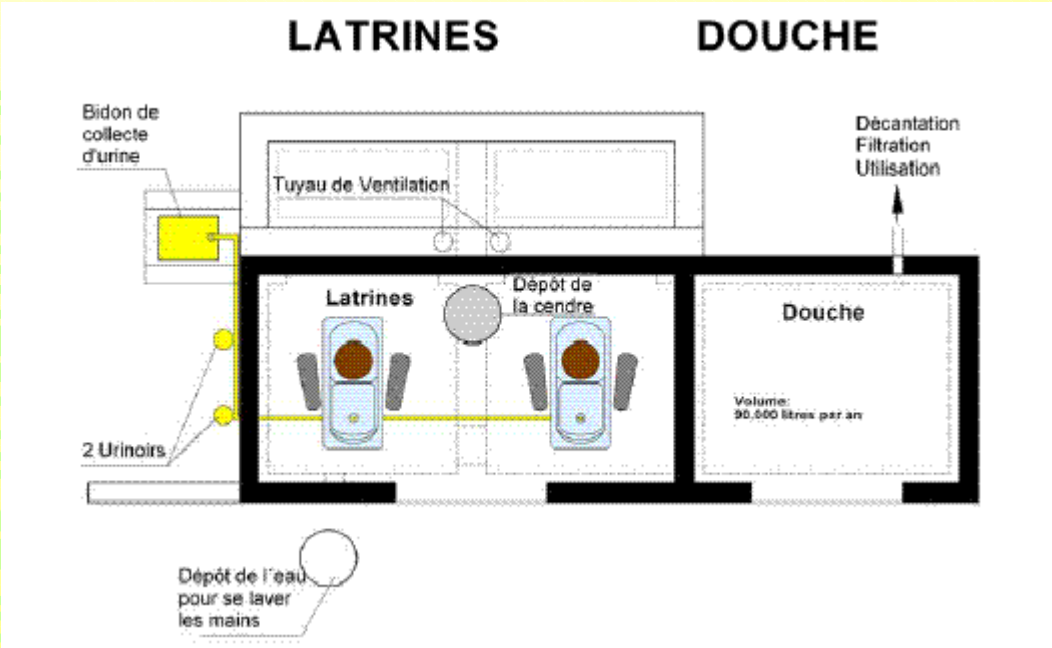
Urine diverting concrete slab

Greywater garden

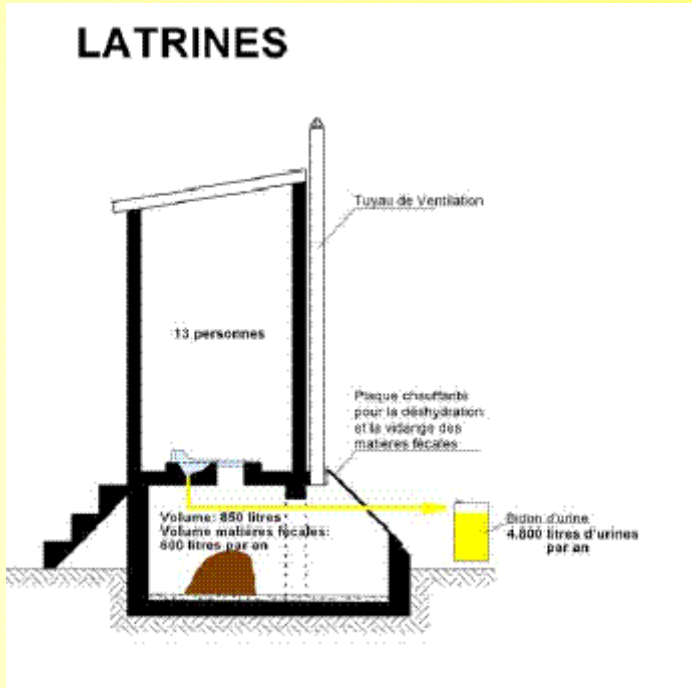


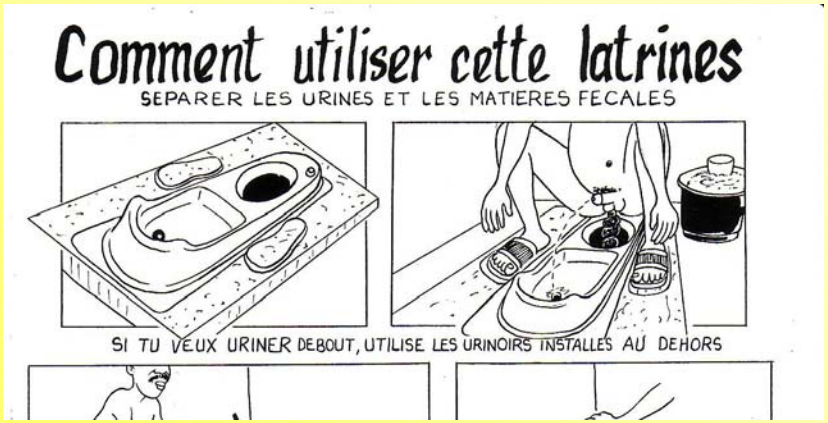
source: gtz, 2005

ecosan UDD toilets in Agnavo, Benin (supported by GTZ)



urine diversion dehydration toilets in rural areas





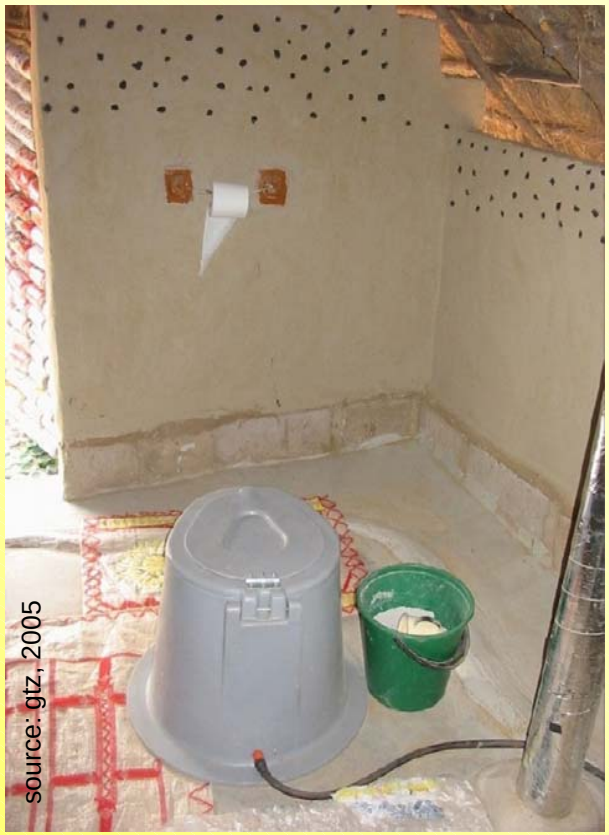
extract from a handout for users

participatory development of ecosan solutions in Gibeon and Marienthal, Namibia (supported by GTZ)

- Information, awareness building, situation and stakeholder analysis
- Participatory development of ecosan concepts
- Pilot and demonstration units (fixed and movable dehydration toilets with urine diversion)

integrated natural resources management in Botswana (supported by IUCN, DED, GTZ)

Introduction of ecosan systems in three communities: dehydration toilets, urine separation and fertilization of gardens with urine



urine diversion toilet made out of plastic

Awareness workshop on a village level

ecosan-study and reuse experiments in Havana, Cuba (supported by GTZ)

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


source: gtz, 2005


source: gtz, 2005

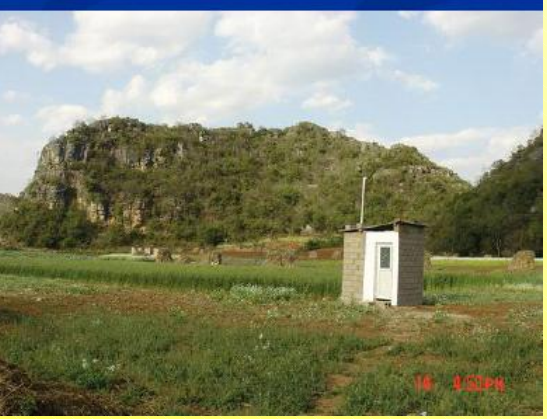

source: gtz, 2005


source: gtz, 2005

UDD toilets and biogas systems in Yunnan, China
(supported by CIM, GTZ, SwissRe and Borda)

Project Impl. Partners

Yunnan Env. Dev. Inst. (YEDI), Yunnan & Qiubei Env. Protection Bureaus (YEPB, QEPB)



Selected Project Activities:

- Construction of 104 dry toilets in households
- Construction of 10 biogas units in households
- Construction of 1 public dry toilet (10 pits), water tank & waste incinerator at Xianrendong Primary School
- Dissemination events: Local, provincial and regional workshops, and a 30 minute dissemination video
- Baseline study for large scale biogas systems for intensive animal husbandry

ecosan project examples

biogas septic tanks Lesotho (supported by GTZ and DED)

- 1st step (2002): small bore sewer grid for 8 houses, a biogas-septic tank unit, upflow filter based on recycled plastic bottles, wetland, 800m² vegetable and fruit garden, two household connections for the biogas as full cooking energy source
- 2nd step (2003): field tests of black-, greywater and urine separation

Promotion of UASB - Biogas Plants, Thailand
(supported by GTZ)

In the 1980es and 90es, a biogas promotion program of GTZ was promoting biogas systems in several countries, e.g. in Thailand, Tanzania, Kenia, Burundi, Nicaragua and Morocco

Promotion of larger scale biogas plants in Kenia (supported by GTZ)

- **3 entrepreneurs offer services for construction and operation of biogas plants for a rising number of clients (May 2006: 22)**
- Capacity building in biogas and composting technologies
- Credit facilities for users
- Support policy change

Enhancing reuse in DEWATS-projects through ecosan-approaches in Chengdu, China (supported by BORDA and GTZ)

Comparison of 5 different models for domestic wastewater streams:

Model 1:Conventinal DEWATS-process with biogas
Model 2: Brown, yellow & grey water separation with biogas (flush toilet)
Model 3: Grey, brown & yellow water separation with composting (dry toilet)
Model 4: Grey and brown separating from yellow with biogas
Model 5: Grey and black water separation with biogas

without fertiliser **urine** **digester effluent** **urea carbamide** **N,P,K fertiliser**

Decentralised Wastewater Treatment Systems (DEWATS) (supported by BORDA)

1994-1998 EU-Research in India & China with BORDA & GERES to improve existing Chinese ‚LOMWATS'

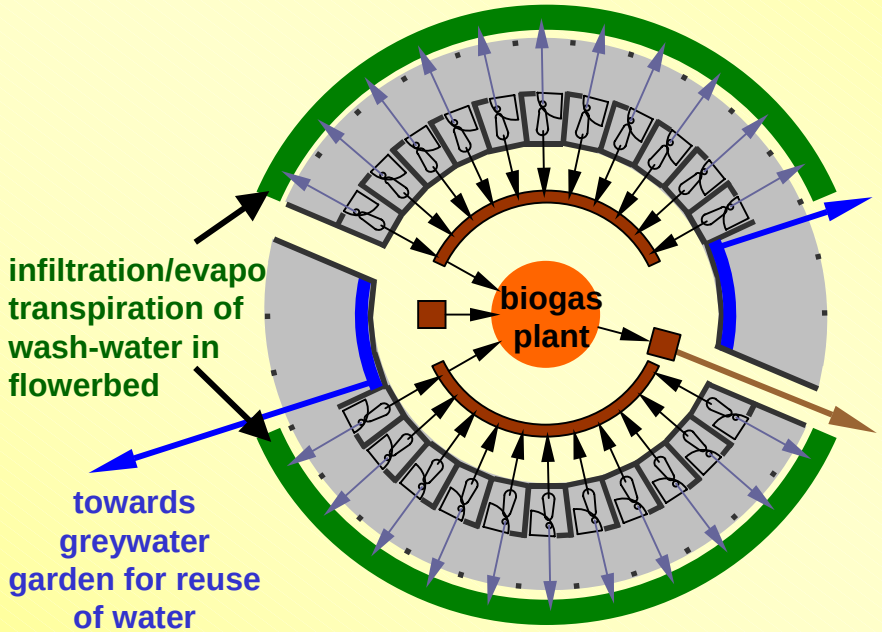
Implementation in
- New Settlements
- Hospitals,
- Offices,
- Public & governmental buildings

Ministry of Agriculture
End of 2005 140.000 Units

Navsarjan "Dalit Shakti Kendra„ vocational training institute in Gujarat, India (supported by SDC and GTZ)

Upgrading of a vocational training institute

- 250 resident students
- Combination of 2 urine-separation double-vault vermitoilets and a common toilet block of 24 cabins linked to a biogas plant
- Reuse of showers and kitchen greywater for irrigation (after organic filtration)

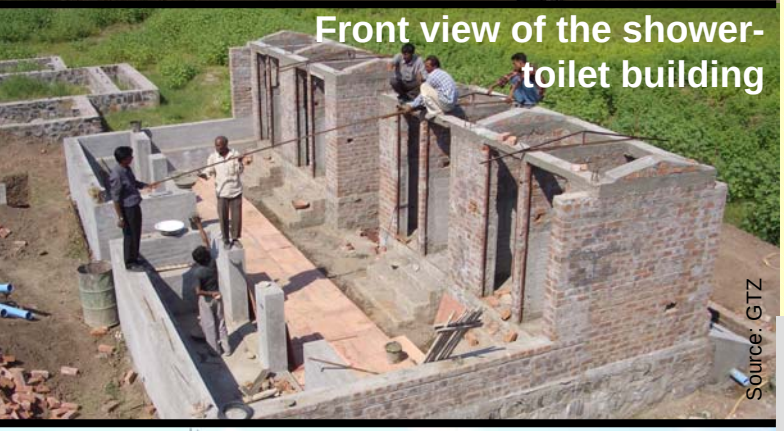


ecosan public toilet centre Bangalore, India
(supported by SDC and GTZ)

ecosan upgrading of a public toilet centre in a slum (transition) area

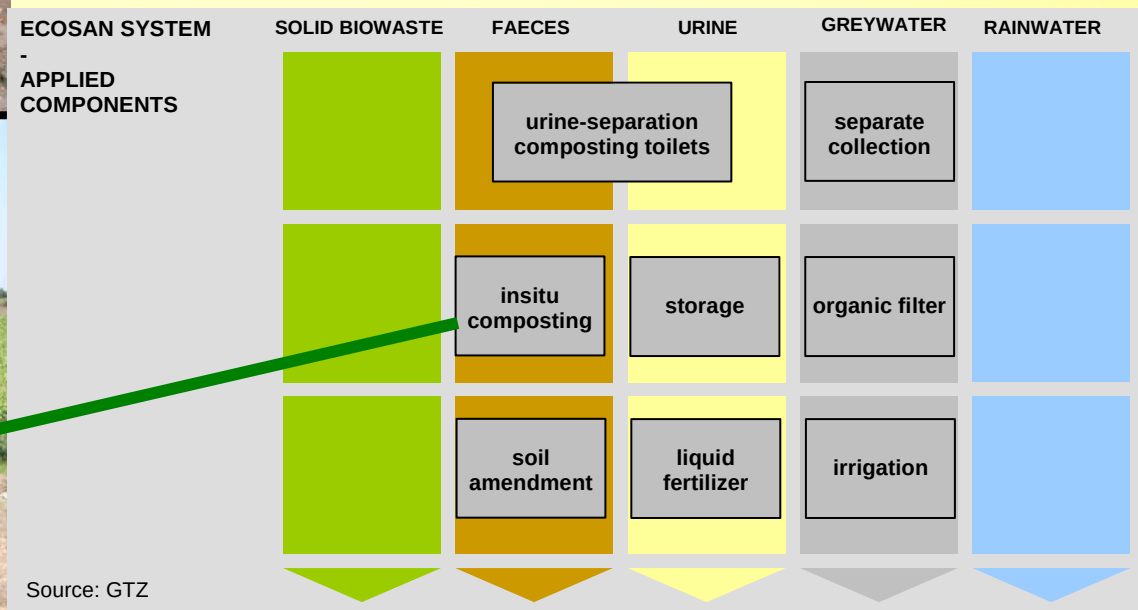
- 8 public toilet cabins: separated collection of urine, faeces and anal cleaning water
- Urine used as fertilizer for banana plantation
- Faeces treated in a biogas plant

Navsarjan primary schools project in Gujarat State, India (supported by SDC and GTZ)

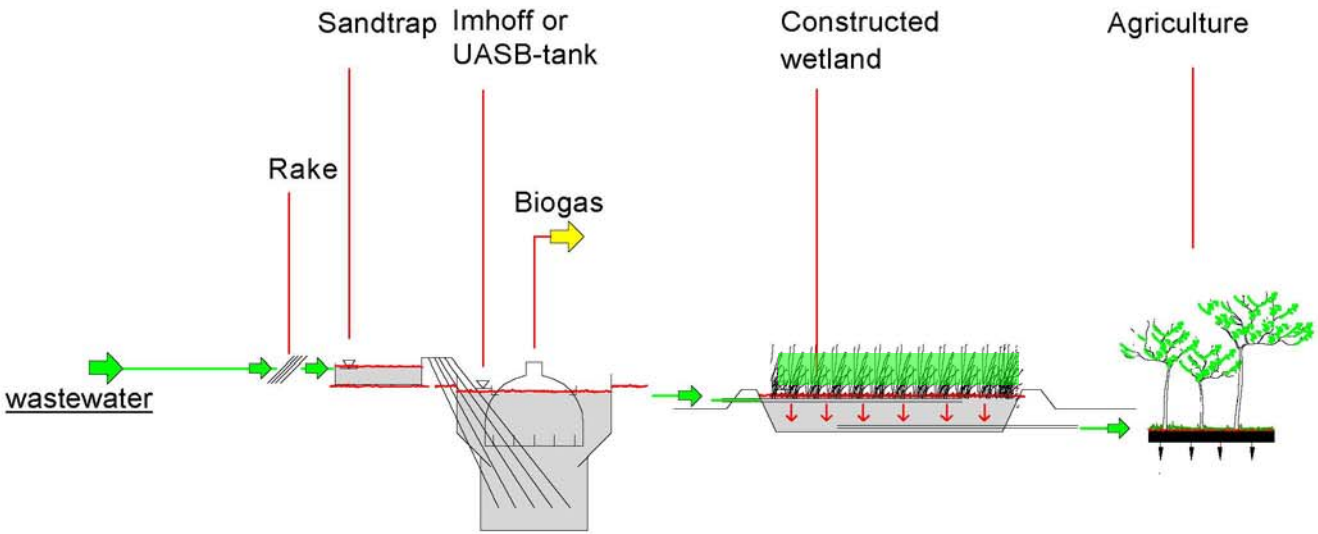


Construction of 4 primary boarding schools

- Each school has a capacity of 210 pupils.
- 6 classrooms, toilet and shower facilities and housing for pupils and staff
- Urine-diversion vermicomposting toilets
- Stored urine used as fertilizer for garden (possibility to use faeces and urine as a comercial fertilizer production)



ecosan concepts for 15 new universities, Ethiopia (supported by GTZ)



- **Alternative B**

UASB-reactors

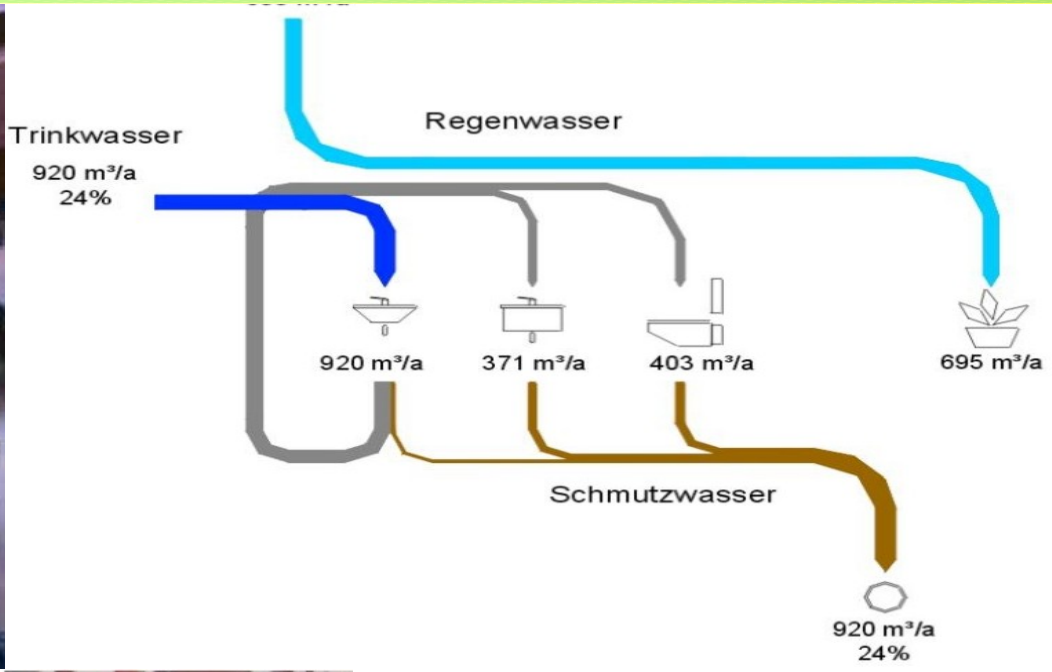
Units	4
Diameter	7 m
Total volume	1000 m^3

Constructed wetlands

Units	4
Length	62 m
Width	20 m
Total surface	5000 m^2

- **decentralised greywater treatment in constructed wetlands, reuse for gardening**
- **centralised treatment of toilet and kitchen wastewater in a sewage plant consisting of screen, sandtrap, UASB-reactor, constructed wetlend and reuse in agriculture**
- **pilot implementations of other alternative ecosan solutions for specific sites**

KfW office building Palmengarten, Germany

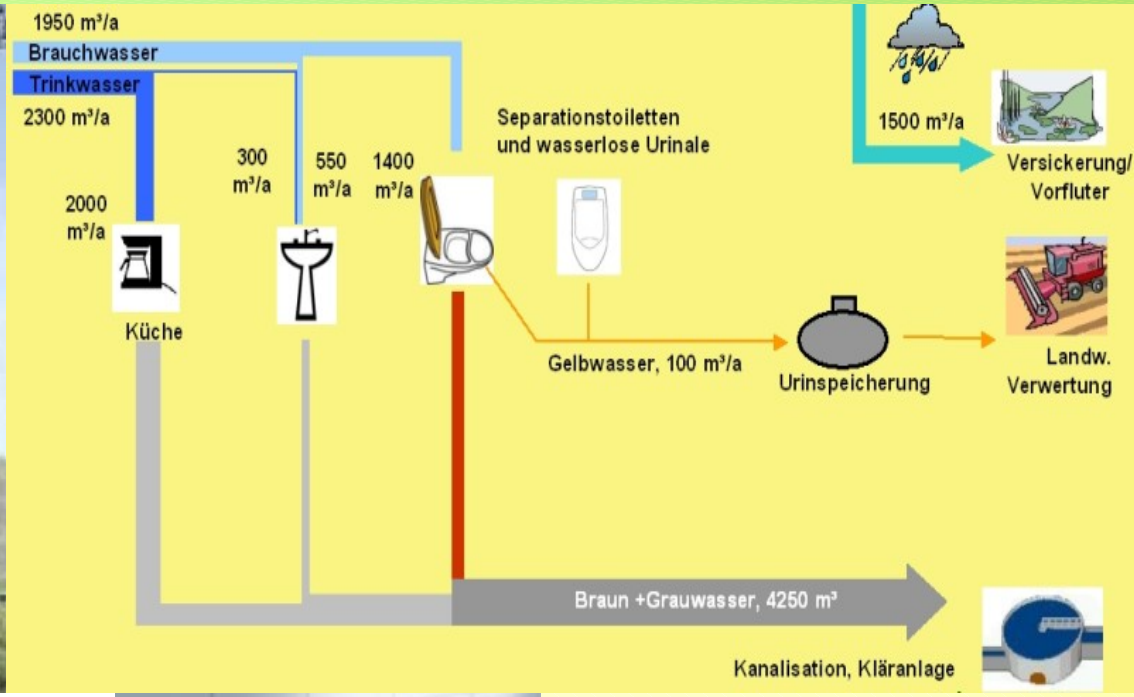


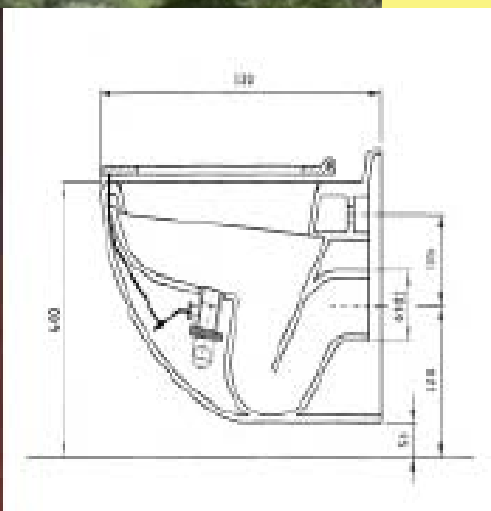
ecosan concept since 2003:

- Greywater recycling
- Rainwater harvesting
- Vacuum wastewater collection

ecosan pilot projects

GTZ headquarters, main building, Germany





ecosan concept: separation, processing and agricultural reuse of urine

urine diversion toilets and waterless urinals

Obstacles and opportunities for ecosan

ecosan experiences in German DC

Obstacles

- Information deficit limits range of choices and leads to false assumptions (e.g. that ecosan systems are necessarily more expensive than conventional systems)
- Few field-tested and proven solutions for large-scale urban ecosan applications are available yet
- Skills, technical components and management systems still need to be further developed
- Interdisciplinary holistic planning and implementation is very demanding
- Inertia of throughoutly developed infrastructure systems makes innovations and change of paradigm difficult especially in industrialised countries
- concepts for the operation and logistic of complex urban systems are still underdeveloped
- Development of model solutions, research and capacity building requires funding
- Debate on potential risks of micro-pollutants e.g. endocrine substances and medical residues in wastewater, particularly urine, when used in agriculture (-> However risk MUCH LESS than when emitted to water bodies!)
- Technical standards, local by-laws and environmental law are often still not favorable to innovative eco-sanitation solutions
- Appropriate financing instruments that help to finance the users investment for on-site and neighbourhood systems have not yet been developed

Obstacles and opportunities for ecosan

Opportunities

- Dynamic development of ecosan in several regions (e.g. China, India, Philippines, Africa) with rapidly increasing number of projects
- Number and variety of field-tested technologies and components is increasing
- Rapidly increasing knowledge base
- Progress in the participation of private companies in system development and operation
- High commitment of international and local capacity building and networking initiatives
- High political support by a series of UN agencies, IWA and a series of national organisations
- Good opportunities for ecosan in fast growing cities and developing countries with little infrastructure (“Pick the low hanging fruits first”)
- Increasing acceptance for reuse of human excreta and domestic water due to policy developments (e.g. WHO guidelines), economic benefits, decreasing availability of fresh water and effect of good practise examples (e.g. Jordania)
- Revision of technical standards, local by-laws and environmental laws has started for encouraging ecosan
- More donor agencies have become interested in ecosan (e.g. EU, WB, private foundations)

Conclusion

German DC is committed to further advancing ecosan

Required actions are to:

- increase the number of pilot and demonstration projects
- combine pilot measures with applied research
- develop management concepts for complex urban systems
- reduce costs (e.g. through mass production of components) and increase benefits (e.g. through the production of energy, biomass, crops, reclaimed water etc,) of the different alternatives
- up-scale the successful rural and urban examples
- get public and private companies involved
- build up capacity

Urban ecosan concept

Source: GTZ-ecosan