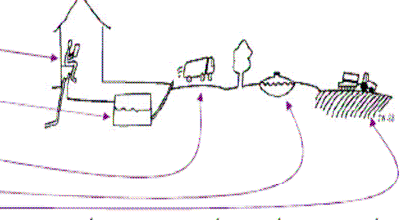
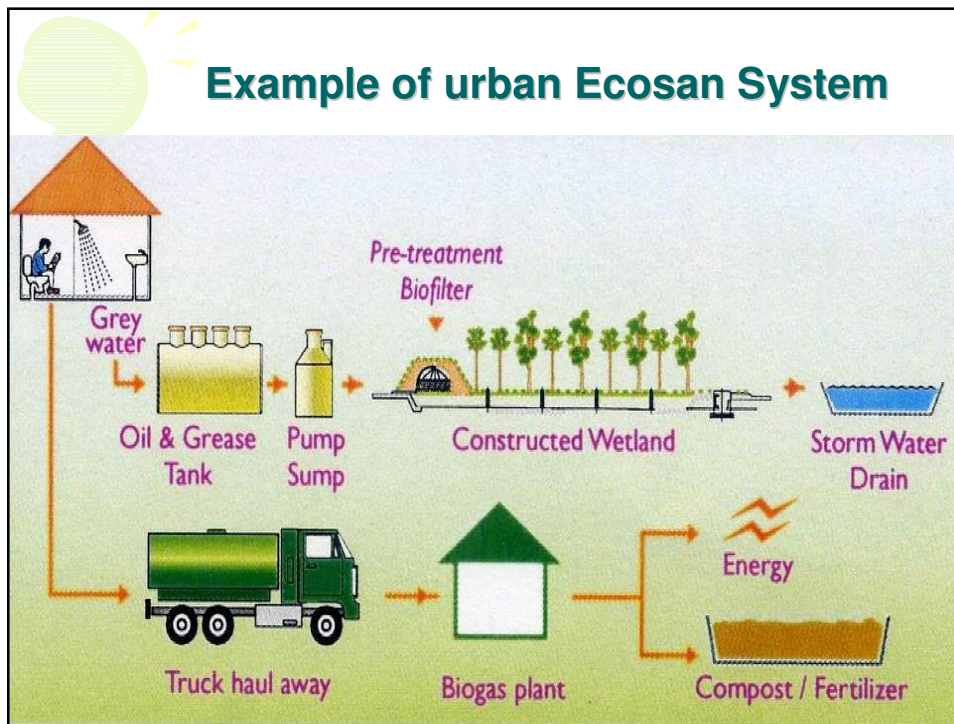


Future Agenda of Ecosan- Urban Experiences

Regional Ecological Sanitation Workshop, Bangalore 15th
-17thFebruary 2008

Urban sanitation system

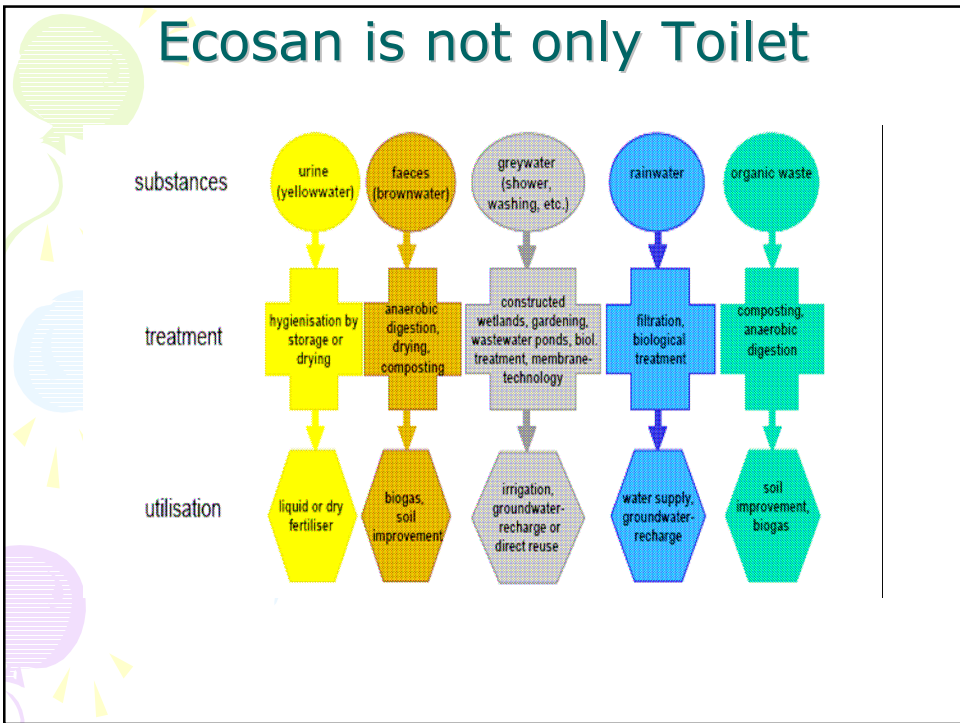
- The users
 - The collection
 - The transport
 - The treatment
 - The end use ... of human excreta, greywater, storm water, solid waste and industrial wastewater
- 



Why Urban ECOSAN ?

- New , innovative , simple & re-invented approach to suit every situation.
- Conventional sanitation system is not sustainable.
- Centralized sewerage system is very expensive.
- To reduce fresh water demand which increased many fold in last 50 years. Half of the world population will face shortage of water. 20-40% water consumption is due to water toilet with or without flush.
- Rapid urbanization has put extensive pressure on already stretched municipal services.
- Recycling the nutrients found in human excreta and pollution prevention. Realizing the fertilizer value of human excreta. (Approximately 3 USD per person per year, 1.5 billion USD from 500 million people)
- 80% of the natural resources are converted into waste. Ecosan can reverse this.
- Integrated ecosan can be implemented in urban areas.

- ecosan is not only a solution for rural , marginalised area, small scale projects but it can be extended to urban areas in a varieties of way.
- Urban ecosan provides a more favourable benefit-cost and cost effectiveness ratios due to scale of operation.
- Ecosan is more economical in comparison to flush and discharge toilet.
- Ecosan can contribute more to social equity and sustainability.
- Ecosan can easily served to urban slums due to its affordability and simplicity.
- Huge water saving potential (>90 %).
- Decentralized system
- 90 % of waste water in developing countries is discharged untreated.






Urban ecosan –An Opportunity

- Urban upgrading (houses, apartments, offices, factories) including retrofitting of existing facilities such as flush and discharge toilet converted to separate
- Integrated ecosan in new urban development areas/apartments.
- Ecosan facilities (most particularly waterless urinals) in public places (Airport, Bus station, Railway Station, Malls etc.), tourist spots (Parks, Memorials, Museums, Other Scenic spots, Beaches etc.), schools/colleges, Hospitals, Factories/Tea-coffee gardens etc.
- Sanitation facilities in urban slums



Ecosan-Advantages

- Recovery of nutrients & applying them safely in agriculture (marketing potential of urine and composted faeces)
- establishing a public-private partnership for operating the ecosan facilities.
- promoting urban farming including rooftop farming
- Helps in food security
- Better health care
- Reduced consumption of commercial fertilizer thus saving energy and thereof reducing carbon emission.
- Mass scale collection of urine can be used for converting urine in to dry crystalline fertilizer.
- Availability of liquid urine fertilizer for city green areas
- Extraction of phosphorous from urine

- 
- In tea /coffee growing region urine from the working labourers as well as collection from other points can be used as liquid fertilizer to enhance the yield and reduce dependency on commercial fertilizer.
 - Establishing the market forces to decide the price of urine as fertilizer.
 - Carbon credit due to ecosan facilities can be used for other facilities which emits carbon.
 - Helps in establishment in resource oriented urban sanitation system
 - Urine can be made available for research purposes to explore its medicinal properties.
 - Provide an opportunity to directly switch to ecosan system by bypassing the sewer system. As in most of the class B and below urban areas does not have centralized sewer system.
 - Reuse of water
 - Energy saving in waste water treatment

- 
- ## Urban Ecosan around the world
- 1600 households staying in 4 storey apartment in Dongsheng city, China. Components are:
 - dry urine-diverting toilets
 - urine collection and recycling
 - dry faecal collection, sanitisation and recycling
 - grey water collector, treatment and reuse
 - kitchen organics collection, composting and recycling
 - source-separation of solid waste and recycling
 - Ecological settlements in cities of Austria, Sweden and Norway.
 - Separate collection of urine and faeces
 - Onsite treatment of faeces
 - Agriculture reuse of urine and composted faeces



Apart from this there are many good pilot /demonstration ecosan work in several countries, some of them are:

- Waterless urinal in IHE-Delft, Netherlands
- Ecosan installation in GTZ office in Germany
- Ecosan in Malaysia, Philippines, Syria, Cuba
- Ecosan public toilet in Musiri, Tiruchi
- Ecosan public toilet in Bangalore
- Ecological settlement in Mexico city for 33, 000 persons
- Ecological sanitation in township settlement, Durban , South Africa



Ecosan Facilities

- Urine diverting dehydration toilet (UDDT) 0 - 0.1 liter/use
- Urine diverting (no mix) 0.1 - 4.0 liter/use
- Water saving (vacuum) 0.5 - 1.5 liter/use
- Waterless urinals 0.0 liter/use

Available toilet types			
Toilet type (faeces-f/urine-u)	UD (Y/N)	Description	Example
Dry mixed	No	Faeces + urine with or without Wash water mixed, no flush	composting toilets, Leh, Lahul-spiti and pit/bucket latrines without water seal.
Dry F/dry U	Yes	Faeces without, urine without flush and separate wash water	UDD toilet squatting and pedestal rural/urban, Dongsheng-China (no wash water-wipers), waterless urinals
Dry F/wet U	Yes	Faeces without (wipers), bidet for washers, urine with mini flush	In Sweden (Type of no mix)
Wet mixed (vacuum)	No	Faeces + urine + Wash water mixed, vacuum system (very low flush)	Germany, vacuum toilet ~ 1 L/flush
Wet F/wet U	Yes	Faeces –wash water with, urine with flush	Also in Sweden & Germany. "NoMix Toilet"
Wet mixed (gravity)	No	Faeces +wash water+ urine mixed, big flush	Conventional flush toilet (WC), ~ 10 L /flush

Water Consumption			
Toilet type (faeces/urine)	Water per defecation	Water per urination	Water use (L/cap/day) one defecation and 4 urination.
Dry mixed	0	0	0
Dry F/dry U	0	0	0
Dry F/wet U	0	0.1	0.4
Wet mixed (vacuum)	1	1	5
Wet F/wet U	10	0.1	10.4
Wet mixed (conventional)	10	10	50
Conventional urinal	N/A	4-6	16-24
Waterless urinal	N/A	0	0

Different types of urine Diverting Toilets



China

India

waterless:
faeces and urine
without flush

Most-Man, Sweden

dry/wet:
faeces without,
urine with flush

Roediger, Germany

dry/wet:
faeces with,
urine without
flush

Dubletten, Sweden

wet:
faeces & urine
with flush

Double diverting latrines



Phillipines

Hole for anal wash water

China ash dispenser

SCOPE, India

CREPA, Burkina Faso

Faeces

Urine

Wash water





School toilet complex, China


Twin vault UDDT

Back side of a UDDT Mali



Norway

Latin America



Hospitals using vacuum toilet:

- Hospital in Vence, France
- Park Hospital, Calcutta

The image shows an aerial view of a large hospital complex built on a hillside. The buildings are white with red-tiled roofs. A white toilet icon is overlaid on the bottom left of the image. The slide is decorated with colorful balloons (green, blue, purple) and sunburst patterns on the left side.

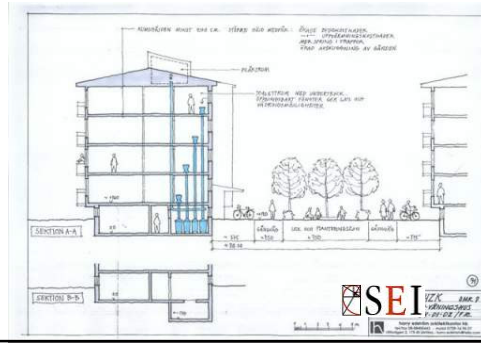
Urine diversion and dry composting of fecal matter at Tingvall conference center Sweden



The image shows a toilet with a urine diversion system. The toilet is white and has a separate opening for urine. A separate container is used for fecal matter. The slide is decorated with colorful balloons (green, blue, purple) and sunburst patterns on the left side.

The image shows the exterior of the Tingvall conference center building, a large white building with a red roof, situated on a grassy hillside. The building has a modern design with large windows and a balcony. The slide is decorated with colorful balloons (green, blue, purple) and sunburst patterns on the left side.

Straight-drop dry urine-diverting toilet in multi-storey apartments in Dongsheng , China





Dongsheng , China



Vacuum toilets

- Usually without urine diversion (but can also be with UD)
- Very low amount of flush water needed
 - Typically uses only 1 L per flush (compared to 8-10 L per flush for conventional toilet)
 - Results in the production of concentrated “blackwater”
- This blackwater is usually treated with anaerobic digestion (ongoing research projects on this topic at Wageningen University, The Netherlands)

UD Water-flush Toilets (No Mix)

- Easy acceptability but not a complete solution to ecosan
- Raises awareness about urine diversion and its reuse.
Comprehensive recovery of nutrients from urine through a minor modification.
- Low cost solution to be found for urine transport.
- Not suitable for low-income areas and also not appropriate in the water scarce area.
- Reduces load on sewer system by diverting urine thus saving cost and energy.
- Possible extraction of phosphorous from urine collected in large quantity from the densely populated area.
- Discussion is on among ecosan professionals about no mix whether this should be considered as one of the feasible option of urban upmarket ecosan scaling or not !

Waterless Urinals



Sweden



Germany



vacuum urinal
KfW-building,
Germany



Ernst



Keramag

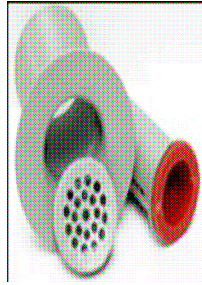


Urimat

Waterless Urinals



Ecosmellstop urinal



Ecosmellstop drain fitting



Female Urinal

Keramag waterless urinals



Urine collection from waterless urinal in a school in Nagapattinam



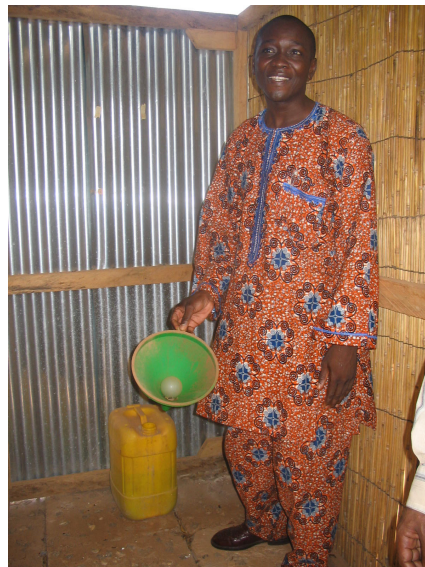
main building of GTZ headquarter, Germany



Waterless urinals by Uridan



Cheapest waterless urinal: "Eco Lily"



Waterless urinals



Storage tanks for urine



Photo: Eco San Res

Spreading of
urine on
farmland

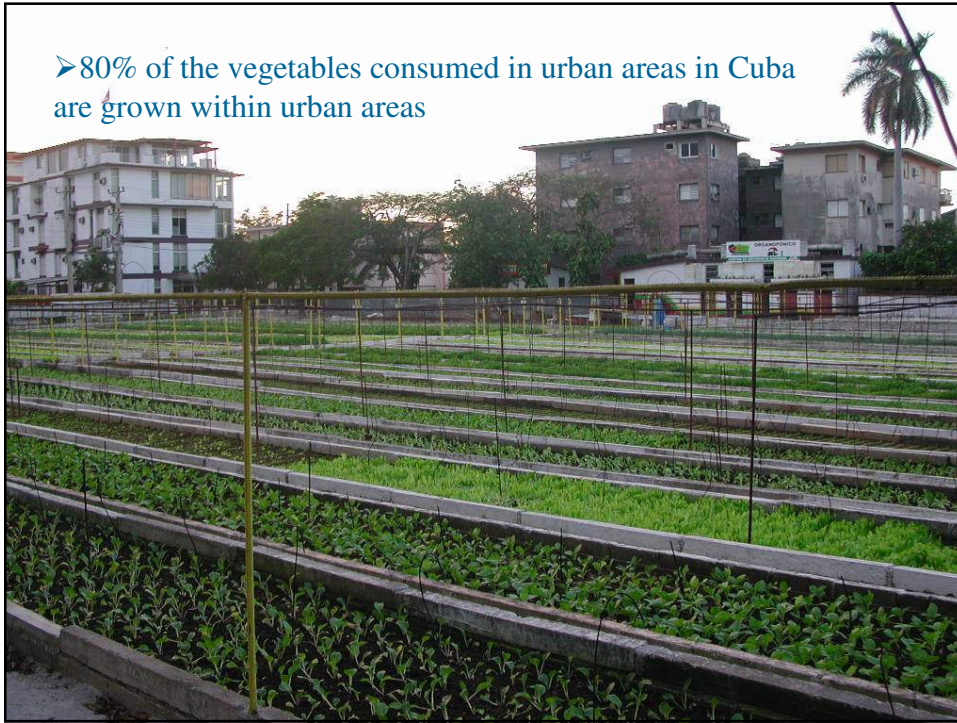
Photo: EcoSanRes



Liquid composting at Norrtälje
Municipality, Sweden



➤80% of the vegetables consumed in urban areas in Cuba are grown within urban areas



**Pilot project Hui Sing Garden
Greywater treatment**

Agricultural Use



direct injection of liquid fertiliser



urban agriculture



irrigation

constructed wetland Haran-Al-Awamed, Syria

Wastewater treatment with constructed wetland system:

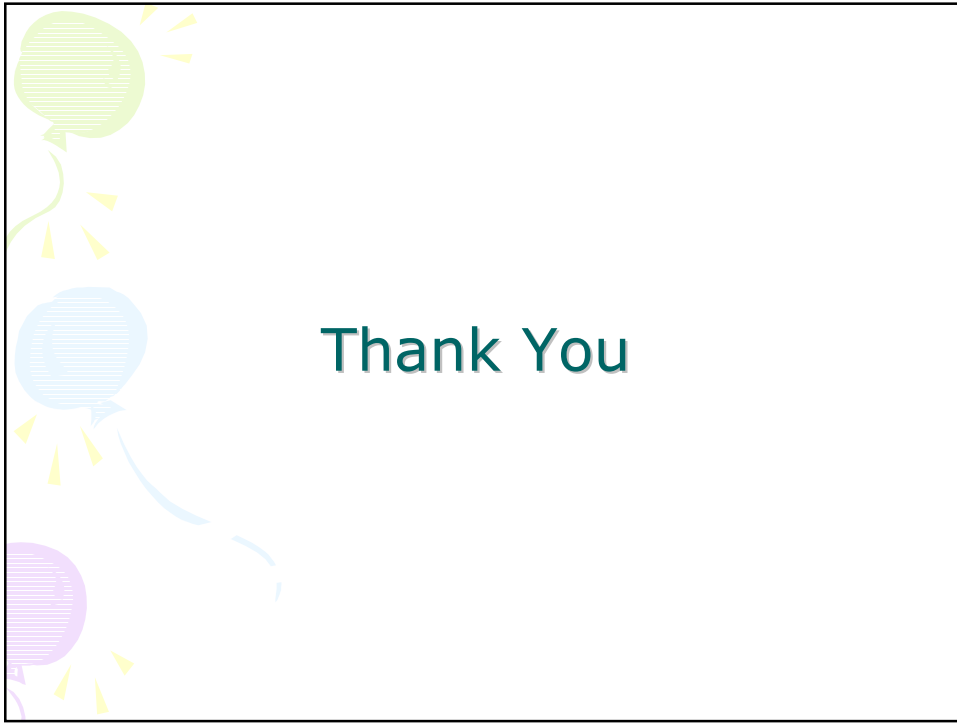
- Wastewater treatment through reed beds
- Sludge treatment through reed beds
- Treated wastewater used for irrigation purpose
- High efficiency for hygienization
- Small surface required: 0.5m² per capital
- Low cost: 13.7 euro/person (construction), 1 euro per person every year (running cost)



How to Promote it?

- Intensive awareness campaign focusing young people.
- Legal adoption-byelaws, guidelines , framework.
- Collaboration with government departments for inclusion of nutrients reuse in initial planning process and thereof its implementation.
- Capacity building and data based advocacy of community, frontline staffs of NGOs & govt., private companies, academicians, politicians and research institutions.
- Technical guidance & demonstration of different types of design and models to suit various conditions. Developing technical guidelines.
- Developing public –private partnership to seek required investment.
- Scaling up together in rural, peri-urban and urban areas.
- Component manufacturing and its distribution network including import , joint venture, localization etc.

- Eco san facilitators needs to work out three complementary educational strategies i.e. participating learning, sharing information and skills training.
- Comprehensive approach linking sanitation, health, agriculture production and domestic & economic improvements.
- More promotion, support, education and training is required than conventional program since this is a new reinvented approach.
- Better coordination between different promoting organizations. Effective dissemination of lessons learned , sharing information, case studies.
- Follow up of implemented project and effective post implementation support.
- Impact based evaluation of implemented ecosan program for scaling up.
- Action research on reuse of urine and comprehensive guideline for different types of crops.
- Establishment of ecosan knowledge centre and regular region centric training for the promotion of ecosan for government officials, NGO partners and local facilitators.



Thank You