ecosan –
closed loop approach for sustainable wastewater management

A supra-regional sector project on behalf of the Federal German Ministry for Economic Cooperation and Development (BMZ)

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1,2 - 1,5 billion people don’t have access to save drinking water

Almost 3 billion people don’t have sufficient sanitation/wastewater treatment facilities

Unsatisfactory purification and uncontrolled discharge of more than 90 % of wastewater worldwide

80 % of all diseases / 25 % of all deaths in developing countries are caused by polluted water (WHO)
Shortcomings of conventional systems

- Precedence of central combined systems in organized disposal
- Consumption of precious water for transport
- High investment, energy, operating and maintenance costs
- Frequent subsidization of prosperous areas, neglect of poor settlements
- Pollution of waters by nutrients, hazardous substances, pathogens, pharmaceutical residues, hormones, etc.
- Loss of nutrients and trace elements contained in excrement through discharge into waters
- Impoverishment of agricultural soils, dependence on fertilizers
- Problems with sewage sludge (disposal, incineration)
- Linear end-of-pipe technology
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The main principles of ecosan

- Closing of material flow cycles
- Recovery and Re-utilisation of nutrients
- Optimising of water consumption
- Integration of organic waste
- Reduction of energy consumption up to the production of energy
- Minimize health risks and hygienic problems

Strategic approach that combines modular facilities and appropriate technologies for specific local conditions
Advantages of ecological sanitation

- **Re-utilisation** (hygienically safe extraction and use of nutrients, trace elements, water and energy)
- **Ressource conservation** (less water consumption, substitution of fertilizer, minimization of water pollution)
- Pathogens from human faeces don’t reach the water flow cycle
- Precedents of modular and decentral systems
- Appropriate, low-cost solutions
- Preservation of soil fertility
- Food security
- Integral, interdisciplinary approach (household water management, environmental protection, town planning, urban agriculture, small-enterprise promotion, etc)
- **Material flow-cycle instead of disposal**
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Important aspects of ecological sanitation

• introduction
• Main aspects
• Key activities

• separation of substances
• Composition and characteristic of household wastewater
• technology (facility systems, compounds, example)
• agriculture utilisation of faeces and urine (composition, quality, hygiene)
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separation of substances

substances

- Urine (yellowwater)
- Faeces) (brownwater)
- Grey-water (shower, washing, etc.)
- Rainwater

utilisation

- Hygienisation by storage or drying
- Anaerobic digestion, drying, composting, mixed with organic solid waste
- Constructed wetlands, gardening, wastewater ponds, biol. treatment, membrane-technology
- Filtration, biol. treatment

treatment

- Liquid or dry fertilizer
- Biogas, Soil improvement
- Irrigation, groundwater-recharge or direct reuse
- Water supply, groundwater-recharge
Composition of household wastewater

One person can provide:

~ 200 m²/y in Europe and

~ 400 m²/y in Subsaharan Africa

of agricultural area with nutrients
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#### characteristics of substances

<table>
<thead>
<tr>
<th>fraction</th>
<th>characteristic</th>
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</table>
| 1. faeces   | • hygienically critical  
• consists of nutrients and trace elements  
• Improvement of soil quality and increase of water conversation ability |
| 2. urine    | • hygienically less critical  
• Consists the main part of plant- nutrients |
| 3. greywater| • Not hygienically critical  
• Largest fraction (concerning the volume)  
• No or less nutrients (simple purification) |
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## Technology solutions/ modules

<table>
<thead>
<tr>
<th>1. Separated collection (faeces / urine / greywater)</th>
<th>„High-tech“</th>
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<tbody>
<tr>
<td></td>
<td>• Double sewer system in households</td>
</tr>
<tr>
<td></td>
<td>• Vakuum.toilets / Urine-separation-toilets</td>
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<tr>
<td></td>
<td>„Low-tech“</td>
</tr>
<tr>
<td></td>
<td>• appropriate latrine-systems</td>
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</tbody>
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| 2. treatment | • Production of biogas (faeces / organic waste) |
|  | • drying (faeces / urine) |
|  | • storage (liquid urine) |
|  | • composting (faeces) |
|  | • Constructed wetlands / sand filtration (greywater) |

| 3. utilisation | • Fertilizer in agriculture (faeces / urine / organic waste) |
|  | • irrigation (greywater, rainwater) |
Agricultural utilisation of nutrients

Human faeces and urine can be utilised in agriculture in the case of:

- Proper pre-treatment (storage, drying, composting)
- Suitable „handling“ (precaution)
- Limitation on special vegetables and field crops, depending on pre-treatment
- Regular sampling and hygienic control
In May 2001, GTZ started a new supra-regional research and development project, ecosan, financed by the German Federal Ministry for Economic Cooperation and Development (BMZ).
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aim of the project:

- promoting the development and pilot application of integral ecologically, economically and socially sustainable recycling-based wastewater and sanitation concepts in developing countries.

- contribute to the global dissemination and application of ecosan approaches and establish these internationally as state-of-the-art techniques – also in industrialized countries.
GTZ – ecosan project offers:

- Knowledge management
- Networking
- Conferences and workshops (e.g. International ecosan Symposium 10/2000 and 04/2003, download proceedings from http://www.gtz.de/ecosan)
- Ecosanet (promotion of an international ecosan network from European and non-European partner countries.)
- International working groups

- Pilot research and demonstration projects in urban and peri-urban areas
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EcoSan = triple win

- protection of water resources by water saving
- Increase of agricultural yield by utilisation of nutrients
- Minimization of health infections by waterway

- Water
- Agriculture
- Hygiene
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further information:

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