Ecological Sanitation

Presentation for

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(1) Why talk about sanitation?

Ever had diarrhoea?

Any idea, why?

Fecal-oral infections: “stool-to-mouth” = conditions of open defecation.

5 fs: feces, fingers, flies, fluids (water & drinks), food.

Diarrhoea – 90% caused by lack of sanitation – kills one child every 15 seconds.

Number of children dead from diarrhoea over the last decade exceeds all people killed by armed conflict since WW II.

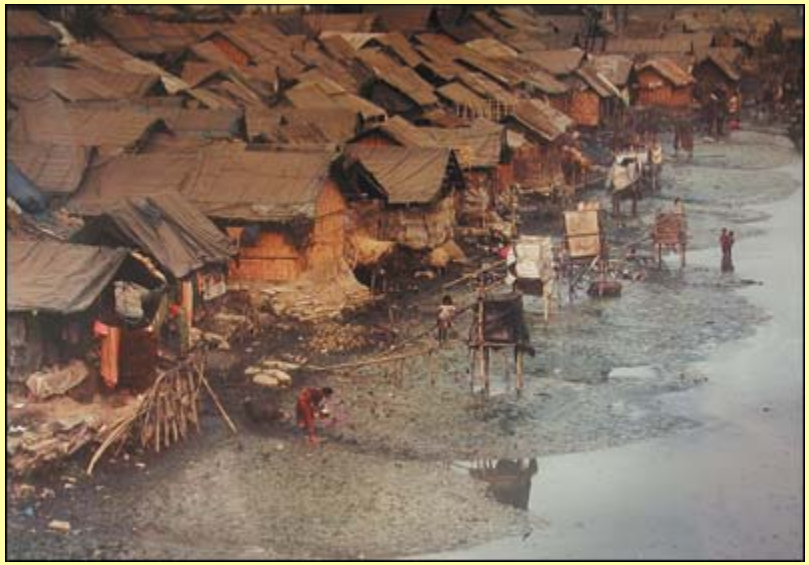
Human feces (stool)

Man produces about 50 ltr of feces and 500 ltr urine a year.

Feces can transmit many diseases (via viruses, bacteria, parasites & parasite cysts, and worm eggs). –

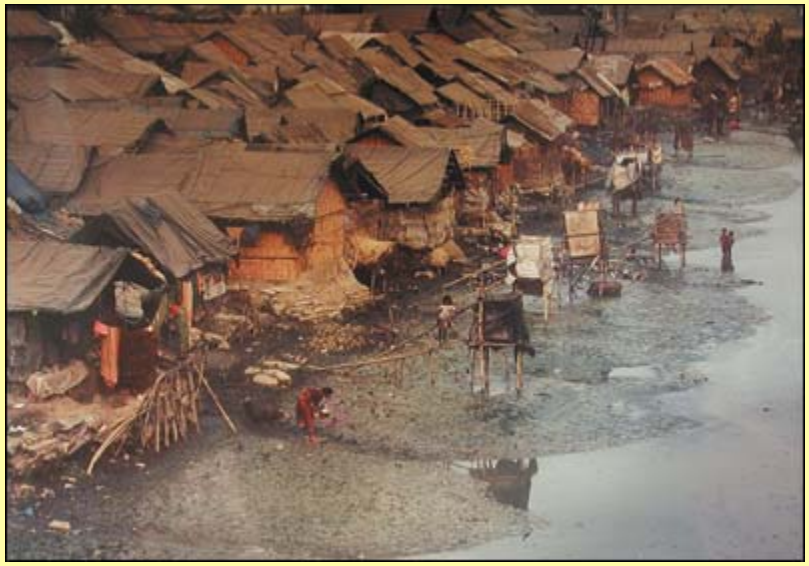
(Most bacterial species are beneficial, viruses often irrelevant, parasite cysts and worms often pathogenic i.e. causing disease.)

Lack of sanitation – the biggest health problem globally



- 2.6 billion people worldwide have no access to sanitation facilities.
- In India 600-700 million i.e. more than half the population.
- 2.2 million annual deaths caused by sanitation-related diseases, mostly children under five.
- In India alone, 6 lakhs deaths i.e. about 1,650 per day or more than one every minute.

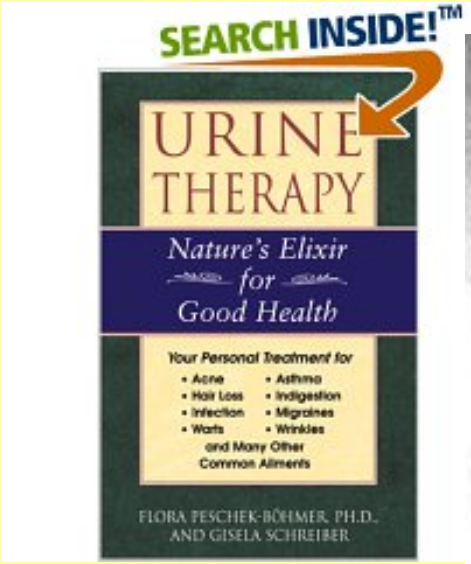
Lack of sanitation is unaffordable for any nation.

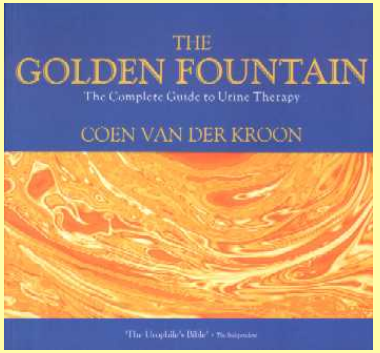


Consider financial impact: doctor fees, medicine, hospital stay, visitors travel, loss of wages, loss of production…

- 443 million schooldays are lost annually worldwide.
- According to a World Bank study (2010), lack of sanitation costs India US$ 65.8 billion a year.

As regards hygiene & pathogen transmission, differentiate between urine and feces.





(1) Why talk about sanitation?

Simple solution: a flush toilet.

(2) What's wrong with flush sanitation?

Flush sanitation is based on a big package of technology:

Water & energy for a piped water supply

(Urban) drainage system = sewers or sewerage;

(Pumps and energy supply);

Sewage treatment plant (requiring energy supply);

Maintenance of sewerage & STP;

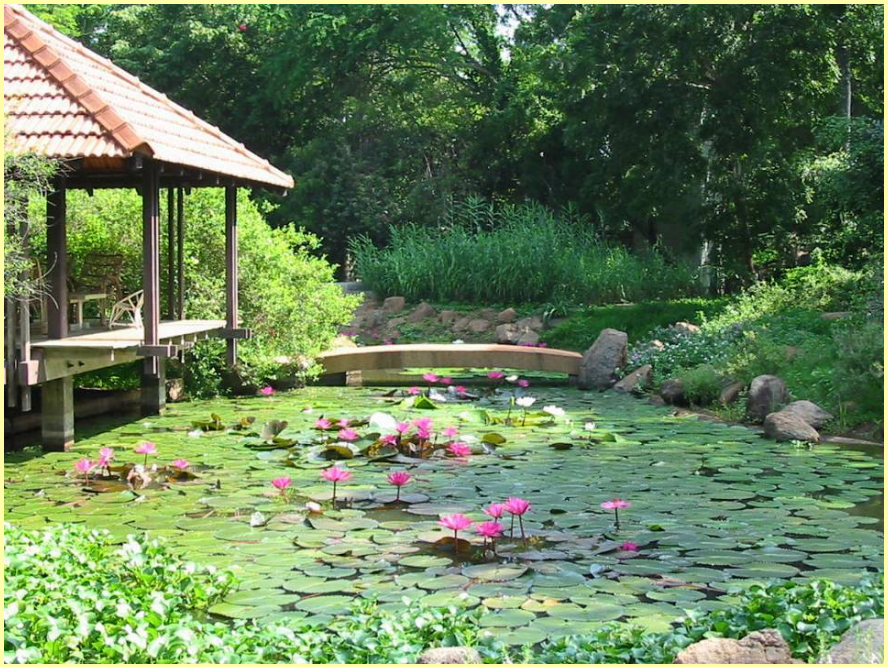
Sludge removal and disposal.

232 of India's 5,233 towns have partial sewer coverage. Sewage is dumped mainly into rivers.

Flush sanitation is based on a big package of technology:

Mexico City's sewerage is 10,000 km long; presently building a sewer 60 km long and up to 200m below ground level.

Package of flush sanitation technology – when security equipment is missing



“Disposal” of final product of STP: sludge – only then the loop is closed

In Germany e.g., sewage sludge production is 25 kg per person per year, i.e. 2 million tons per year.

Excursion Auroville:

decentralized wastewater treatment systems (dewats)

& desludging & sludge co-composting with carbon-rich biowaste (coir, wood chips) and EM, producing forestry compost.

Conclusion:
Flush sanitation…

- Wastes water;
- Neglects the fact that bio-waste is a recyclable resource;
- Is expensive in investment and in operation & maintenance;
- Requires human handling (for O&M) with risks to health.
- And, if not implemented in its entirety, creates new problems.

Is there an alternative?

(3) Essential elements of ecosan – ecological sanitation

Any system of (human excreta) sanitation that aims at
(1) optimum hygiene and
(2) saving water and
(3) re-use of plant nutrients and biomass,

may be called ecosan, e.g. suction toilets in aeroplanes, or water-less urinals.

(3) Essential elements of ecosan – ecological sanitation

In the following we speak mainly of urine-diversion-dry-toilets (UDDTs).

In the present context of rural India UDDTs seem to have advantages (in simplicity of O&M).

(4) Technical implications a UDDT

Composting (or drying) chamber:

Duration required* for complete sanitization makes two chambers and two toilet pans necessary.

*presently defined by WHO as 12 months in tropical and subtropical climate.

(4) Technical implications a UDDT

The less moisture, the easier odor control (advantage of urine diversion and no-flush).

Dry matter to be added on fresh stools, e.g. sawdust, coir dust, ashes, sand, charcoal dust.

Biologically richer dry matter results in compost of higher quality.

(4) Technical implications a UDDT

Water for anal cleansing to be drained separately (into a mini soak pit).

Urine to be collected for direct use or early use.

Ecosan with UDDT
makes use of plant nutrients and organic matter in excreta.

Human excreta, especially urine, contain essential plant nutrients, in particular nitrogen (N), phosphorus (P), potassium (K), and others.

(Plant nutrients in one person's excreta are sufficient to produce the food required by one person.)

No handling of non-sanitized feces – no “scavenging”.

Ecosan with UDDT – technically, a stand-alone system. Invitation to Boodheri…

Ecosan “products” need to be utilized by farmers. Positive response wherever agricultural benefits are demonstrated.

Can be be combined with

- Other organic farming inputs,
- Composting techniques & fermenting techniques,
- Biochar and Terra Preta.

Terra Preta

Defined as long-term carbon-stable fertile and productive soil, developed by the native "Indians" of South America,

Made from biochar

+ nutrient-rich bio-waste

+ microorganisms,

possibly via fermentation in terrakotta pots.

"Terra Preta Sanitation" =
the combined processing of
human excreta and biochar
(i.e. the charging of biochar with plant nutrients from human excreta),
possibly facilitated by lactic acid fermentation.

Challenges for ecosan:

- Logistics for urban scenario (transport from production site to market);
- Upgrading in status for urban middle and upper classes;
- Integration into urban planning and architectural design.

Thank you. Lucas