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Ecosanitation: An Integrated Approach towards Sanitation.

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ABSTRACT
There are at least 2.6 billion people in the world without improved sanitation. Improved sanitation is defined by WHO as connection to a Public sewer, connection to a septic system, a pour-flush latrine, a simple or ventilated pit latrine. Most of this 2.6 billion reside in rural Asia and Africa. But technically even access to improved sanitation does not solve the problem, a spit latrines which serve about 2.8 billion people usually fail to sanitize and contribute to ground water pollution. Also, septic systems and sewerage treatment plant often discharge in to the overloading and eutrophication. The need to close the loop on nutrients indicates that a paradigm shift towards sustainable sanitation is necessary environment with little or no sanitization or nutrient removal, polluting the ground water table streams, lake sand coastal zones, helping to perpetuate the cycle of human disease and upsetting fragile aquatic ecosystems by nutrient. The health risks associated with the current state of sanitation in the world require immediate action. Thus in present scenario huge amount of water and piping coverage is required and inspite of all these things the operational and maintenance cost are also high. This traditional British flush sanitation system has created havoc. Ample amount of NPK which is readily available in absorbable form by plants is wasted down the drain. Due to ever expansion of urban areas are getting far away which is increasing the cost of conveyance of sewage.

I. INTRODUCTION

Ecological sanitation has attracted many definitions. Morgan (1998) defined ecosan as system that makes use of human waste and turns it into something useful and valuable with minimum pollution of the environment and with no threat to human health. Guzha (2001) defined ecological sanitation as an environmentally friendly way of managing human excreta in a way that benefits people and their environment. Ecosan, according to Morgan (1998), is a system in which toilets are designed to Store and prepare human waste for use in agriculture by formation of humus through the addition of ash, soil, lime or any other biodegradable materials.

Some call it feces and some call it humanure and some call it other things not fit for this document. Everybody poops and it has to go somewhere. So it should be important to everyone where it goes. Ecological sanitation (Ecosan) is an integrated sanitation strategy developed through traditional knowledge and biological science in which natural processes are utilized to transform human wastes (poop and pee) into fertile soil.

Ecosan is based on three principles:

1. The prevention of pollution rather than an attempt to control or mitigate it after the fact;
2. The sanitization of urine and poop; and
3. Using the resulting safe products to enhance agricultural production. EcoSan provides an innovative, low-cost solution to multiple problems faced by the world's poor and has the potential to simultaneously improve a community's overall structure.

Sanitation is a key determinant of society's ability to sustain itself. If we cannot meet the sanitation challenge described above, we will not be capable to provide for the needs of the present generation without hindering that of future generations. Thus, sanitation approaches must be resource minded, not waste minded.

1.1 History of Ecological Sanitation:

- The concepts behind ecological sanitation are based on natural processes and, as such, have been understood and practiced by indigenous cultures for centuries. In China, human wastes, called "night soil", have been collected and used to enhance agricultural productivity for over 500 years.Throughout Africa and Latin America, peasants will explain that their most productive fruit trees can be found on or near old latrine sites. Even an observant suburban American has noticed that the grass is greener near the septic tank.

1.4 Issues with Traditional Approaches:

The Price of Sewers and the Problem With pits:

- The two primary sanitation approaches promoted globally are:
- 1.To flush the wastes away with water through sewers that lead (Sometimes) to a treatment plant, or

- 2. To soak the wastes into the ground and let the soil filter it as is done for deep-pit latrines and septic tanks.
- Both of these approaches remove raw human wastes from the immediate household environment, and, as such, the spread of these technologies has significantly reduced the transmission of water born disease. However, both approaches have unintended environmental consequences, which affect both public health and the long-term sustainability of these sanitation systems.

Problems with water borne sewage arise when:

- **Public money is tight*:*** many developing countries do not have the resources for sewer projects for cities that have burgeoned with unplanned settlements and are stressed beyond the capacity for which they were designed.
- **Sewage is discharged untreated**: when raw sewage is discharged into aquatic ecosystems it increases both nutrient concentrations and faecal pathogen loads. If these aquatic systems are near or upstream from human habitations sewage can pose a serious public health risk. Even when sewage is discharged far from humans, the nutrients can cause shifts in aquatic ecosystems, which ripple throughout the food chain.
- **Waterisscarce*:*** when water is scarcer people live far from a water source, flush toilets are dependent on constant labor (usually performed by women and children) and often experience problems with clogged pipes. Access to running water is largely determined by economic status, and flush toilets are not designed to cater to the poor. As clean water resources become more and more scarce it will become increasingly difficult to maintain flush toilets, even in wealthy countries.

Problems with pits arise when:

- **Groundwaterishighortheareafloods*:***When the groundwater rises above the bottom of the pit, nutrients and microorganisms from human wastes mix with the water table and can cause serious environmental and public health problems.

- **Mosquitoes breedinthesludge*:*** Because volumes of urine are so much higher than faeces, pit latrines generally contain standing water, especially in clay soils which can be breeding zone for flies and the mosquitoes that carry malaria and dengue fever.

- **Ventilation is poor*:*** Pit latrines can have terrible Odors when they are not well ventilated.

- **Soil is vulnerable to collapse*:*** deep latrines are prone to collapse in some soils, particularly if they are not lined. Pit collapses can be fatal depending on the depth of the latrine and the construction material.

Septic tanks similarly dispose of wastes on site by settling out the solids from flush water in a tank or series of tanks and filtering the excess water into the surrounding soil, often through a leach field. Again if they are correctly sited away from water sources, above the water table, and with enough drainage space, they can safely manage wastes. But they have similar problems to pit latrines in areas with high water tables or flooding and must also be emptied when full.

1.5 The double-vault toilet in India:

In India, the Vietnamese sanitation system has been adapted to a population of 'washers'. Not only urine, but also the water used for anal cleaning is diverted – in this case into an evapotranspiration reed bed next to the toilet. The vault is lined with straw before use. This provides a carbon-rich bed to receive the faeces and also absorbs moisture. A handful of ashes are sprinkled over the faeces after each use. Occasionally some straw, leafy material and paper scraps are also added, which means that there is a process of decomposition rather than dehydration. A reduction in volume of the vault contents confirms that decomposition is occurring. The first vault is opened after one year or more of operation.

The evapotranspiration bed requires very little maintenance. All that is required is that excessive growth is cut back, chopped into small pieces and added to the processing vault..

1.6 Concept

The basic concept of our project is to separate urine and excreta at source. We see the 19th century toilets uses so much water to flush out excreta to far away STP. But the problem is not solved here as the laymen thinks. There are so much processes that are to be done to this waste-water that it involves so much amount of time, energy and money. This resources are too precious to be wasted in modern world. Leave apart the kilometers of pipelines that are included. The normal STP then gives water output that is not at all useable in day to day lives. The water is released into natural streams to restore back its natural condition and again then treated in water treatment plant.

So we see here there is so much of haphazardness in this precious resource planning.

Hence the very simple and lucid method is to separate it from very source. The urine which can be accustomed as "Gold Urine" can be easily treated at very nominal cost and can be a very rich resource in agriculture due to easy usability by plants. The excreta can be directed to septic tank and the supernatant thus generated is also good source of nutrients can be too used in agriculture along with urine. Hence the whole natural cycle is maintained and the nutrients of soil is restored back by this very concept.

program to increase the carbon content of soils. Most efforts to address the atmospheric build-up of carbon dioxide (CO_2), which is believed to be causing climate change, have focused on reducing the CO_2 emissions from fossil fuel burning and the clearing of rain forests. However, scientists have recently begun to focus on the ability of soils to serve as a sink for excess atmospheric carbon. (In soils carbon is stored in the form of humus and decaying organic matter.) A number of factors influence the accumulation of carbon in soils. Returning sanitized human excreta to degraded lands would play a significant role in this process by enhancing soil fertility, increasing plant growth and hence the amount of CO_2 pulled from the atmosphere through photosynthesis. A modest doubling of the amount of carbon in non-forest soils, from the current low level of 1% (as a result of erosion) to 2% over the course of 100 years would balance the net annual increase of atmospheric carbon over that time[3].

Access to improved Sanitation- Urban (%)
Access to improved Sanitation- Rural (%)

	1990		1995		2000		2005	
Afgh	7	5	7	2	30	16	49	29
anista	55	12	54	18	53	27	51	35
nBan	...	...	65	70	65	70	65	70
glade	45	3	49	9	55	17	59	22
shBh	100	...	100	42	100	42	100	42
utan	48	7	53	15	58	23	62	30
India	82	17	56	26	89	34	82	41
Maldi	82	64	93	75	96	85	98	89
vesN								
epalP								

Ref: Banglore Workshop.

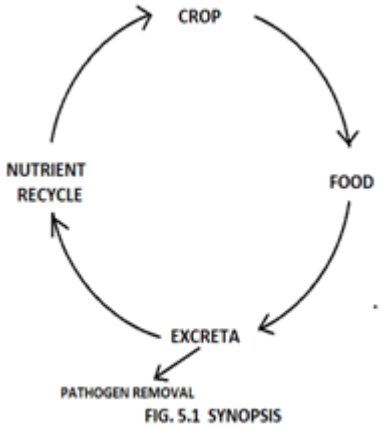


FIG. 5.1 SYNOPSIS

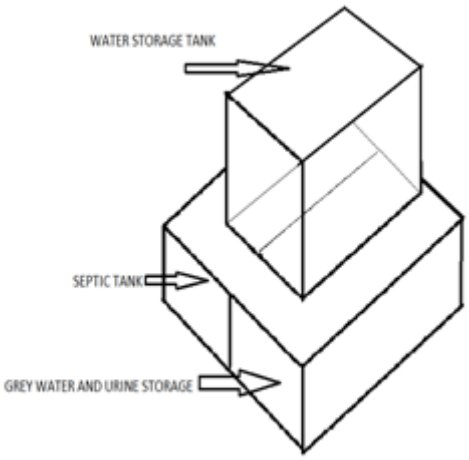


FIG. 5.3 STRUCTURE OF BATHROOM

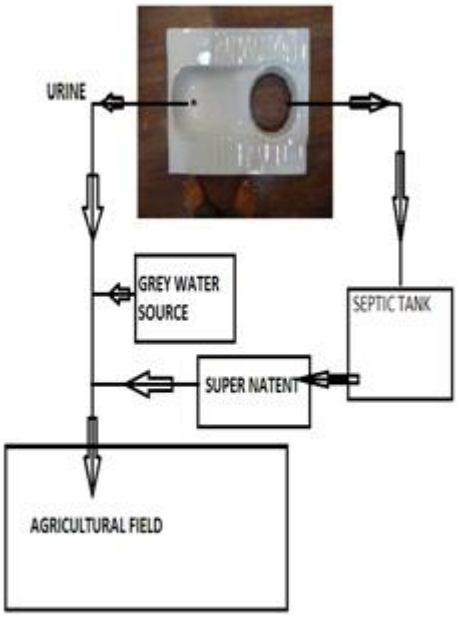
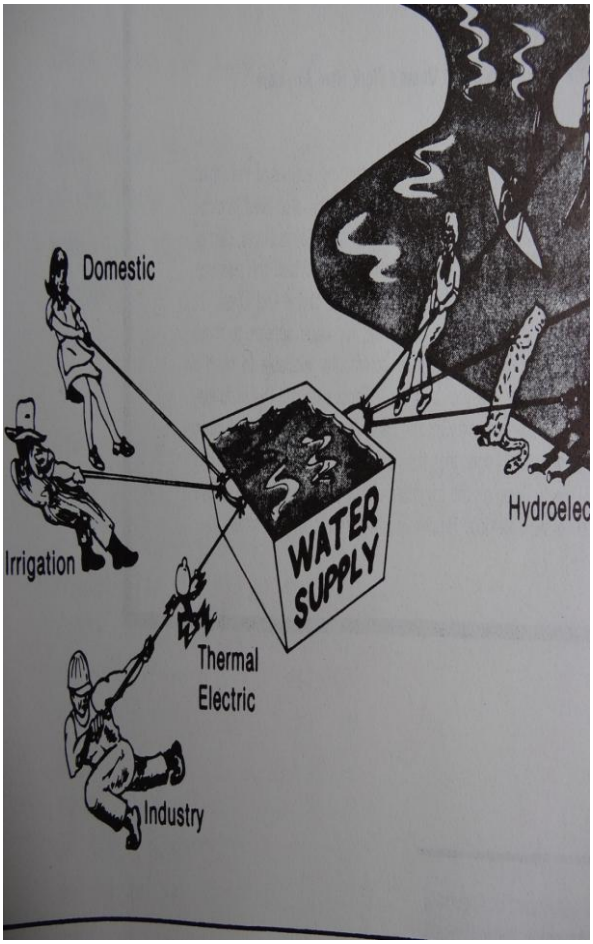
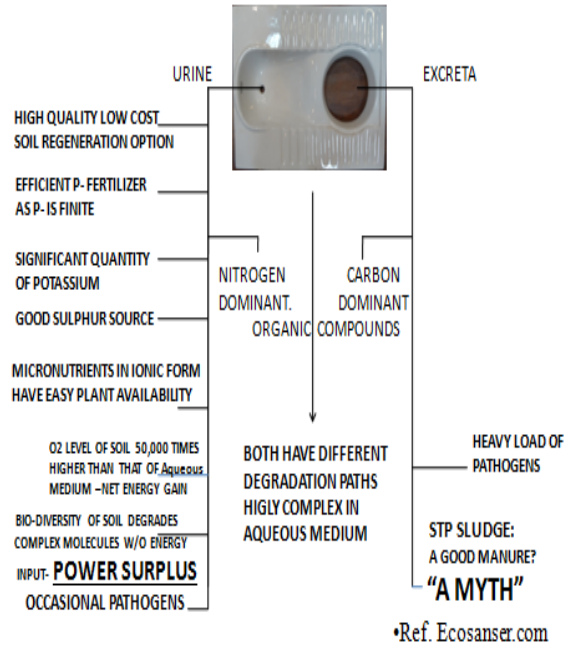


FIG. 5.4 OUTLINE



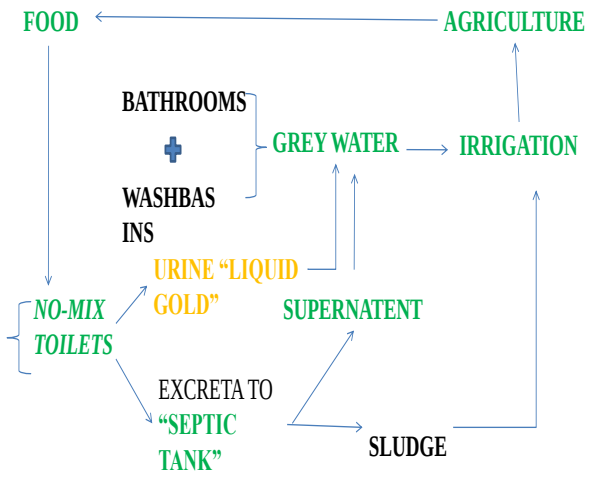


No. of person	Normal scenario	Scenario when using ecosanitation
Water to be treated at STP for one person	135 litres	30 litres
Water to be treated at STP for 1000 person	13500 litres	3000 litres

Ref. Indian Plumbing code

Thus the table shows the need of ecosanitation by showing how much sewage load can be reduced to stp by ecosanitation.

A STEP FORWARD: TAKING CLOSED-LOOP TO NO-MIX TOILETS



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