

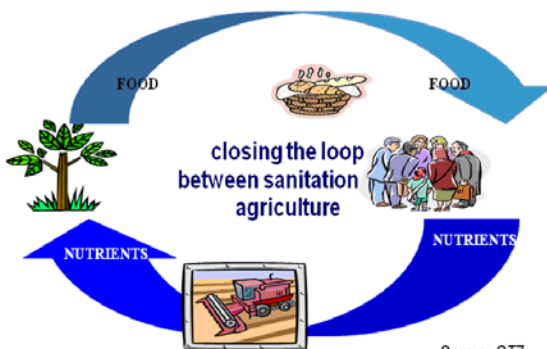
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## Commercializing an Innovation in an Invisible Market : Case of Ecosan toilets

Over 60 per cent of the Indian population lives in urban, semi-urban and rural areas that are not connected to a centralized sewer system and have little or no access to public water connections. Let us refer to such areas as ‘marginalized zones’. Even with an annual GDP growth rate of 5.3 per cent, there are at least 800 million underprivileged people in India today living on less than 2\$/day. Only one in three Indians has access to any form of a functioning toilet. Putting these three facts together, it seems highly likely that the population that has no access to toilets contains a majority of the underprivileged living in marginalized zones.

It is clear that sanitation is at the heart of not only environmental security but also food security and health, as better sanitation improves health and thereby labour productivity. As labour productivity increases, the capacity to generate revenue

*Principle of EcoSan*



also increases, enabling larger expenditures on food, health care and education. Keeping in mind that all the eight goals enunciated in the MDG can be linked to food security, health security or environmental security directly or indirectly, better sanitation will therefore have a positive impact on all the MDG targets.

Ecological sanitation regards human waste as a resource to be recycled rather than as a litter to be disposed. The use of human urine and excreta for crop fertilization has been widely practiced in many regions of the world since centuries. Eco-sanitary toilets refer to those in which animal

biomass (human waste for instance) is collected and then processed with plant biomass (wood, leaves etc.) or with inorganic matter such as sand or rock filters, to be reintroduced into nature in ways that do not pose nutritional or environmental risks to living organisms.

There are many kinds of ecosan toilets. One type of ecosan toilet, involves the separation of urine and faeces, and is referred to as a urine-diversion toilet (that we will simply refer to as an ecosan toilet in what follows). In such a toilet, urine and faeces are separated (for details see paper by M.Subburaman in this conference series) and then treated. Urine is let out or stored to be used as fertilizer, and faeces are converted into compost through dehydration and decomposition facilitated by ventilation and the addition of dry material. Thus, ecosan toilets contribute to environmental security and health by minimizing the introduction of pathogens from human excrements into the water cycle and by facilitating a safe and hygienic recovery and use of nutrients from human waste.

In the above context, the objective of our paper is to examine the emergence of ecosan toilets in India and then study the determinants of their usage through a case study of the coastal village of Kameshwaram in Tamil Nadu.

## I

### **On markets and innovation creation**

In economics, there are two ways of looking at innovation creation at a macro-level. One is the input-output approach that involves examining the relation between investment inputs and innovation outputs. The other is the systematic approach, which considers the creation of technological competence and the generation of innovations to be a collective and cumulative process involving a variety of economic actors such as firms, public laboratories, financiers, consumers, institutions and the State, within a well defined national system. The different actors compete for resources and revenues but also collaborate to generate wealth. The outcomes of competition and collaboration depend on a variety of factors such as regulation, nature of markets, bargaining positions of each of the actors, etc. Thus, the design of any new technology is a result of the interaction between a variety of economic actors. It is this latter approach that we adopt in the paper.

The common point of both approaches is their assumption that new technology does not develop in vacuum. It emerges due to the forces of market or societal demands and the forces of market supply. Thereafter, the systematic approach tries to identify and understand the nature of the economic actors, the market environment and the regulatory environment that comprises an 'innovation system' and leads to a particular pattern of innovation creation, while the input-output approach focuses only on relations between investment and outcomes, leaving the middle as a black box.

The systematic approach permits us to identify the origins of innovations as

emanating either from the demand side or the supply side of the market. Innovations might be generated through a demand pull exercised either by individual consumers, institutions, firms or even the state. For example, Green Revolution as a measure was introduced to address famine, while private firms catering to the needs of national and international consumers created innovations in the Indian software sector leading to its spectacular development. Innovations might also be a market response, a 'supply pull' reaction to competition. Through the launching of new products or new cost efficient processes, an innovating firm can increase its market share or increase market barriers through building a reputation and earning 'first mover advantages'. This is typically the case in the pharmaceutical sector.

### **What is the market for toilets targeting the underprivileged group?**

Supply side of market for toilets targeting bottom of income pyramid

Usually any innovation system comprises five active players: The state, firms, public laboratories, financiers and consumers. In the market for toilets, the active players in India are the state, which plays multiple roles, and non-profit organizations (NPOs). Firms and public laboratories play a marginal role here. Consumers are slowly becoming more active.

The Indian state: The state is usually the most important actor in any innovation system and this is very much the case in the toilets market also. Four phases of state intervention with very different approaches can be distinguished.

Phase I- 1947-1986: The initial concern of the policy makers of independent India was to invest and create capacity in heavy industries such as power, iron and steel, machinery production and chemicals. In other words, the need of the hour was to develop the capital goods industry that would form the foundation for industrialization. The private sector was left to cater to the demand for consumer durables and non-durables. There was no policy focus on sanitation.

Phase II-1986-1999: The first public programme to focus exclusively on sanitation was the Central Rural Sanitation Program (CRSP) initiated in 1986 by the Ministry of Rural Development. Offices of the District Rural Development Agency (DRDA) financed recipients, partially or totally, to build toilets. However, the supply and maintenance of the toilets offered to the poor was blatantly sub-optimal. According to a UN report the CRSP failed to be effective because the cost of the existing toilet models was out of reach of many rural households, the public sector employees were not very motivated, and other economic actors like NPOs and firms were not very involved in the sanitation drive.

Phase III -1999-2004: With the adoption of economic liberalization and the initiation of policy reform in 1991, the Indian state began withdrawing as a direct

player on the supply side of the market to becoming an indirect player, financing sanitation drives. From being the main supplier on the toilets market, the state became the main financier.

In 1999 the Department of Drinking Water Supply in the Ministry of Rural Development, launched the 'Total Sanitation Campaign (TSC)' in order to provide incentives for the development of a private market for sanitation that involved a demand driven approach, with education as a major component and actively soliciting the participation of panchayats (village level government bodies), NPOs, women's groups and youth clubs.

Incentives for the development of a private market for sanitation were provided as follows. Financing was available for 'Start-up activities' (survey on the status of sanitation, peoples' attitude and demand, preparation of implementation, etc.), 'Information-Education-Communication Activities' (area specific, involving all the sections: motivation, health and hygiene awareness, maintenance of facilities), 'Rural Sanitary Marts and Production Centres' (for procuring material required for the construction and services, and providing guidance--- could be opened by NPOs, SHGs, women's organizations, and panchayats), and for the 'Construction of Individual Household Latrines'.

Phase IV-2005-2007: According to a number of experts and NPOs, with whom we have spoken, the TSC really took off only after the tsunami of December 2004. In fact, the management of the refugee camps and the rehabilitation of tsunami victims highlighted the sorry state of sanitation in rural India and served as a trigger for shifting the sanitation-related-activities to a higher gear. From 2005, the number of projects launched under the TSC scheme increased and the reimbursement accorded by the government to every toilet that was built increased from Rs 500 to Rs 1200. The enormous amounts of private donations received in the aftermath of the tsunami also provided finance for sanitation drives in the post-tsunami period.

Local NPOs: In the pre-liberalization period, when the state was the major player in the market for toilets, there were only a few NPOs dedicated to the cause of sanitation (e.g. Sulab). Founders of such NPOs invested their time and efforts to bring out innovations and develop business models for the maintenance of sanitation infrastructures. They also managed to survive because they were able to attract funds with their message, their personal charisma and their efficiency. Given the paucity of financiers, only NPOs which were highly efficient in raising funds could be active in the field of sanitation.

In the post-liberalisation period, business opportunities for NPOs opened up with the state becoming a financier, and with the entry of multinational NPOs and agencies as contract providers. Thus, the NPO sector is growing steadily in India. According to Srivastava and Tandon (2002) there are about 1.2 million NPOs in India today. They are mostly rural based, nearly 50 per cent are unregistered and

about 73.1 per cent have only 1 or 0 full time employees. Nevertheless, an NPO cannot consecrate time to generate innovations unless it has a contract to undertake research. Therefore, while NPOs are perceived to be the most efficient agents for the transformation of funds (whether from state, agencies or individuals) into concrete toilet structures or education on toilets, investing efforts to create toilet technology innovations remains clearly an NPO-specific 'managerial or founder's vision' undertaking.

International agencies and western multinational NPOs: International agencies like the UNICEF and UNDP have been active in environmental management since many years. Since the adoption of liberalization and the new ease of mobility of people, commodities, capital and knowledge permitted, India has seen an influx of international organizations like Water Aid, GTZ, BORDA and now SuSanA or sustainable sanitation alliance, which are extremely active in various fields of sanitation promotion. Most of these organizations create business opportunities in India through offering contracts for Indian NPOs, though some of these organizations also have their own subsidiaries or at least a front office in India. Through contracts with local NPOs, they have greatly contributed to the improvement of sanitation conditions through financing of toilets and other sanitation projects and transferring savoir-faire or know-how from abroad.

### **Demand side of the market for toilets**

In examining the demand for toilets, we must distinguish between expressed demand and latent demand.

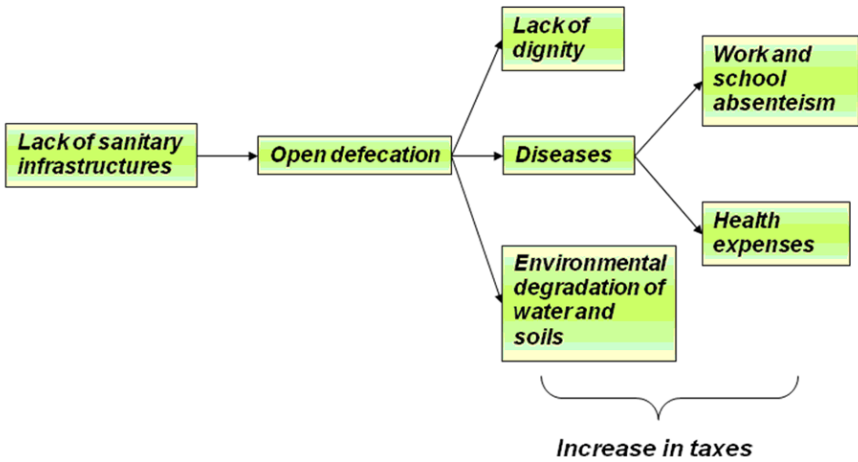
Expressed demand is that which comes from potential users. There is ample evidence that the poor prefer to spend on goods that strengthen local social networks or on those that offer immediate utility in terms of escapism from daily drudgery, rather than on durables that yield indirect benefits in the long run such as toilets. Thus, the poor prefer to spend on temple festivals or family functions or dowry that strengthen locals-social-networks or TV, movies, music systems or alcohol, all of which offer immediate escape rather than on toilets.

However the obvious need for toilets is glaring. According to the World Health Report 2004 , 61 per cent of the population has access to functioning toilets in India in cities and only 15 per cent in rural areas. Globally only 28 per cent of the population have access to a functioning toilet.

So it is a market where there is an evident social need. Toilets usage will generate positive externalities leading to a diminution of health hazards generated by open defecation (mosquito spread diseases, water and soil contamination) and a decrease in public expenses on health, which can then be diverted to improving food security or livelihoods.

The above discussion of section 1 brings us to our first result:

Result 1: The market for innovations in products like toilets, targeting the



underprivileged group, is an invisible one, because the expressed demand is much less than the latent demand; and because on the supply side, innovations are mainly created by NPOs through ‘learning by doing’ routines rather than by ‘investment in learning’.

## II

### Toilet entrepreneurs and introduction of Ecosan

In this section, we trace the recent history of toilet innovations in India dividing them into three phases.

Phase 1: Introduction of ‘toilets for the deprived population’ and ‘public toilets’ as a business model - Sulabh : 1970

Sulabh was created in 1970 by Bindeshwar Pathak, a young sociology student and a follower of Mahatma Gandhi. His objective can be summed up as follows: “To restore human rights and dignity to scavengers by stopping the practice of manually handling human excreta”. Pathak saw his mission to improve sanitary conditions as going much beyond just introducing new technology. For him, it was a veritable movement to fight against casteism and the employment of millions of members of the scavenger caste in cleaning traditional latrines by sweeping out human refuse. He fought against the employment of people in cleaning out human excreta manually by introducing a model of a toilet that could be maintained autonomously without the need for a scavenger.

Pathak was also the first to break the myth that the government must provide public toilets as a merit good; i.e. as something that the public merited. This has clearly led to sub-optimal maintenance of public toilets in India. He insisted that a public toilet must also be supported by a robust business model that permits

accessibility to all, while generating enough revenue to employ personnel to ensure its cleanliness. By 2001, Sulabh had constructed 700,000 individual household toilets and about 3000 pay-and-use public toilets, generating employment for about 50,000 people.

#### Phase 2: Calvert and appearance of Ecosan model in Kerala - 1994

The Sulabh toilet model, while being suitable for dry areas was found to be unsuitable for areas with a high water table such as coastal areas. Hence, the Sulabh model was never adopted widely in such regions. In the early 1990s Paul Calvert, an English marine engineer, who was based in Trivandrum, the coastal capital city in Kerala observed that the fisherfolk along the coast had no access to toilets and that the high water table area prevented the optimal maintenance of pit latrines. In 1994, to solve this problem, he adapted an existing European urine-diversion toilet model, with a 2-in- pan (segregation between liquid and solid, and production of compost) for Indian coastal areas. Calvert is now a social entrepreneur. He founded the organization EcoSolutions with the aim of designing, demonstrating and promoting ecological sanitation and such toilets are now popularly known as ecosan toilets.

#### Phase 3: Second-generation of Indian innovators - the SCOPE Trust (Society for Community Organization and People's Education)

Since its introduction in 1994, ecosan toilets have been promoted by a number of international agencies in India such as UNICEF, GTZ and BORDA. It has been enthusiastically adopted by a number of Indian NGOs, some of whom, like the Society for Community Organization and People's Education (SCOPE), have added incremental innovations to the main model to make it more suitable to the Indian conditions.

SCOPE was created in 1986 by M. Subburaman and initially SCOPE was active in a variety of activities to promote livelihood and empowerment through education. However, Subburaman noticed that increases in income generated in the target areas were frittered away on medicines for water borne diseases (thus, leaving the families with the same disposal income as before) and he identified the lack of toilets as being the main problem. In 2003, in a workshop organized by Shanta Sheela Nair (Secretary, Department of Rural Development, Tamil Nadu), Subburaman met Paul Calvert, who introduced him to ecosan technology. SCOPE was working in Musiri block (Trichy district) located on the Cauvery River bank. Ecosan appeared as the solution for this high water table area and consequently SCOPE adopted it. Adoption of ecosan was simply a technical solution to reach their objective, that's to say: to ensure complete toilet coverage in rural India.

SCOPE has also greatly contributed to diffusing the ecosan technology and making improvements on the toilet pans used, the superstructure and complementary

artifacts like the vent pipe etc. SCOPE integrates new knowledge upstream, through participation in national and international conferences and leads a group of Indian ecosan actors. Downstream, it interacts extensively with beneficiaries. Such feedback has been crucial for the improvements made on the technology and ensuring optimal usage of toilets by beneficiaries. However, their innovative activity, like those of most small NPOs, is constrained by the absence of a scientific team and a lack of finances to conduct experiments.

We can thus sum up the determinants of the generation of innovations in the toilets market in the following result.

Result 2: Innovations introduced in the toilets market are uniquely driven by the private and organization-specific vision of a few NPOs, rather than being an outcome of incentives provided by the market or the state.

### III

#### **The demand: Kameshwaram case study**

Kameshwaram is an isolated village in the district of Nagapattinam, 10 kilometres away from Velankanni. It is a high-water table area, with heavy rains during the three months of the monsoon and therefore, it is impossible to put pit latrines there without polluting the ground water. Its population is 5300, comprising mainly farmers, with a small fishing community. As people in the village are used to practising open defecation, the area is infested with mosquitoes during the monsoons.

In the aftermath of the tsunami, SCOPE built 250 ecosan toilets in Kameshwaram financed by UNICEF, DRDA (District Rural Development Agency) and the French Association Un-Ami (called Friend-in-Need Trust in India).

After the construction of the first 50 toilets, we conducted a study in order to:

- Measure the rate of utilization of ecosan toilets;
- Identify influential factors and the nature of their impact
- Analyse the process of adoption and utilization

We proceeded in three steps:

1 – Micro qualitative study : In order to understand the issues, we conducted extensive interviews with 10 families in October 2006.

2 – Quantitative study : In order to measure the rate of utilization and identify the determining factors, we conducted a door to door survey of 39 families, corresponding to 171 individuals in December 2006.

3 – Focus group discussion : In order to understand the nature of the process leading to decisions on whether or not to use toilets, we held open discussions with gender segregated groups of 10 persons each in March 2007.



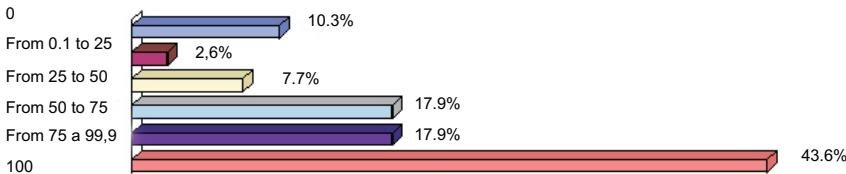
In the rest of this section, we share some of our first results. From the outset, it was very clear that the necessity of defecating outside, robs individuals of dignity. Morning and night, people have to search for ways of concealment and women often have to ask another woman to accompany them for reasons of security. Open defecation is very often mixed with feelings of shame. In this context, ecosanitary toilets are clearly regarded as a major innovation in the lives of the users and a means of empowerment. The main advantages of the ecosan toilet are perceived as:

- (i) Convenience - proximity to residence;
- (ii) empowerment-fulfilment of need for privacy without having to take recourse to an escort and elimination of the risk of harassment;
- (iii) ecological - fertilisation of earth through diversion of urine and use of faeces-based compost in a garden around the toilet.

However, there is an inertia about investing in toilets because of the perceived disadvantages of a toilet in terms of having a room that is impure, smelly, dirty, used by others and expensive to build.

At the individual level 72 per cent or 122 of the 170 individuals use toilets. At the family level the percentage of family members using toilets is distributed as follows:

Figure 1 – Distribution of rate of use at the level of the family

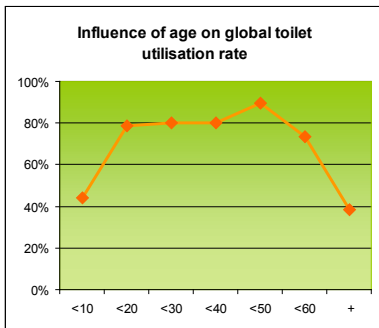


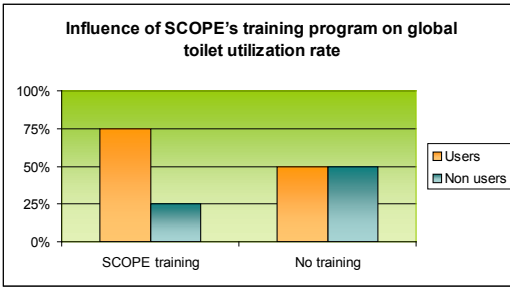
Note: The vertical axis shows the percentage of family members using toilets and the horizontal axis shows the percentage of families in the village corresponding to each usage group.

The principal result on determinants of toilet usage is summarized as follows:

Result 3:

- Age, education occupation and participation in the educational program of SCOPE are influential in determining whether or not an individual uses a toilet.
- Women use toilets much more frequently than men.
- Religion, caste and revenue have no influence on toilet utilisation.





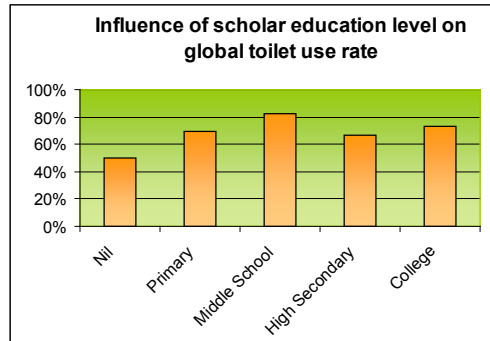
Age is an important factor as is evident from the figure. The population in the age group 15-55 use toilets the most. Children find it constraining to go indoors within an enclosed space. For the elderly, toilets are a new imposition. They claim that a toilet is difficult to use, for physical reasons, but

this is not very credible as to bend or to squat is the same within a toilet or when going in open-air. They claim it is difficult to change habits.

Literacy plays a very important role but the number of years spent in school has no influence.

With respect to Occupation: About 90 per cent of housewives and merchants use toilets. Among the rest, the rate of utilisation is about 50 per cent. This could be because they are away from the home during the day.

SCOPE's training has had a strong influence on behaviour. The training classes were made interesting so that participants were able to commit the main messages to memory and then go back and discuss them with their family members and neighbours and spreading awareness of the technology. We feel that with the knowledge, they retroactively became aware of the environment and health risks faced in the practice of open defecation. But this transformation occurred only after training and using toilets.



Our central finding on the process of adoption and usage is summarized in the following diagram:

A successful sanitation drive is one where toilets start from being a non-evident solution to becoming a social norm. When toilet usage becomes a social norm, a market demand is created for toilets. For example, in Kameshwaram toilets were mainly created for the farming community, but now the fishermen want toilets too !

#### IV Recommendations

Four recommendations emerge directly from our field observations on the utilization of toilets.

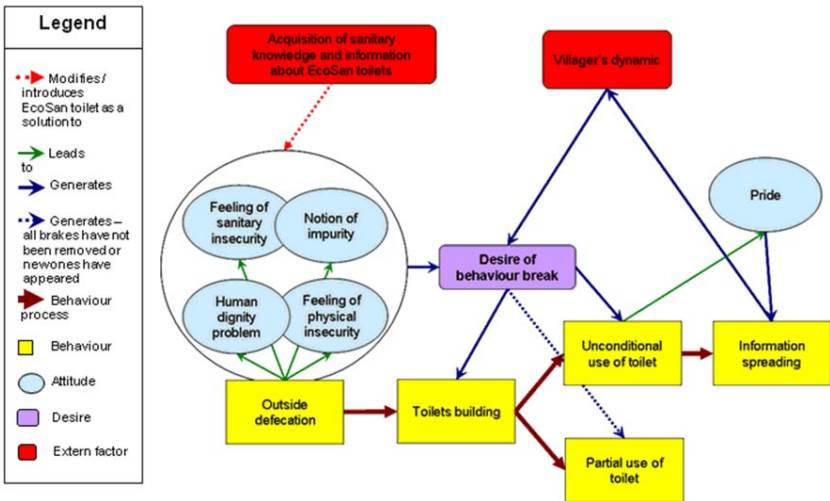
**Recommendation 1: In order to ensure a successful sanitation drive:**

- In the pre-toilet construction phase, it is essential to impart knowledge of the benefits of toilets and the dangers of open defecation.
- Then it is necessary to build a few experimental toilets in order to ensure that they are adapted to the terrain.
- It is also necessary to ensure that the experimental toilets are associated with potential local facilitators.
- Women should be actively involved as they appreciate toilets and benefit from them even more than men.

**Recommendation 2: The choice of NGO involved in the sanitation drive will have a crucial impact:**

- The NGO has to be a good and reputed “connector” who knows the local culture.
- The role of such a NGO should include:
  - Education and motivation before toilet construction.
  - One year of monitoring of toilet usage, trouble shooting and compost formation.
  - Sending compost formed for testing for contamination.
- The NGO has to be paid for its internal administration and the services rendered so as to ensure focus on project.

Figure 2 - Process of adoption and use of Eco San toilet



**Recommendation 3 (for the State):**

- There must be investment in research in public labs to study the determinants of quality of compost in order to establish ‘safety norms’ for compost made

from human waste.

- Courses on ecosan toilets or toilets in general in environmental and medical schools must be improved and aligned with field work
- Incentives must be provided to engineering schools to improve the design of toilets for the BOP group.
- The diffusion of information through Panchayats can be improved.

### 1. Conclusions:

Reflections on the political economy of innovations promoting environmental and socio economic security such as toilets

Social philosophers like Ivan Illich, Jacques Ellul and even Gandhiji have claimed that every innovation, every technology, and even every technique leads to a specific economic, political and cultural model of society. Analysing the features of ecosan toilets, it is possible to claim that this technology corresponds to a model of society that seems radically different from our current model of society in an increasingly globalised world.

The ecosan compost toilet is a simple technology that everyone can understand it, create it, reap benefits from it or modify it. Thus, it permits autonomy and independence from experts, engineers and high skilled workers. In addition, it is:

- A local technology, since almost all raw materials are locally available: sand, bricks, iron sheet etc.
- A cheap technology : low construction cost and no maintenance cost
- A resource-saving technology: consumption of water and energy is reduced to a minimum

- And most important of all, it is an ecological technology.



The motto of the Swedish ecosan network EcoSanRes is 'close the loop'. To ecologists, this may be banal, but for others this motto is practically a call for a revolution. It calls for the reintegration of the activities of humans with the natural environment, a far cry from the functioning of most industries today, which are based on the exploitation of nature by humans:

exploitation of minerals and vegetal and animal resources.

According to Illich or Ellul, organizations like SCOPE have to choose between two paths today. Either they can limit their work to the conception, implementation and diffusion of ecosan toilets and related knowledge. In this case, their role remains limited to that of an NPO catering to the underprivileged groups. Or they can go

further in understanding the socio-economic and political consequences of the promotion of ecosan technology and recognize that it is actually an approach to particular way of development, competing with other development trajectories that are less ecological. In this way toilets become a 'means' of promoting a particular ecologically sustainable development trajectory and are no longer limited to being



*Inauguration of the toilet n° 100/100  
with Nagai P.O. – 6/01/07*

simply 'an end' in themselves.

Thus, it is incoherent and incomplete to focus on compost toilets without aiming to initiate changes in the larger spheres of food security, health security and socio-economic security, in ways that dovetail the characteristics of the ecosan toilets. How can autonomous sanitation be promoted without seeking autonomous, dependency minimizing, self-sufficient agricultural production or livelihoods? These are the questions that have to be explored and conferences like these can serve to create cross sectoral networks between ecosan adherents, organic farming promoters, women's entrepreneurship groups etc. The traditional sayings rings truer than ever: 'united we stand, divided we fall' .]



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<sup>1</sup> We would like to thank Sangeeta Venkesh for excellent research assistance for this paper. We also gratefully acknowledge useful comments by Paul Calvert of Ecosolution and by M.Subburaman and V. Ganapathy of SCOPE.

<sup>2</sup> In 2006, according to World Bank Statistics <http://devdata.worldbank.org/external/CPPProfile.asp?PTYPE=CP&CCODE=IND>

<sup>3</sup> <http://www.infochangeindia.org/analysis150.jsp>

<sup>4</sup> <http://hdr.undp.org/en/reports/global/hdr2006/>

<sup>5</sup> C. Freeman, 'The National System of Innovation in historical perspective', Cambridge Journal of Economics, 19, 1995, pp. 5-24 ; B.A. Lundvall (Ed.) National Innovation Systems : Towards a Theory of Innovation and Interactive Learning (London, Pinter, 1992); R Nelson., (Ed.), National Innovation Systems : A Comparative Analysis, (Oxford, Oxford University Press, 1993).

<sup>6</sup> <http://www.un.org/esa/agenda21/natlinfo/countr/india/CaseStudyIndiaws1.pdf>

<sup>7</sup> <http://www.un.org/esa/agenda21/natlinfo/countr/india/CaseStudyIndiaws1.pdf>

<sup>8</sup> <http://www.un.org/esa/agenda21/natlinfo/countr/india/CaseStudyIndiaws1.pdf>

<sup>9</sup> Srivastava and Tandon (2002) <http://pcserver.nic.in/ngo/conference/ngo-pria.pdf>

<sup>10</sup> <http://www.who.int/whr/2004/annex/country/ind/en/index.html>

<sup>11</sup> <http://www.sulabhtoiletmuseum.org/profile.htm>.

<sup>12</sup> Ivan Illich, Tools for Conviviality (1977)

<sup>13</sup> Jacques Ellul, The Technological Society (1964)