# Green Technology Diffusion: **The Case of Ecosan Waterless Toilets**

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## The Challenge

Although between 1990 and 2010, 1.8 billion people gained access to improved sanitation, more than a third of the world population rely on open defecation in rivers and bodies of water, open fields, bushes, and forests, facilitating the transmission of disease. The problem is most acute in sub-Saharan Africa and South Asia.[1] For instance, an estimated 1.1 million liters of feces are introduced into the Ganges River in India every minute.[2]

The international community will likely miss the UN Millennium Development Goal of providing 75 per cent of people with access to improved sanitation facilities by 2015. In fact, seven out of ten people lacking access to improved sanitation facilities live in rural areas.[3] Furthermore, while 79 per cent of urban dwellers have benefited in recent years from improved sanitation, the figure is just 47 per cent for rural dwellers.[4]

### At a Glance:

### ECO SANITATION technology to improve rural sanitation

- Environmental challenge: Expand access to improved sanitation in places with no infrastructure
- Technology solution: Waterless toilet system, easy to install and maintain, that converts human waste into compostable material
- Technology dissemination: Manufacturing in South Africa with sales in Africa, the Caribbean, South America, Australia, Europe
- Transactions: Eco Sanitation Ltd., JoJo Tanks, local agents in many countries
- WIPO GREEN: Platform to identify new markets, and new partners for distribution and possibly manufacture

1. A sanitation facility hygienically separates human excreta from human contact, Unicef and World Health Organization (WHO), Progress on Drinking Water and Sanitation 2012 Update, at http://whqlibdoc.who.int/publications/2012/9789280646320_eng_full_text.pdf?ua=1
2. Unicef, Media Note: Water, Sanitation and Hygiene, 2010, at www.unicef.org/madagascar/Final_Global_Latrine_Day.docx
3. UN Conference on Sustainable Development, Fact Sheet: Water and Sanitation, 2012, at www.un.org/en/sustainablefuture/pdf/Rio+20_FS_Water.pdf
4. See Unicef and World Health Organization (WHO), Progress on Drinking Water and Sanitation 2012 Update, at http://whqlibdoc.who.int/publications/2012/9789280646320_eng_full_text.pdf?ua=1

A lack of access to improved sanitation has a range of effects on human health and the environment. In developing countries, on average 90 per cent of sewage is released into the environment without any treatment. Sewage runoff into the ground and surface water raises micronutrient levels, causing algal bloom, which creates aquatic dead zones where little or no oxygen remains in the water.[5] This situation causes marine animals and coral reefs to perish.[6]

It has been estimated that nearly 10 per cent of the global disease burden could be eliminated through improved sanitation and access to clean water. 88 per cent of diarrheal illnesses result from poor sanitation and hygiene, killing 1.5 million people per year of which 1.4 million are children. Other debilitating illnesses related to lack of sanitation and clean water include: malnutrition due to diarrhea, parasitic infections from agents like hookworm which reside in contaminated soil, cholera, trachoma, polio and schistosomiasis. Fortunately, most of these diseases are preventable. A 32 per cent reduction in rates of diarrheal disease can be achieved through improvements in sanitation alone.[7] Many new technologies have been developed to improve the situation, many of which are specifically designed for use in developing countries.

## Technology Solution Developed by Eco Sanitation Ltd.

Eco Sanitation Limited, based in South Africa, produces, distributes, and markets the EcoSan waterless toilet, a sanitation system that converts human waste into dehydrated, compostable material. The waste can then be used as compost or disposed of at a traditional waste management facility.

The EcoSan requires neither water nor sewer access to function. It eliminates the cost and infrastructural barriers associated with the installation of sewer and water systems, while removing the negative health and environmental effects of open defecation. It is particularly relevant to improving sanitation in rural communities.

The system is composed of a tank, a seat and a bowl, all of which are made of high-quality polyethylene. The simplicity of the design and lightweight materials allow the system to be installed by the customer.

Waste falls into a helical, screw-shaped conveyor that is moved every time the toilet seat is lifted. Over the course of 25 days, the waste is slowly dehydrated and gradually moved it to its final destination: a reusable collection bag. Depending on the number of users, the bag must be emptied once every six months. Normal amounts of excrement and urine, and small quantities of water can be put into the system and will dehydrate over the course of a month. The collected waste, reduced to 5-10 per cent of its original mass, can be used as compost or fuel, or disposed of.

The current design was created to serve local development needs in Africa. The system is highly adaptable, allowing for above or below ground installation of the tank, depending on ground conditions. The EcoSan can be removed and reinstalled elsewhere if needed. The sturdy construction requires very little maintenance and rarely, if ever, requires parts to be replaced. In fact, in over 15 years of operation, the company has not received a single maintenance request regarding a broken part.

The EcoSan toilet was designed to resist the many hours of direct sunlight and high temperatures typical in most African countries. The bowl and seat are practically unbreakable, unlike toilets made of porcelain. The system, however, cannot handle large quantities of water as this interrupts the dehydration process. If too much water is poured into the bowl, the toilet must be left to dry out for at least a week, or the water must be pumped out of the system.

## Technology Dissemination

The EcoSan toilet, invented in South Africa, was brought to market there in 2000. Eco Sanitation Ltd. has been the sole patent licensee, with exclusive rights to manage manufacturing and distribution. Currently, all parts of the EcoSan are manufactured only by Eco Sanitation Ltd.'s partner, JoJo Tanks, in South Africa. The product is exported throughout Africa, the Caribbean, South America, Australia, and Europe.

Eco Sanitation works with a network of agents who sell EcoSan toilets to customers in their geographic regions. Agents are located in African countries including Namibia, Zambia, Mozambique, and Tanzania, and are also in Australia and France. Typically, an agent purchases toilets from Eco Sanitation Ltd., adds a markup based on the cost of shipping, and sells to customers locally. Eco Sanitation Ltd. tests the relationship with a new agent for an initial period of three to six months before signing a longer-term distribution contract.

Installation, as well as basic maintenance, can be performed by the customer. For instance, the collection bag must be emptied every few months and is reusable. Customers can also make and use their own bag or toilet seat. The materials are lightweight, which makes it easy to deploy the technology even in isolated areas.

## Outlook for the EcoSan Waterless Toilet

The current model of the EcoSan waterless toilet has been broadly deployed in developing countries, and the company is expanding its target market to include customers in developed countries. In current markets, the technology has been popular in rural areas for low-cost housing developments, schools, farms, and game reserves. In Europe, the EcoSan has been installed at leisure resorts and lodges in rural areas.

Eco Sanitation Ltd. has developed a range of offerings to meet different needs, such as: an Asian-style squat toilet model for use in countries that do not typically use a Western commode, a high-volume model, for use in commercial settings, that utilizes a drum rather than a bag for collection, and a model for use in underground mining operations. Based on market research, Eco Sanitation Ltd. is now developing a new model, aimed at a more upmarket client base, that will include features like a more attractive bowl and high-quality, standard seat.

In addition to distribution via a growing network of global agents, Eco Sanitation Ltd. is exploring the possibility of having certain agents manufacture the EcoSan, provided their facilities can meet the necessary quality standards. Currently, manufacturing is restricted to the South African facility run by JoJo Tanks. In 15 years, Eco Sanitation Ltd. has amassed significant know-how in relation to the EcoSan design and manufacturing. This valuable intellectual property would be shared strategically by the company with confirmed manufacturing partners.

The company has found marketing online through its website, together with word-of-mouth, to be effective in generating customer interest. At the same time, as it explores new markets and begins targeting new types of customers, Eco Sanitation Ltd. plans to leverage platforms such as WIPO GREEN to raise awareness about its offerings, and to attract new agents and partners. The EcoSan waterless toilet has been uploaded to the WIPO GREEN database.

5. UN Water Sanitation Drive 2015, Fact Sheet 5, 2013, at http://sanitationdrive2015.org/wp-content/uploads/2013/03/Planners-Guide-Fact-Sheet-5_English.pdf
6. Organisation for Economic Co-Operation and Development (OECD), Agriculture's Impact on Aquaculture: Hypoxia and Eutrophication in Marine Waters, 2012, at www.oecd.org/tad/sustainable-agriculture/49841630.pdf
5. WHO, Safer Water, Better Health, 2008, at http://whqlibdoc.who.int/publications/2008/9789241596435_eng.pdf

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