PROJECT RESULT / CASE STUDY

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# Country Water Action: Rising Eco-Town Boasts "No-Flush Toilets"

A big housing development project is bringing ecological sanitation toilets that do not require water, to a water-scarce municipality in the northern region of the People's Republic of China.

In a city where the groundwater is polluted, water is rationed, toilets are lacking, and open defecation even during winter is common, human dignity is as scarce as the water for people's sanitation needs. So it is a good thing that residents of Erdos Municipality in the PRC are regaining their dignity little by little with the installation of new no-flush toilets. Of course, it helps that the toilets come with brand new homes.

The Erdos Eco-Town Project (EETP) - a collaborative enterprise of the Dongsheng District of the Erdos Municipal government, Stockholm Environment Institute (SEI), Swedish International Development Cooperation Agency (SIDA), and a private real estate developer (Daxing Co. Ltd.) - is the world's first major attempt to build an entire town with onsite ecological sanitation (ecosan).

Conceived in 2003, the project constructed 825 apartments in 4 and 5 floor multi-storey buildings each equipped with no-flush, urine-diversion toilets and urinals developed in Sweden and the PRC and manufactured within the country.

The EETP boasts of an eco-station composed of a greywater treatment plant and thermal composting unit, a solid waste center, a storage pond for treated greywater, agricultural experiment plots, and sanitation research testing facilities. All waste in the 50-hectare eco-town is designed to be treated onsite and recycled for agriculture. Household organics are collected and composted, while urine, feces, and greywater are treated separately.

The entire ecosan operation and management, including communicating with individual households, is carried out by a local ecosan team comprising technical and social workers.

## Downtown Dongsheng district

The Erdos Municipality is located 100 kilometers south of Baotou in the Yellow River Basin. Known for its fine cashmere and coal mining, Erdos is composed of city clusters within a mining belt that has 125 billion tons of coal reserves. The town has a 20 percent annual GDP growth rate.

Dongsheng District, Erdos' largest, currently has a 400,000 population that almost doubled in the past 5 years alone. Downtown Dongsheng has 15,000 households living in multi-storey residential buildings and 45,000 households living in single-storey homes. Of these, only a third has flush toilets and the rest depend on public lavatories. Less than 10 percent of the public lavatories are equipped with modern toilets; most just have deep and shallow pit latrines.

Open defecation still occurs in peri-urban areas, risking environmental and human health. The general sanitation condition is characterized by poor community awareness, non-maintained facilities, and chronic underinvestment.

Dongsheng also contends with a fragile water supply. In some areas, water is available only three times a day for 30 to 90 minute periods. Its scarce rainfall (300-400 mm per year) makes water rationing imperative. A sanitation system that uses little or no water has become an obvious need, especially since the population is expected to continue increasing at the present rate.

## No-flush toilet technology

One of the most interesting features of the Erdos Eco-Town is the no-flush, urine diversion eco-toilet installed in each housing unit. Each porcelain toilet bowl has two compartments: one catches urine and the other catches feces. They are separated to avoid cross-contamination, contain the fecal pathogens, and lessen foul odor.

Collected urine is stored onsite in underground tanks made of bricks and cement, and reused for agriculture. The dry fecal matter is captured by a built-in teflon-coated bowl with a turning mechanism and is 'flushed' into wheeled bins in the buildings' basements. 'Flushing' uses sawdust, dispensed from the back of the toilet, instead of water. The bins are collected every 2 or 3 months, taken to a composting plant in the eco-station for thermal composting, and reused as soil fertilizer. While the composting plant is being set up, the feces are treated using traditional soil composting methods in a nearby farm.

The water these ecosan toilets save augments scarce water supply for kitchen use, bathing, and doing the laundry. Household wastewater from these activities, designed for an average of 80 liters per person per day, is treated onsite in a small treatment plant using activated sludge. The treated water is stored in a pond for reuse. Storm and runoff water are kept separate from the household wastewater and allowed to drain following the natural contours of the landscape.

## Living with the system

About 75 percent of the 825 apartments are now occupied, mostly by displaced people from grassland and farming areas, coal-miners, and other urbanites. Most of them remain interested in the system, but roughly 30 percent have difficulties adapting to a waterless sanitation system. In addition to acquiring new toilet habits, the day-to-day cleaning of the toilets using a wet brush and no flush water requires getting used to.

In an open meeting last 17 March 2008, households expressed their concerns about the system. Some complained that children and visitors found it difficult to use the dry toilet since they were not familiar with its mechanism. Others said odor problems have persisted, especially during windy days with high atmospheric pressure and during the past winter when rooftop vent pipes became blocked with ice from condensed water vapor that froze. Odor has also been caused by faults in the original installation of urine and ventilation pipes and faulty ventilation fans. Still others were very pleased with the toilet saying it is the best toilet they ever have used.

The fact that households were allowed to occupy their apartments before the ecosan toilets were completely installed contributed to these problems; the ventilation fans were not installed yet and the urine tanks were not built according to the design causing ammonia to vent back into the toilet rooms.

The ecosan team aims to solve all the odor problems with a series of retrofit improvements in 2008 and the household reactions will be closely monitored. An objective third party will be engaged in validating the entire project and these improvements before initiating the process of developing a permanent local holding organization in 2009.

Training and follow-up ecosan awareness activities are ongoing for all homeowners and prospective unit buyers. The local management team also continually monitors the system while local universities are undertaking research to input into the project's implementation and future planning. An economic study shows that the water savings of 30-40 percent compared to conventional housing provide major economic savings. The world market price for phosphate has risen during the past 14 months by about 6-fold, so the value of the nutrients from such sanitation systems is also one of the advantages.

## More Ecosan societies

That this is the world's largest attempt to use dry sanitation in multi-storey apartment buildings means challenges are ever present, both technically and socially. The technology is not off-the-shelf and new adaptations have been made especially in the area of ventilation efficiency and sedimentation of struvite crystals deposit control in the urine pipes.

"This sanitation system provides the users with a good toilet in their homes and time for more productive work, makes the housing developers aware of the importance of building environment-friendly sanitation systems while still making profits, and allows the local government to provide a safer overall environment", said Arno Rosemarin, SEI's Research and Communications Manager who has been managing the project from the start. The Dongsheng government leads the project, and SEI's support covers technical advice and improvements, demonstration of the technique, and capacity development of the local staff.

A primary school for 900 pupils and additional commercial facilities, including a 30-room hotel, have been built in the ecotown. The Erdos initiative hopes to open up opportunities for larger-scale implementation of ecosan systems, as similar initiatives are now being undertaken in Mexico, Bolivia, Burkina Faso, South Africa, Uganda, Ethiopia, India, Sri Lanka, the Philippines, North Korea, Viet Nam and other countries.

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