Sweden-China
Erdos Eco-Town Project
Dongsheng, Inner Mongolia

Background

To show that it is possible to build and operate an urban community with sustainable approaches to sanitation, water use, solid waste management and infrastructure, a bold new project has been initiated by the Dongsheng District in Erdos Municipality, Inner Mongolia Autonomous Region, China. The city, in partnership with a private construction company, has collaborated with the Sida-financed EcoSanRes Programme in the development of a new town with four and five-storey buildings, a nursery school and a commercial centre. Phase 1 includes 825 apartments, on-site ecostation and greywater treatment system and was completed in 2006. All phase 1 apartments have been sold at market price and families are taking up residence. This eco-town represents the first major attempt in China - and the world - to build an entire town applying on-site ecological sanitation (ecosan).

Introduction

Dongsheng, on the Erdos Plateau of Inner Mongolia, is located in Northern China, in a region well endowed with minerals and especially rich in coal and natural gas deposits. The economy is developing rapidly, urban expansion and reconstruction is omnipresent, and housing is in great demand. However, the environmental conditions are fragile, especially in regard to freshwater resources. The area receives an annual precipitation of 300-400 mm with an evapotranspiration potential of about 2,800 mm and water rationing is commonplace. The population of Dongsheng is over 300,000 and the eco-town site (Hei Zao Kui) is only a few kilometres from its centre.

In downtown Dongsheng there are about 60,000 households, 15,000 in multi-storey and 45,000 in single-storey buildings, of which 1/3 have private flush toilets and 2/3 use public toilets. There are nearly 300 public toilets, of which 56% are deep pit latrines, 38% are shallow pit latrines, and 6% are flush toilets. In the peri-urban and rural areas most households have private, shallow pit latrines – most of which are in miserable condition. Open defecation is common. The sanitation situation in Dongsheng and vicinity is typical for China as a whole, a patchwork of facilities that are poorly maintained leading to poor human health, ground-water pathogen contamination, nutrient pollution and environmental stress. Indeed, the poor sanitation conditions put a high toll on the already stressed freshwater resources.

Fig. 1: Apartment Buildings

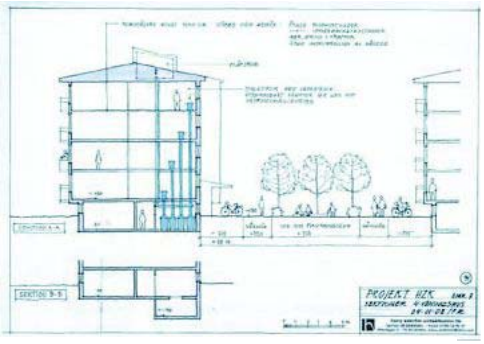

Fig. 2: Straight-drop urine diverting toilet design

Sewage conditions

Prior to 1985, when collector pipes were introduced to the city centre, household sewage, including flush toilet waste, was jointly discharged with storm water through open trenches. In 2002 the first sewage treatment plant was put in operation with a daily capacity of 30,000 tons, but due to inadequate collector pipes the volume treated is lower. The current practices contribute to polluting the groundwater and there are obvious needs for a sustainable system that prevents pollution and conserves water. It is against this background that the city is testing ecosan in multi-storey buildings.

The Eco-Town

The ecosan project is a unique private-public partnership in which a private developer has adapted a sustainable sanitation approach in a real estate business venture in return for access to a particular parcel of land and a government tax rebate. Demonstration, training and state-of-the-art ecosan knowledge is offered by the EcoSanRes Programme. The R&D ecosan support relates to technical solutions, management aspects, institutional dimensions, community sensitisation, policy promotion, cost-benefit analyses and monitoring. More information about the urban ecosan development in Dongsheng can be found at www.ecosanres.org.

The ecosan town is equipped with modern porcelain toilets and urinals. The urine-diversion, dry toilets and urinals use standards developed and applied in Sweden and in China. The sanitation fixtures and related equipment are developed and manu-

Eco-Town Facts

- 825 apartments in multi-storey buildings – phase 1 completed in 2006
- nursery school for 900 children and 100 staff plus public service centre
- dry urine-diversion toilets and urinals for collection and reuse of urine and dry faecal collection for containment, sanitisation and reuse
- greywater is treated on-site and reused
- household organics are collected, composted and reused
- solid waste source-separation and recycling
- greywater treatment, thermal composting and solid waste sorting takes place in an on-site ecostation
- the entire operation, including management and communication with the households, is carried out by a local ecosan team

Fig. 3: On-site storage pond for reuse of treated greywater

Fig. 4: Turning-bowl mechanism

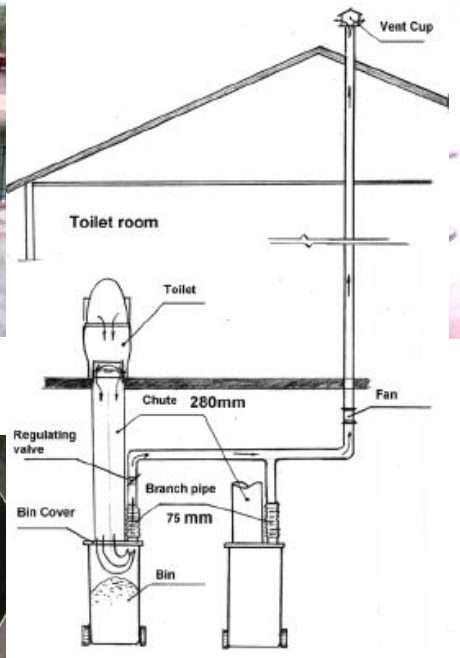

Fig. 5: Ventilation for the faeces collection system

Fig. 6: Faeces collection bins

Fig. 7: Urine-diverting porcelain toilet

factured in China especially for this project and now available on the Chinese market. Urine is collected and stored on-site in under-ground brick and cement tanks made with local materials and subsequently used in local agriculture.

Faecal material is retained in dry form in plastic bin containers, removed from the building basements and composted and sanitised along with household organics in the on-site ecostation for reuse as soil improvement. Thus, the community is offered sanitation services that work without water, while the water and nutrient cycles are being closed.

Water supply is restricted to kitchen and bath use and designed at about 80 litres/person/day. The greywater is collected and treated on-site in a septic tank including aeration, post-chlorination and storage pond prior to reuse and surface-soil discharge during the winter months. Storm and runoff water is drained along the natural contours of the landscape without any mixing with the household products. Household organics and solid waste fractions are source-separated and brought to the on-site ecostation for composting and reuse.

The project staff has been organised into a series of R&D and operational teams specialising in various components e.g. infrastructure planning and installation (roads, water supply, power, IT, ventilation), housing architecture and construction, eco-toilet installation and maintenance, urine and faeces handling, greywater processing, composting, agro-reuse, communications, and community sensitisation,. Local universities are engaged in R&D assessments. Ecosan training for enhanced understanding and knowledge is offered to management team members, operators, government officials and others from the local community and beyond. The apartment owner-residents also undergo training for awareness and understanding of the eco-town measures.

Once in full operation in late 2007, and after the international scientific ecosan conference in August 2007, the model town will be the object of further performance studies by sanitation and water specialists, urban planners, urban agriculturalists, finance experts and economists. In particular, the performance of the ecosan system will be evaluated and economic and environmental analyses for comparisons with conventional practices will be made. Follow-up information and promotion in regard to policy development at local, provincial and national levels is a collaborative effort between Dongsheng, the EcoSanRes Programme and the government of Inner Mongolia. Since inception, the eco-town development has been subject of considerable international attention.

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