

Workshop report

Erdos Eco-Town Project: Lessons learned and ways forward



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Report by INA JURGA

Workshop summary

Erdos eco-town project (EETP) started in 2003 in Dongsheng district, Erdos Municipality, Inner Mongolia, China as cooperation between the Dongsheng government and the SEI-EcoSanRes programme. The project comprised of the installation of urine-diversion dry toilets (UDDT) in 832 apartments in multi-storey buildings, greywater treatment facility, an eco-station for waste composting and a component for agricultural reuse of the products. It is considered the world largest Ecosan project for urban areas at that time. There were technical problems existing since the project had started operation, in 2006 mainly the occurrence of smell within the apartments as a result of construction faults and design errors, especially after a strong winter in 2007. SEI has been retrofitting actively to assure a smell free environment, but the households lost their confidence and demanded and initiated a refurbishment of all dry toilets into flush toilets in 2009. Hence, from the perspective of a UDDT-ecosan project it can be perceived a “failure”.

The lessons-learned workshop invited almost 50 key stakeholders of the Eco-Town project to a two-day workshop to discuss and analyze the reasons which led to this result after six years of joint efforts and financing. The project objectives, technology, social aspects, project management and issues related to environment and economics were discussed in detail. The outcomes and recommendations from this workshop shall give not only valuable information for the Erdos case but also for the development of urban, large scale (sustainable) sanitation projects in the future.

The Erdos Eco-town project has been an ambitious project from the beginning, given its large scale and the little local experience and knowledge on the UDDT technology itself. Rapid economic development in Erdos changed the project set-up from initially farmers' resettlement houses in a water scare area, into a middle-class housing development in a very urbanized area with higher storey buildings and improved water supply infrastructure. The scope of the project was research & development; however the housing developer and all households' owners were expecting a mature and developed technology.

One of the key problems identified was the toilet-riser itself which was inconvenient to use and socially hard to accept. And furthermore households suffered to various degrees from the occurring smell, but especially during winter and with wind, which has led to the very low acceptance. The insufficient construction supervision and missing links in the institutional project arrangements contributed to the weak performance of the overall system. Users were patient in accepting the new system, but too many problems arose and it took too long time to solve them, so they lost patience with the retrofitting process. It can be concluded that the project went to large-scale implementation too fast, so testing and demonstration on small-scale were not possible and later retrofitting were therefore hugely costly. Although economic cost-benefits can be achieved for the overall project these benefits were not felt by the developer or especially the households. Their fear of economic burden to pay for maintenance costs after the handing-over triggered the decision refurbishment.

Erdos Eco-Town Project has achieved the largest installation and testing of multi-story dry toilets in world, and established important research results in dry toilet design, ventilation, reuse, user acceptance, and economics. All participants believe in the significance of the concept of sustainable sanitation to protect the environment and water resources, not only for Erdos but in a worldwide context.

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Abbreviations

DPO	Dongsheng Project Office
EETP	Erdos Eco-Town Project
HH	Household
O & M	Operation & maintenance
R & D	Research & development
SEI	Stockholm Environmental Institute
SIDA	Swedish International Development Agency
SPO	Swedish Project Office

1. Background of the Erdos Ecosan project

The China-Sweden Erdos Eco-Town Project (EETP) was initiated in 2003 by the Dongsheng District Government and Stockholm Environment Institute (SEI) as part of the EcoSanRes Programme. The project aimed to introduce dry ecological solutions to provide opportunities for meeting high environmental ambitions and conserving water in this semi-arid zone of northern China. Although initially intended to be a small-scale R&D project and resettlement houses for farmers, rapid economic development in Erdos led to the decision to build it as a housing development of modern 4- and 5-story apartment buildings.

Completed in 2006, with the installation of dry toilets in 832 apartments and a supporting eco-station for on-site treatment and reuse of the sanitation products, the EETP was the largest installation of dry ecological sanitation concepts in the world. The project has involved a large number of collaborating organizations, specialists and support staff.

The project had technical problems from the beginning, mainly the occurrence of smell within the apartments as a result of construction faults and design errors. SEI has been retrofitting actively to assure a smell free environment, more convenient use of the toilets/urinals and an improved handling of the waste bins. After a one-year research and retrofitting process in two buildings in 2008, the system operation improved a lot, although there were still problem. In 2008, SEI initiated the process of handing over the project to the local authorities. However, by this point the households in the remaining buildings had lost their confidence and patience with the system. There was increasing pressure from the households to remove the existing system, and in 2009 the local government decided to change the dry toilets to flush ones. The present system is now compromised of water-saving flush toilets and a wastewater purifying station for 500m³/d, which is currently being installed.

The original project objectives were:

- Providing dry sanitation solutions for human excreta management in multi-story buildings
- Providing dry sanitation solutions for greywater management in multi-story buildings
- Providing dry sanitation solutions for source separation of solid and organic household waste
- Establishing a cost-effective way to recycle household waste

Research & development themes for the EETP:

- Raise public acceptance and awareness of importance of reuse and recycling
- Public health aspects of the proposed technologies and policies
- Agricultural implications of closing the loop
- Institutional and legal measures required for the development of eco-towns
- Financial implications of building eco-towns

2. Workshop background

Rational of the workshop

The workshop had three mayor objectives:

1. Learning lessons from the EETP which can be applied to future projects using urine-diversion toilets in urban areas, specifically with regards to sustainability criteria.
2. Extraction of key lessons and key messages from the project.
3. Provision of important perspectives and recommendations for future ecological sanitation, urban and large-scale projects.

The outcomes of the workshop will also provide a stakeholder-based foundation for a book produced on the Erdos Eco-Town Project.

Participants

The workshop participants were selected as representative of the main stakeholders involved in the project. Further national and international experts were invited, who could share similar experiences and likewise represent the interests of the sustainable sanitation community. Participants included the following organizations:

- SEI
- Erdos government
- Eco-Town Households
- SPO/ DPO
- Construction company
- Technical consultants
- Swedish Embassy
- Chinese Node for Sustainable Sanitation
- Separett dry toilet distributor
- UN-Habitat
- SARAR transformacion
- Kyoto University National and other international Ecosan experts

Overall there were 48 participants from 8 countries, including 16 representatives from Erdos.

Workshop organization

The two days workshop was organized into five thematic blocks to give a structured reflection of the project from different relevant aspects.

1. Project objectives
2. Technology
3. Social aspects
4. Project management
5. Environment & Economics

Each block started with an Introduction by the facilitators, followed by a Key Note presentation by 1-2 relevant speakers. After this input and the presentation of additional Guiding Questions, the floor was given to a participatory Discussion in either the plenary or small groups. The small groups composed of a representative mixture of all participants.

The workshop discussions were summarized by the reporter at the beginning and end of Day 2 respectively. The workshop ended with a final plenary discussion on the key problems and recommendations.

Facilitators: Han Guoyi, Jennifer McConville, Zhang Lingling

Reporter: Ina Jurga

Organisation: SEI, EcoSanRes knowledge node for Sustainable Sanitation at USTB

3. Workshop outcomes

This chapter will give a summarized report about each of the five blocks of the workshop. The notes from the workshop and remarks from the group discussions can be found in the Appendix.

Welcome address

The welcome addresses were given by Mrs. Lailai Li from SEI, Sun Lixia from Erdos Dongsheng government and Anna George, SIDA representative from Swedish Embassy, Beijing.

Given the shortage of water and to assure water for future generations, SIDA and the Erdos government supported this project because sustainable sanitation projects considering reuse aspects are regarded as crucial for sustainable urban development.

Workshop introduction

The facilitators gave a short introduction into the objectives of the workshop, selection of participants and organization of the workshop into the five distinguished blocks (see also chapter 2).

Thematic block 1: Project objectives

INTRODUCTION

Globally, there is a need for sustainable (urban) sanitation given the scenario of growing uncertainties of water availability, resource shortages and environmental protection. The purpose of the China-Sweden Erdos Eco-Town Project (EETP) was to carry out a R&D project aimed at applying ecological sanitation in an urban environment in an area of China that was water stressed and in the same time had inadequate sanitation coverage. At the time of inception time Erdos was one of poorest areas in China and water rationing was common throughout the year.

The project objectives were:

- Providing dry sanitation solutions for human excreta management in multi-story buildings
- Providing dry sanitation solutions for greywater management in multi-story buildings
- Providing dry sanitation solutions for source separation of solid and organic household waste
- Establishing a cost-effective way to recycle household waste

Furthermore, EETP has included several individual research studies on public acceptance, public health aspects of the technologies, agricultural benefits, institutional and legal matters and on the economics.

KEY NOTES

Prof Zhu, who participated as project advisor up to 2006, highlighted problems in three mayor areas:

1. Implementation
2. Motivation of the stakeholders
3. Project did not follow procedures of R&D

Because there is a local market for organic products and favourable government policy, if the technology was improved, he stated that

“Failure of dry system in EETP should not mean the doomed failure of dry systems in urban condition.” (Zhu Qiang)

Arno Rosemarin introduced the objectives and also the project history. Although initially intended to be a project in small-scale and lower houses, rapid economic development in Erdos lead to the development of dry systems in 5-story buildings. Despite being reluctant to go to large scale, all project partners were convinced, the only country which could do it would be China.

“The Advantages of learning outweighed the disadvantages of failure.” (Arno Rosemarin)

The project has experienced many changes in the frame conditions:

- Changing of government and different mayors
- Changing of ambitions by real estate company and government
- Households have gone through a rapid changes in lifestyle and aspirations

GUIDING QUESTIONS

- | |
|--|
| <ul style="list-style-type: none">- Were the objectives clearly stated?- Were the objectives appropriate?- Was the scale of ambitions appropriate?- Were the objectives adapted to the local context?- Was everyone in agreement or aware of the project objectives?- Did some stakeholders have other objectives than those in the project document? |
|--|

DISCUSSION (in plenary)

In the plenum it was agreed that the concept of sustainable sanitation is not questionable and it is important to achieve environmental sustainability not only in water scarce areas of China. Ecosan has been introduced in rural areas, so the logical next step was to introduce ecosan in urban areas as well.

China is a fast growing country, and local areas are in the transmission from rural to urban. Other cities and countries will face the same problems (Zifu Li), and therefore the Eco-Town movement, promoted and financially supported by the government, will succeed (Lin Jiang).

How to link concept with reality? (Zifu Li)

Sun Lixia explained that when introducing the project, Erdos had a bottleneck in water supply. Now, Erdos is facing an unforeseen fast-rocketing development (National Rank number 3 in terms of development) and reached a population > 500.000, and an improved water supply and infrastructure is in place. Additionally it has been for the first time a project for multi-story housing and they have overlooked the potential, unexpected problems during project planning.

CONCLUSIONS

- The development of sustainable sanitation is important given the challenges of water scarcity and environmental protection
- The objectives of the project were clear to all partners (SEI and Erdos government), but there were different ambitions by the developer.
- The set-up the project changed, due to unforeseen urban development,
- Favourable boundary conditions (water supply, target group, government support) changed over time.
- Although intended as R&D it did not follow the process and overlooked potential problems in the planning.
- The scale of the project was ambitious.

Thematic block 2: Technology

INTRODUCTION

The technology component of the project includes:

- Urine-diversion dry toilet
- Ventilation system
- Collection system in the basement of the house.

The eco-station and composting unit are currently working under test conditions, because there have been problems in the collection system.

KEY NOTES

Zhang Weiwei, SPO and maintenance team, explained in detail the occurring problems in the technology interface.

- Urine pipe were incorrectly installed with various sizes of pipes and had leakages
- Basement faeces bin had technical difficulties with opening and it was difficult to complete seal the bin. Dirty handling
- Ventilation from basement to roof top is difficult to achieve
- Ventilation fan has not been sufficient. Resulted in noise for the first floor apartments
- Despite teaching the households how to use & cleaning toilet- they still preferred to use water. Some Perceptions are unavoidable.

He further described some positive results after retrofitting in building No 5 and had personally checked smell occurrences with different wind velocities (up to 0.4m/s there was no smell). The newly installed Separett system in four households is very promising, even with higher wind velocities.

The composting system and collection of household organic waste started test operation after training and education in 2008.

Zhu Tianle described the concept behind the ventilation system. The odour problem was analyzed and results from the following conditions:

- Improper construction
- Unsatisfactory supervision during construction and maintenance
- Errors in design and details

The retrofitting measurements included the installation of odour traps in the urinals, improvements for the UDDT and retrofitting the storage system in the basement. After the retrofitting, smell was not detectable anymore in all six tested apartments and matched Chinese indoor quality standard.

GUIDING QUESTIONS

- What is an appropriate scale for such a project?
- Is a dry system in the multiple-story building feasible?
- What are the key issues (technically) that need to work if the system was to be continued?
- If we had continued for another year, what could have been changed/improved?
- Has operation and maintenance of the system been a technical challenge? Are there techniques that should be improved?

DISCUSSION (in plenary)

It was noted that other technical options had not been discussed during the project planning (Mang), and a feasibility study had not been conducted by Daxing.

Ecosan is more than dry toilet, it is a concept. (Heinz-Peter Mang)

Smell was the major issue, especially occurring after an exceptional cold winter in 2007, and therefore households could not sustain the system. Ventilation should preferably have a separate pipe for each toilet, instead of connecting to one mayor pipe in the basement. The unsatisfactory use of sawdust, resulting in blockages and inconvenient handling for the users, was also discussed. Suggestions arose to either let the maintenance team apply the sawdust or switching to ash as an absorbent.

Shresta and Mang stated that there are existing examples of successful installation of dry toilets in multi-storey houses. Therefore the root cause is not the technology itself, but the lack of supervision during construction and lack experienced technical staff for management. There is a need for reliable quality control mechanism (Harada) and continuous training (Mang) to assure the design is implemented accordingly.

Any construction relies on design standards, and the design needs to adopt that standard, therefore Daxing Company requested qualified products following strict standards, which can be put into the market by developers. However, as an R&D project, the EETP was not dealing with standardized technology.

Arno Rosemarin explained a recent very promising breakthrough at the EETP where four demonstration units of Separett model dry toilets have been installed without any smell problems. The concept is to ventilate the air in the toilet bowl only, and not in the entire system, with a small fan inside each toilet creating an odour lock. This results in smaller air volumes and therefore proves to be more successful. The technology based on Swedish-German experience is a robust system that works even with bad workmanship.

It was remarked in several plenary remarks that social acceptance is a fundamental base for any technology application. The households should feel an “attachment to their toilets”, for example in Sweden where users are also responsible for maintenance and received trainings/education prior to the start of the project (Li Zifu). It is further critical to understand that this project experienced a change of the target group. Initially the EETP housings were planned for displaced farmers, but the majority of apartments were bought by urbanites and as the houses increased in value they were even sold further to 2nd hand owners. In addition, since the project itself is no longer located on the edge of town, it has a more reliable water supply (for the time being) and the households preferred the use of flush toilets. Li Lailai stressed it is important that every resident have clear, balanced information and an understanding about the project concept and system. Then the owners would not only consider problems but possibly see more the advantages.

CONCLUSIONS

- Feasibility study considering different options was not done.
- Dry toilets have proven to be feasible in other projects, but technology was not mature enough.
- There were differences between design and construction.
- There were design and installation problems with the ventilation system, partly due to lack of standards, resulted in heavy smell.
- User interface (convenience, acceptance, preferences and knowledge) needs to be improved and user preferences respected.
- Retrofitting and new demonstration technology of Separett technology showed positive results.

Thematic block 3: Social aspects

INTRODUCTION

The latest user survey was conducted by Mrs Qu in April – May 2009. The user perspective on the main problems revealed that for almost 50% thought it is the smell and 18% had trouble with inconvenience. When asked about necessary changes to make the toilet acceptable, over 57% wanted a refurbishment to a flush toilet and reduction of smell (33%). In this survey, 96% of households stated they prefer flush toilets, and only 1% preferred a UDDT. However, almost 10% would still recommend a dry system. This acceptance and satisfaction is disappointingly low, and also much lower than in previous years.

KEY NOTES

Mr. Shen (household representative) stressed, that initially the households supported this project because they had the confidence it would be an ideal toilet for the residents. Even with the reoccurring problems they showed their support by constantly raising suggestions to improve the system. The problems were:

- Odour and terrible smell: households suffered to various degrees, but especially in winter and with wind.
- Sawdust: the use and addition of sawdust is inconvenient and uncommon. The sterilization of faeces might not have been achieved.
- Lifestyle: visiting friends might feel embarrassed
- Costs: With the handover in 2009, the payment for O&M costs was supposed to shift from the government to the households. Many people do not accept to pay money for such system¹, because they think it is not cost-beneficial, and especially compared to flush toilet the service is not reliable. Even people who approved of the system asked for renovation, due to the costs issues.
- Lost confidence: Certain problems did not achieve sufficient solution. The inhabitants are uncertain how long it will take to change satisfactory, therefore there is no confidence anymore in the improvements.

These factors led to a decrease in acceptance and finally a decision to refurbish to flush toilets.

Mrs Ren (Communication officer) gave her explanation for the non-acceptance of the system:

- Habits and education background is not easy to change. The dry urine diversion system has strict requirement on water use. But sometimes residents use water to clean the toilet, which cause problems. The technology is not advanced enough.
- Construction quality is bad. Resulting in odour.
- Construction didn't match with the design specifications.
- Too large scale at start instead of testing the technology at a smaller scale.
- Education and dissemination. Among the community there was misleading information about the project, so people bought apartment under false expectations and knowledge of the system
- Ventilation is noisy which influence rest& sleep of people

But she also noted that there is great potential for the concept, because of the key theme to save water and pollution reduction. Maybe currently the people do not pay high attention, but in the future they will. Therefore dry toilets need to be maintained, redesigned and further studied.

If you want to improve the project I am willing to support! (Mrs Ren)

¹ The annual O&M cost for the eco-station are about 1 Mio RMB. Divided by 1000 household it would result in 1000 Yuan/year/household.

GUIDING QUESTIONS

Hypotheses on low acceptance:

- People do not understand the system
→ would more awareness and education have made a difference?
- The dry system was cultural inappropriate
→ Are there any critical social and cultural aspects that were overlooked? e.g., embarrassed to have friends over
- What is perceived as “modern toilet”?
- Lack of trust and confidence in the technical system
- Does the resident/buyer really understand the nature of the project as R&D?
- Relationship between “promise-to-fix” and erosion of confidence – is there a “tipping point”? (ratio of the acceptance)
- The system does not work (?)

DISCUSSION (in groups)

Group 1 (Arno Rosemarin)

Within the group there was the discussion and identification of the “*tipping point*” when the households lost all their patience and support and finally decide to refurbish to flush toilets. During international conference in 2007 the households became aware that the project was R&D rather than a mature technology. This event was followed closely by a very cold winter with high odour occurrences. In 2008 the discussion to hand over from SEI to local government started and owners could foresee how they would be left alone to deal with project themselves without technical support, and high maintenance costs. Another “*killing factor*” for the concept was the availability of water through improved water supply from the Yellow River, it was not longer thought of as a limitation.

Group 2 (Ina Jurga)

Given the ideal scenario of proper project planning and a mature technology, these recommendations could have counteracted the low social acceptance:

- Continuous & professional public relations, using different methodologies and identification of local champions.
- Increased capacities of service and education team. Training of local trainers.
- Selection of proper target group and consideration of migration of inhabitants.
- Assure cost-benefit for households
- Inhabitants should be involved in decision making, and given time for choice

Group 3 (Jennifer McConville)

Households have been patient in the beginning, but it took a long time to fix and improve the system. From the social perspective the inhabitants experienced an increased standard of living, and therefore also demanded a corresponding sanitation system.

1. Need a better technology/ toilet
2. Achieve marketable quality for reuse.

Why do we have the system if we cannot reuse the waste products?

Group 4 (Attila Weibel)

Households did not know in the beginning that it was a ‘new’ technology and a ‘R&D’ project and felt bad that there were not told before hand. So then they start looking for problems. Also they were not interested in saving water and in the protection of the environment. It is too short time to achieve a complete change of mindsets. The technical staff also did not help much and were impolite.

Group 5 (Zhang LingLing)

The household's points of view were:

- Lack of continuous communication: investment brochure stated that it was advanced Swedish technology. Residents did not know that they were part of a R&D project.
- Initially the real estate price was reasonable and low. Buyers paid little attention to the installed system.
- Maintenance of dry system was a problem: Cleaning process complicated and inconvenient especially for the women. Use of vinegar increased the cost.
- Problems with different odours. There has been an investigation to get rid of it, but the problem was not rooted out.
- Rapid Expansion of the city. Inhabitants feel inferior to other water-flush development sites close by.
- Costs for sawdust, maintenance, and electricity for ventilation. With low water price no incentive to save water and no incentive / felt need for the reuse or the residents.
- Toilet has potential health problems for women.
- "Dry system is not modern"
- Composting process should not take place in the centre of the city.

Suggested UDDT to be applied in world heritage cities, nature reservoirs or underdeveloped or water scarce areas.

In the plenary discussion that followed, Ron Sawyer identified that the social and education part of the project as being rather vertical. People should be given enough and truthful information to be effective decision makers. They need to be involved early if they are to effectively manage the project later. It was also agreed by Lin Jiang who highlighted also the importance of local champions to expand and push the project forward. The 8% of the user who would recommend UDDT can be taken as champions (Mang). Roshan Shrestra suggested trying out the system in few apartments first before expansion. It is also important to make sure household feel a benefit rather than economic burden. Even with increasing water price, the perception of expenses and high extra costs, make households prefer flush toilets. A solution could be to integrate dry toilets into a wider project context (Fogde) and to do projects in less developed areas rather than in dense urban areas (Zhu).

Arno Rosemarin explained that the honest facing of the problems of EETP has received positive feedback from the sustainable sanitation community and sanitation experts. The development donors' top-priorities are totally water supply oriented, and sanitation is still not a top priority on the political agenda. Only few cities take up the discussion on the disadvantages of conventional sanitation further. The need for innovation is huge, and the outcomes of EETP will give valuable lessons-learned.

There is a big myth about the success of flush toilets. We cannot cover the world only with flush toilets
(Arno Rosemarin)

CONCLUSIONS

- Missing local champions to promote the project
- "Tipping point" was a cold winter
- Households have not been informed correctly about the R&D nature of the project and expected mature technology from Sweden.
- Habits and education background is not easy and fast to change
- Inconvenience for use and cleaning of toilet and application of sawdust
- Problems could not be solved in time
- Household felt the economic burden, while not seeing any benefit compared to flush toilet, There was no incentives for reuse

Thematic Block 4: Project Management

INTRODUCTION

A large-scale international R&D project like Erdos is as a matter of fact also a complex one, with multiple stakeholders and interfaces involved. The block on project management should look at the aspects of management structure, local ownership and capacity development, R&D scale, public-private partnership, operation and maintenance and the retrofitting. Project management considers the planning, management and implementation of a project.

KEY PRESENTATIONS

Mrs Sun Lixia introduced the background and objectives of the project. The assigned roles for each partner, namely SEI and Erdos government and the cooperation agreements between developer and government were presented. The lessons-learned for the government were:

- There has been no full consideration of all variables, such a extreme climate, local knowledge, user acceptance & perceptions
- There was too little control of real estate development speed and project went into scale too fast
- Lack of supervision during construction
- Lack of supervision of technology

She also highlighted the design problems, with the key factor being the UDDT seat riser. The design of UDDT was not good. The parts had very low lifetime and when broken down there were no spare parts available. The overall design of the project did not consider a) local material specification and circumstances and b) the severe climatic conditions in Erdos.

Arno Rosemarin presented project initiation, organisation and finances, the technical challenges in the execution of the project and the improvement that have been made. The project never had the chance to test and demonstrate the dry system on a small-scale, and went to scale too fast. Furthermore there has been a problem to get a local chief technician for the project itself. In response to the previous key note, Arno admitted that the design was inadequate and it could not compensate the poor construction quality.

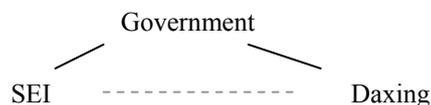
Ecosan reveals building problems (Arno Rosemarin)

GUIDING QUESTIONS

- | |
|---|
| <ul style="list-style-type: none">- Could the project have been managed differently? Critical discussion on institutional issues- How to define responsibilities and regulate the pace of development?- How can we assure a public-private partnership is mutually beneficial and contracts honoured? |
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DISCUSSION

Group 1 (Wang Sujing)



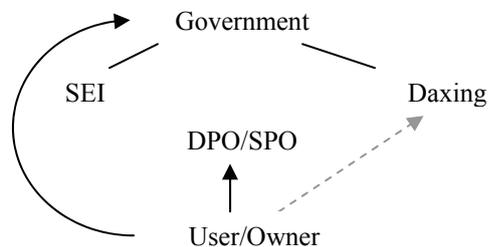
In the implementation SEI and the Government signed a contract, and the Government & Construction Company signed an additional agreement. The point is that SEI and Construction Company did not communicate directly and had no agreement or legal binding contract with each other. This missing link is a serious issue.

Two feasible solutions for similar project for composition of management team:

1. In case of a R&D project: project ownership by designer & planner. And the project should not be for sale, but another model, such as leasing to volunteers. In case there are problems during the implementation, they can be solved. After successfully established, apartments can be sold and developers can reach higher prices.

2. If R&D and broader scale: rely on developer itself. The Developer should be project leader and SEI and local government should only come in as ‘consultants’. Management should be divided.

Group 2 (Han Guoyi)



In a normal construction project, in case of occurring problems the owner would address to the construction company/developer. But in this project the users went first to DPO/SPO, and because they could not solve all the problems timely, they later went up to government level. This pressure had also negative influences on the relationship between Government and SEI, and Government and SPO/DPO. This organisation structure indicates project and system level problems. The system is in the background of the country, but in addition there is no national policy to regulate this kind of special project and the top level coordination should have been stronger. Concerning the maintenance of the system, local government might not have had enough capacities. In case of problems in this large scale project, they need a large amount of money to solve them.

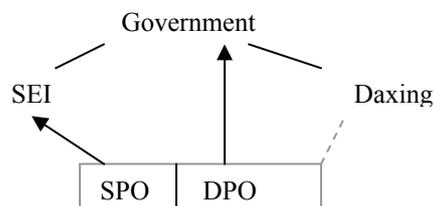
Group 3 (presented by Jennifer McConville)

Although the plan was to start small, there was high demand for larger scale by the Developer. SEI agreed, and because of the missing contract between SEI and Developer, the latter had full control of the scale.

- Should have gotten more feedback during and slower implementation.
- Lack of contracts and specific dates and stop points

*“We would have had the capacity for small scale, but > 800 HH is hugely costly and beyond control”
(Group 3).*

Group 4



Management problems identified were:

- SPO and DPO: this created two separated structures that even did not talk with each other in the beginning, there would have been better with a singular entity
- Cooperation has not been cohesive: many people came and left.
- Maintenance: there has been a lack of trained and continuous technicians and lack of spare parts
- Procurement process: very complicated loop from SEI- Gov-SPO
- First batch users, should be the experts themselves, so they can directly feel and experience the problems

During the open discussion that followed, Heinz-Peter Mang underlined in regard to O&M, there was not only low knowledge and slow reaction on complaints, but a manual was only available in 2008. There has been no permanent experienced technical advisor for the project.

For Daxing Company the investment failed and did not make profit. The project ruined their reputation, because of the negative impacts. They admitted however that they:

- Made decision too quick without a throughout market base analysis beforehand.
- Trusted the local government not to ruin their reputation. But decision was based on trust with local government and an agreement that the apartments could be served as commodities to the market.
- From a market point of view, local government had good will, but not the capacity to develop.
- Had no contract and agreement with SEI, rather Daxing company was an ‘independent participant’ in the project.
- There have been a lot of overlaps and overlooking of quality control issues.
- Budget constraints: lack of money to buy qualified facilities and the tight budget resulted in quality problems.

In the future if there are mature technologies promoted on the Chinese market, we are willing to participate. (Daxing representative)

CONCLUSIONS

- Institutional arrangements had some missing communication and contractual links between the stakeholder
- Developer has not been engaged enough in the development of project and was not bond
- Missing capacities on local level.
- Missing technical supervision and control.
- The large project scale was challenging for project implementation, financing

Thematic block 5: Environment & Economics

INTRODUCTION

If a project wants to assure sustainability it has to achieve environmental protection and yet balancing the budget. This thematic block presents the results from

- Agricultural reuse
- Greywater treatment
- Economic evaluation

KEY PRESENTATIONS

Liu Zhong (agricultural specialist, Erdos) gave the local experience and results of two years of agriculture tests. Composting took place under traditional utilization, because the eco-station has not been finished. The composted material needs to fulfil national organic fertilizer standard. Because of increasing sawdust composition and little organic content quality has been low. The same is true for urine. In 2006, according to tests, nitrogen content is basically unchanged; water content may be around one-third. But by 2007, more than two-thirds is water and more water inevitably results in a transportation cost issue. Transport is necessary because of the distance to fields. The experiment with urine in 2007 and compost fertilizer ash yielded good effects: the output with compost experiment is 10% lower than using chemical fertilizers. If mixed chemical fertilizers into the compost fertilizer, output increases about 5%. Another experiment with corn and potatoes in contrast with chemical fertilizers, the output is cut by 15%.

Zifu Li (University Science Technology Beijing) presented the greywater² concept developed by Tianjin Academy of Environmental Science, which is based on a centralized treatment approach. After research of the quantities and qualities of greywater, the design includes anaerobic/ aerobic treatment and secondary sedimentation and post-treatment. However actual implementation is less sophisticated. The greywater effluent quality, tested in 2008, revealed satisfactory results, meeting national discharge standards. But as the new flush toilets also discharge into the greywater system, he is expecting operational problems. According to his observation, there are lots of areas to be improved

On behalf of Zhou Lu (Tsinghua University), Prof Li presented also the economic evaluation of EETP, which compared the source-separated domestic wastewater (SSDW) system with a conventional sanitation system. The cost-benefit analysis considered resource scarcity, pollution control, environment improvement and the project's contribution to the country's welfare. The Economic- Net-Present-Value³ of SSDW system in Erdos is much more than one of conventional sanitation system, because of high external benefits it ranks 35 times higher. Even if investment costs are more than two times higher in SSDW, technological development and external benefit can outweigh this. It is recommended that support mechanism should be built as soon as possible, including water right, exchange of wastewater discharge right and rational wastewater tariff etc to help support SSDW. Although based on limited experience, the results should be a positive reference for similar projects in the same scale.

² Greywater includes all household wastewater excluding toilet and urinals

³ Based on a social discount rate of 8%

Within the session Heinz-Peter Mang presented the findings of the retrofitting consultant team⁴. He pointed out that in the rather complicated communication scheme between the stakeholders Daxing Company is not even included. Challenges in the project arise from:

- Awareness raising and training
- Reaction on complains and O&M

He gave examples on their findings, which showed the severe gaps between planned design & real construction: all in all 41 technical problems were identified. The retrofitting in building numbers 1 and 5 has been successful. Missing records and databases for training, construction and O&M were also mentioned. The team recommends:

- Involvement of users actively in project development, fine-tuning, management and maintenance work,
- A well staffed singular project management unit.
- Development of a clear communication strategy

GUIDING QUESTIONS

- What drivers do people have to achieve environmental criteria? (cost benefits, actor interest conflict, public-private partnership)
- What resources (financial and human) and procedures are needed?
- How do you secure quality of construction, system design, and treatment?

DISCUSSION (in plenary)

The participants agreed on the necessity of social sustainable development, and discussed how protection for the environment can be achieved from the national and global perspective.

Ecosan should not be a stand alone project but be part of regional, integrated urban planning (Zifu Li). But local government still does not see environment and economy as interlinked developments, and the eco-town is only one small aspect of urbanization (Sun Lixia). Given the Swedish experience, it takes time to develop environmental awareness. China has not only demands and drives for sustainable development, but also the advantage of strong governmental leadership compared to other countries (Shresta, Sawyer). Because business and local politics are following the government there is a need for clear policy and objectives (Scott Chen, James Gao).

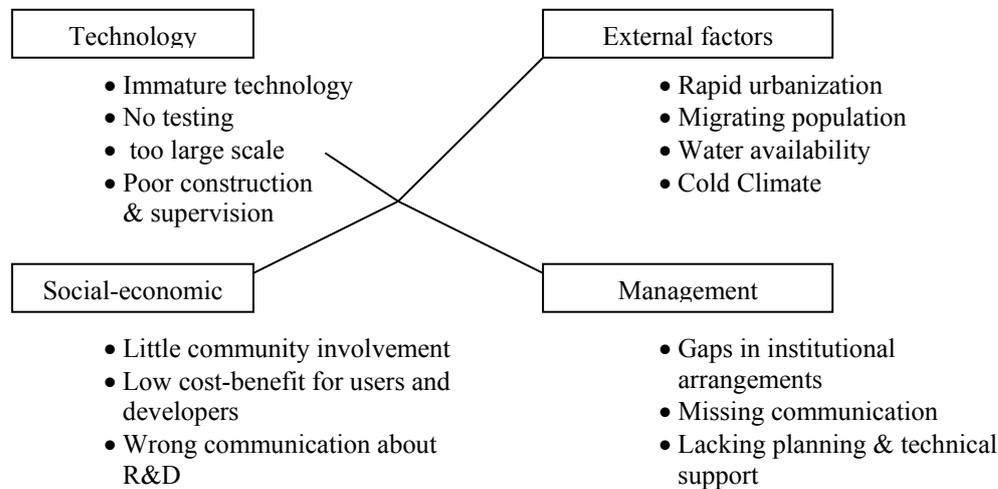
You can have policies, but need to implement them also (James Gao).

There is further advice to involve the local people more actively, build upon their knowledge and find “champions” of development (Shresta, Sawyer). Han Guoyi analysed that although the economic evaluation states clear economic and environmental benefits, from users and developers and even from government points of view it is not achieved, because each one calculates his own benefit.

⁴ Content should be rather considered under thematic block 2 or 4

Wrap up and Final Plenary

To wrap-up the two-day workshop Ina Jurga gave an analysis of different technology, socio-economics, institutional and external factors leading to the overall “failure“of the system.



To identify the root causes of problems the following questions apply:

- Would better management have yielded to improved technology? YES
- Would better technology yielded to more acceptance and change? YES

Recommendations for successful project implementation can be found within the thematic blocks, especially those relating to project management and technology.

After a statement from Sun Lixia that the toilet riser developed by Sweden and produced in China is the single reason of failure, a hefty discussion arose. Others argued that 10% of users had been satisfied and the odour also came from very low construction quality and poor management. It was agreed that the toilet was a major factor, but that project management and planning could have done much to avoid problems and improve social acceptance.

One of the main failure factors is the toilet riser (Sun Lixia)

Closure

The closing speech was given by Madeleine Fogde from SEI/ EcoSanRes programme extending her gratitude to the motivation of all participants during the workshop.

The EcoSanRes programme aims at the promotion of ecosan through capacity development, knowledge and communication, for example through “Knowledge nodes” worldwide and to certain smaller extend through projects. Despite the failures, there are achievements in wealth of experience and research knowledge on technical and social aspects of the system. We have in place a green community with small decentralised wastewater system that is environmentally friendly and an eco-station that is available for research. A model seat riser has been found that gives promising results. There is hope that EETP will generate more knowledge and continue to be a model for learning. SEI will continue to work to develop ecosan solutions through the knowledge nodes.

4. Conclusions and way forward

Lessons-learned is knowledge gained through experience, which if shared, would benefit the work of others.

The lessons-learned workshop gave a multi- stakeholder perspective of the factors leading to the ‘failure’ of the project, in terms of reaching a “tipping point” where installation of flush toilets were the only solution for the households.

What became clear during the presentations and discussions of the different thematic blocks was that that all aspects are very much interlinked with each other and cannot be handled separately.

Recommendations

Based on the presentations and discussions the following recommendations for the development of other (sustainable) sanitation projects can be made:

Overall

- Sustainable sanitation needs to be promoted, given the problems of water and resource scarcity and the need for environmental protection and sustainable urban development in China and the world. The conventional sanitation system and flush toilet can not be a solution for every location.
- The “failure” of the Erdos eco-town project which has installed urine diversion dry toilets does not mean a failure of urban ecosan in general.

Technology

For the project in Erdos it has to be considered that it was established as an R&D project.

- User interface is the key! The Toilet must be right design and convenient to use. One of the key problems identified has been the seat riser, which was too immature in its development and not convenient to use or acceptable by the households.
- Proper feasibility study with different technology options is necessary. All stakeholders – especially the developer- should have proper understanding on the technology options and benefits. It must also be assured that agricultural reuse is possible nearby.
- Supervision on construction quality control is crucial. Any project in developing countries should consider lower local construction and material quality. To reduce the difference between design and actual construction, quality supervision should be assured.
- Start on small scale, before going large scale. An R&D Project should demonstrate and test the feasibility and effective operation & maintenance before going to scale. This will make necessary modification less costly and workable. Project management should agree on project Stop-points and milestones.
- Adaptation to local conditions necessary. Consider different user preferences and habits, but also local climatic and environmental conditions
- Household and developers need a mature and standardized technology. The source separation system is often a new technology and standards do not yet exist. Considering the R&D character of the project it’s important to communicate this issue to all relevant stakeholders, especially the households, beforehand and make sure the project can tackle problems in a short-time.

Socio- economics

- Ecosan puts the sanitation system closer to the user, therefore user awareness of benefits and their acceptance is crucial.
- Involvement of households in project development, management and maintenance, especially if they are also owner of the apartments. This is also expected to assure a smoother handover of the project.
- Establish a continuous and truthful communication strategy between all stakeholders and especially for the benefit of the user. This can be supported by involvement of a professional Public Relations officer.
- Identify local champions:
By establishing just 10% of the population as local champions, these persons can lead the remaining community in awareness and acceptance. They will be the ones to promote and educate about the system.
- If possible select the target group, but otherwise consider “floating/ migrating” population with different background, attitudes and habits. The technology and a communication strategy must cater for this.
- Consider that changes in mindset and behaviours take a long time, especially when introducing a new system and concept.
- Try to achieve an acceptable cost-benefit ratio:
 - for overall system compared with conventional system
 - for the users, costs for the O&M should not be higher than flush-system or they should directly experience benefits from agricultural reuse, water saving, etc....
 - for the developer

Certain incentives might be necessary.

Project Management

- Institutional arrangement has to include the developer:
On a larger scale development project, the developer/construction company should not be left aside, but be contractual involved since the start of the project. Special efforts should be made to agree on responsibilities and cost-bearings for construction mistakes.
- Long-term and continuous technical support by experienced experts necessary:
It is preferable to chose local experts if available. The expert should also carry out technical on the job training.
- Establish a single Project Management unit including one chief engineer and other well trained staff with sufficient technical expertise and responsibilities in managing the project.
- Capacity building for all stakeholders necessary throughout the project
- Assure timely and good O&M service to remove problems.
This also includes the availability and stock taking of spare parts.
- Proper reporting and database necessary in R&D:
reporting and database can identify crucial points on construction, O&M and user satisfaction/ complains and can help to improve overall project management. It will also support the technical, economic and social evaluation of the project.

External factors

External factors can be “killing” but also “driving” factors for projects, and should be considered with enough flexibility to account for potential changing conditions in project design and during implementation.

- try to consider variables in the project planning, during implementation and during the future running, such as:
 - rapid/stagnating/decreasing local development
 - changes of target group with different aspirations , expectations and awareness
 - changes in political support
 - changes in beneficial and hindering boundary conditions, for example climate, water availability, water price, policies, etc...

- Location of project should be carefully chosen:
 - In favour of locations with pressing environmental concerns and/or high ambitions for environmental protection and water saving.
 - Proximity to agriculture should be sought to keep transport distances between the generation and use of the ecosan products short.

- Governmental support should be guaranteed.
In China, it is very crucial to have ample high government level support, which drive the development and solve problems at lower level.

- Favourable policies for sustainable development are crucial.
The existence of these successful demonstrations can feed into the launching of favourable policies, which then lead to the country wide dissemination.

- Integration with other aspects, such as sustainable urban development, climate change, etc could be helpful to promote ecosan within a wider context.

Way forward

Erdos project is not closed and finished with this workshop. The project continues to exist as a showcase for green construction in water-scare area in China. It will act as learning and showcase project for ecological sanitation.

There will be a final evaluation from the donors (SIDA) in spring 2010.

A book will be written by Arno Rosemarin, Jennifer McConville, Amparo Flores and Zhu Qiang (to be expected fall 2010).

FAILURE IS THE MOTHER OF SUCCESS

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(CHINESE PROVERB)