

**„Application of  
closed-loop sanitation approaches  
in the township of Yang Song”  
“ecological sanitation for ecomodel cities”**

**Workshop Report**  
**Yangsong, 17 – 20.03.2003**

on behalf of the   
Deutsche Gesellschaft für  
Technische Zusammenarbeit (GTZ) GmbH

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## ACRONYMS

BMZ	Federal German Ministry for Economic Cooperation and Development
BRTC	Biogas Research and Training Centre
CEEIC	Chengdu Energy Environmental International Cooperation, China
DEWATS	Decentralized wastewater treatment system
GTZ	German Agency for Technical Cooperation (Gesellschaft fuer Technische Zusammenarbeit, GmH)
IEEP	Institute for Energy and Environmental Protection, Ministry of Agriculture
TBW	Technologie, Bau- und Wirtschaftsberatung (T.B.W.) GmbH, Germany

## 1. Introduction

### 1.1 Background and Objectives

In order to effectively promote strategies orientated to the material-flow recycling process in the field of wastewater management and sanitation and within the scope of development cooperation, the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, acting on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), has started to conduct the supra-regional sector project "ecosan". The GTZ sector project on ecosan, characterized by interdisciplinary global networking and cooperation has started in May 2001 with an anticipated duration of 5 - 6 years and a first phase of 2 years.

The overall objective is to investigate ecosan-systems, establish them in national and international guidelines and prepare them for dissemination.

An important objective of the sector project is the implementation of pilot demonstration projects. There are a range of good examples worldwide, especially in rural areas. But with increasing urbanization, especially in Asia, the focus should now set on urban areas. Still there is a lack of solutions for densely populated regions and the Adapted projects have to be planned, implemented and monitored and concepts have to be developed for marketing the generated products.

In 2001 the GTZ sector project "ecosan" started a project for an ecosan strategy in Yang Song township, 45 km northeast from Beijing capital-

Yang Song was named as a "model township" for small-town construction in 1997. This status obliges the government to develop the industrial and urban sector, and to protect and improve environmental conditions. With regard to the model-status of Yang Song township and the upcoming Beijing Olympic games in 2008, the local council is currently considering various treatment technologies for municipal wastewater and ecological sanitation strategy for the urban and rural district.

To demonstrate the application of ecosan-principles in township planning in China a baselins study was carried out in summer 2002. The study aims to come out with a definition of an ecosan-strategy for the township of Yang Song and could be the base for joint project proposals in the field of integrated ecological sanitation, preferably suitable for innovative technologies. The intention of this proposal is to show the practical implementation of water conservation and nutrient reuse in urban areas by using grey water and organic wastes from individual households for irrigation, toilet flushing and urban greenery and agriculture. It is essential to harness the scarce water resources to ensure an adequate supply of safe drinking water for all citizens.

Main activities of the study team in cooperation with Yang Song Municipality, that have been executed between June and October 2002:

- A database about existing and further planned infrastructure, housing areas, industrial areas, entertainment facilities and agricultural areas was prepared.

- Existing and potential waste and wastewater related problems, impacts, quality and quantity, if possible separated by streams and sources have been listed.
- Environmental standards permitted for the specific area have been analyzed.
- Technical, environmental and economical frame parameter and criteria for nutrient recycling oriented waste and wastewater treatment, disposal and reuse, were listed.
- Technical solutions to fulfill ecosan-criteria under the given infrastructure and economical situation are being proposed.

To collect the data for the study in Yang Song, four methodologies have been used:

1. Interview with authorities on local, provincial, and national level
2. Interview with village and town population
3. Field and site visits
4. Statistical analysis and report studies

## **1.2 Workshop and participants**

The workshop “Ecological sanitation for eco model cities” was hold in Yang Song Township, Beijing City, from 17. - 20.03.2003 and was jointly organized by the People’s Government of Yang Song, the German Agency for Technical Cooperation (GTZ) and the Institute for Energy and Environment Protection (IEEP), Beijing. It was held in the conference room in the People’s Government building of Yang Song.

The workshop addressed the relevant governmental institutions and organizations involved in the planning and decision making processes and further interested in the elaborated base line study. Further participants from the GTZ project ‘Ecomodel City’ in Yangzhou and Changzhou, also attend the workshop. The participants came from the Environmental department, Planning Department and Construction Office.

The aim of the workshop was to introduce the concept of ecological sanitation and alternative, decentralized wastewater treatment methods. One of the main objectives was to present the base line study and the elaborated recommendations for Yang Song township. Further to present existing practical implementation solutions and companies involved in the sector. Another important task was the exchange and discussion of knowledge, technical aspects as well sustainable resource planning.

As participants Mr. Jiao Anqi, (Secretary General of Huairou Government; Governor of the People’s Government of Yang Song Township), Mr. Lu Wenjie, (Director General of the Environment Protection Agency of Huai Rou County) and Mrs. Yao Xiangjun, (Director of the Institute of Energy and Environment Protection, IEEP) held some official speeches in the beginning of the workshop. For the GTZ, one of the organizers, Dr Suding, Paul, Energy and Environment Coordinator for China, German Agency of Technical Cooperation (GTZ) presented the scope of work of the GTZ in China, especially in the environment protection sector. *(For participants list see the attachment).*

The Governor, Mr. Jiao Anqi, opened the workshop and expressed the warm welcome and the great interest of the county and the district on the methods and strategies lined out in the base line study.

The director of local EPA explained the importance of the ecological and environmental protection measures to be taken in the county and district regarding the “Green Olympics” in 2008. The district is one of the most important drinking water suppliers to the Beijing city with a daily amount of 700.000 m<sup>3</sup>. This is equivalent to 20 % of the daily demand in Beijing City.

Mrs. Yao Xiangjun, director of the IEEP, extended a warm welcome to all participants and expressed the hope that everyone will enjoy being in Yang Song. She wishes good and productive discussions and looking forward to the final conclusions. She hopes each of the participants will take home a few good ideas from this workshop and the findings of this important assessment report will serve its major purpose of attracting the attention of policy-makers and decision-makers in governments, bilateral and multilateral agencies and civil society for further measures.

## **2. Content, Procedure and Time Schedule**

### **2.1 Time and Procedure**

The workshop was conducted from 17<sup>th</sup> to 20<sup>th</sup> of March 2003 (details see workshop program). One day of the workshop (19<sup>th</sup>) was taken up with excursions. In Yang Song township relevant areas of the study were visited. Further facilities for decentralized wastewater treatment technologies in the area of Huairou and Beijing have been inspected. The workshop aimed to present and demonstrate the application of ecosan-principles in township planning of Yang Song. Advantages and disadvantages of the presented study should be discussed for analyzing and identifying further measures in the process.

The intention of the workshop was to come up with commitments of the participating institutions and governments for the next implementation step and with a proposal for the elaboration of a feasibility study.

### **2.2 TOR of the Moderator**

The task of the moderator was follow:

- Review of the relevant documents; e.g. baseline study, ecosan presentation materials, etc.
- Explain the procedure of the workshop and facilitate accordingly
- Motivate the participants towards an active and constructive participation
- Steering the logical and professional contributions and consistency
- Steering group dynamic processes
- Communication / Mediation between partners and participants

- Conduction of a 3 days workshop on GTZ requirements with outlined specifications in the program
- Mediate the denseness or communication shortcomings during the whole process
- Make use of visualization tools and instruments
- Contribution to the discussion process with constructive comments.

### 2.3 Key Note Speakers

As key-note speeches for eco-sanitation in China, **Prof. Yan Jingsong**, who is the Chairman of the Ecological Engineering Committee of the Ecological Society of China started the session and gave an overview on the fundamental principles and methods with ecological, economical and social aspects to the rural and urban societies. Basic explanations on the understanding of ecotourism and eco-sanitation have been outlined. As an overall goal he defined the following strategies: sustain the structural, functional & process sustainability through self-organization & recycling

**Mr. Heinz-Peter Mang**, German Agency of Technical Cooperation (GTZ) presented the concept of “ecological sanitation- closed loop with waste and wastewater” according the GTZ philosophy. He also referred to the aspects on ecological sanitation and some examples of applied systems in other countries. Further explanations were given to different approaches of the traditional and ecological sanitation, solutions for utilization of different waste water treatment types and to toilet systems all over the world.

**Mrs. Li Xianghong**, from the Guanxi Medical University, presented an impressive package of information and data on the comparison of sanitation systems in China. She explained rural sanitation methods and aspects, including different types of rural toilet systems, (such as VIP, Ventilated Improved Pit) and made some recommendations and goals for future implementation.

**Mrs. Xu Fang**, from the Institute for Urban Wastewater Management, Technical University Aachen, Germany presented her Phd Study on sustainable sanitary solutions for in China. and secondly the research work of the institute. . The first presentation deals with the potentiality of sustainable water supply and drainage systems in China with actual and future demand and supply problems.. It was an impressive presentation of the differences between urban and rural water supply and drainage systems with concepts for sustainability and scenarios for implementation. The second report was rather technical and research oriented and dealt with technologies for water supply and wastewater treatment applied in Germany.

**Mr. Zhang Mi**, Manager of the Chengdu Energy and Environment International Cooperation (CEEIC). presented “decentralised wastewater treatment systems” (DEWATS) with examples and experiences made. First the concept of DEWATS was explained. He presented three different treatment types:

1. Conventional treatment – conventional septic tanks
2. Centralized treatment – sewage plant

3. Decentralized wastewater treatment system (DEWATS)– biogas septic tanks and explained the technical advantages and disadvantages of the different systems. He also introduced the actual situation on the biogas development in China, eco-farming systems taking biogas as a key energy source and the different approaches and digester techniques applied in China and several projects abroad.

**Mr. Dong Baocheng** from the Institute of Energy and Environment Planning (IEEP) presented a pilot project from the Beijing Municipal Planning and Development Commission of for intensive animal farm waste treatment and nutrient recycling in Huai Rou District, Beijing.

**Mr. Zhang Baoqi**, Vice- Governor of the People’s Government of Yang Song Township introduced some aspects of

- Township development planning as model townships
- Implementation of sanitation technology for villages of Yang Song
- Options for wastewater treatment in Yang Song.

Mr. Zhang presented data and facts to the actual situation in different sectors and areas in Yang Song, such as:

- Yang Song (YS) social development and industrial situation
- YS land use planning (industrial, agriculture, living area)
- YS transportation and infrastructure planning
- YS publish facilities and construction planning
- YS land system and urban planning
- YS environmental protection regulations
- YS ecosan-planning( waste water and night soil treatment, rural toilet construction)
- YS disaster mitigation systems

**Ms. Jurga, Ina**, from GTZ-ecosan project, presented the results of the base-line study and the ecological sanitation strategy proposals for Yang Song Township. Mr. Wang Gehua, TBW-Consultant, who was a contributor to the base-line study commented different aspects of the study and the generation process. Ms. Jurga presented a preferably and most suitable and appropriate system for ecological sanitation in the surveyed area of Yang Song. The presentation also shows and explains the practical implementation of water conservation and nutrient reuse in urban areas by using grey water and organic wastes from individual households for irrigation, and urban greenery and agriculture. In the strategic ecosan oriented proposal several recommendations were made for sanitary system in residential areas (urban as well rural area) and for sanitary equipment and waste water treatment systems.

Two tables summarize some recommendations for sanitary equipment and waste water treatment in Yang Song area. (*see below*)

	Village	Town			
		Residential Buildings	Communal Buildings	Villa area	Industry
Existing	Improved latrine design: greywater flushing or separation toilettes	(Changes hardly achievable)		Owner can decide about sanitary equipment: Implementation of Urine diversion toilets difficult, vacuum toilets and -sewer system preferable, Separate blackwater and greywater disposal	(Changes hardly achievable)
New		Upgrade toilets with water saving device			Upgrade toilets with water saving device
Planned		-	Separate blackwater and greywater disposal. Toilets with water saving device, greywater flushing		Separate blackwater, greywater and process water disposal. Toilets with water saving device, greywater flushing, process water reuse

**Table: recommendations for sanitary equipment**

	Village	Town			
		Residential Buildings	Communal Buildings	Villa area	Industry
Existing	Improved pit design with retention time Or: Simplified sewage with biogas or dry separation toilettes	DEWATS Modular expandable		-	Treatment with residential wastewater (Wastewater quality meet household quality)
New		Separate treatment of blackwater and greywater Black water: baffled septic tank with up-flow anaerobic filter, sludge post-treatment biogas stations		Owner can decide: On-site treatment: Septic tanks with anaerobic filter chambers, dry separation etc.	
Planned		Greywater: decentralized community's treatment plant. Consisting of Imhoff tank or constructed wetlands			Pre-treatment up to household wastewater quality

**Table: Recommendations for treatment of wastewater streams**

## 2.4 Company Presentations

A self-presentation of project related companies in the ecosan sector was part of the workshop on the 20<sup>th</sup> of March. The following presentations of ecosan-technology companies and institutions have been given:

- CEEIC, China, Mr. Zhang Mi presented the Institute and its main functions:
  - research
  - training
  - development of new products
  - design
  - construction (biogas plants)
  - consultation
  - monitoring of biogas plants
  - publication.
- GTZ, Germany, Dr. Paul Suding explained the differences between TC and FC, and the organizational structure of the GTZ in China. He introduced the PPP-approache and the “third-party-business’ possibilities in China.
- Roediger Passavant, Germany and China, Ms. Zhu Jing, Mr. Han Yanbin and Mr. Hou Dun. Ms Zhu presented the latest technologies on vacuum sewer systems and vacuum toilets of Roediger Passavant, for water saving with many technical advantages and some applied examples.

- TBW Germany, Mr. Hartlieb Euler presented the developed and applied techniques of TBW in the sector of solid and liquid waste treatment. He explained the different solutions for the anaerobic solid waste treatment as well as the integrated anaerobic digestion.

*(For a copy of the presentations please contact the ecosan team at [ecosan@gtz.de](mailto:ecosan@gtz.de) or IEEP at [ceepd@china.com](mailto:ceepd@china.com) )*

## **2.5 Excursions**

During the one day excursion six different sites in Huairou and the Beijing area have been visited.

1. Landfill of Yang Song Township: The landfill is an open pit without any ground protection folia or an systematic infill and compression. Five years ago the actual landfill was a fish pond. During the last years the ground water level decreased by more than 5 m in the visited area. The water quality does not respond the Chinese drinking water standards. The participants agreed that urgent measures should be undertaken for the insulation of the landfill and a recovering of the groundwater with potable quality.

2. The second station was a new housing area in Yang Song with an improved garbage collection system and newly constructed drainage system. Some differences between the local and the national government regarding the grey and rain water treatment have been discussed.

3. In Shou Cao Village a dairy farm was shown and introduced to the participants. The director of the farm explained the handling and use of the manure. The participants have had an active discussion for improved reuse techniques referring to the solid and liquid residues of the animals, such as biogas systems, vegetable plants (mushrooms), etc.

4. In Huai Rou district a sewage treatment plant connected to two pig farms ( ~4000 heads in stock) was visited and explained by Mr. Guo Xianzhang, from the Institute of Energy and Environment Planning (IEEP). The plant functions as a pilot plant for intensive animal waste treatment and biogas production, and was financed by the Municipal Planning and Development Commission and the local government. The plant construction started in late summer and the completed late fall of 2002, so the trial operation does not fulfill the designed parameters due to the cold climate in winter. After the inspection of the plant, the participants came to the conclusion that the plant did not reached the technical capacity, either in construction or in function. Several suggestions were made for technical improvement.

5. In Shuanziyuan, a quarter in the northwest of Beijing City, a water supply, rainwater harvesting and urban drainage system was inspected. The decentralized wastewater plant is designed for 2,000 inhabitants, and treated wastewater is used for fire storage, water fountain, and car washing. Stormwater can infiltrate into the ground because of special,

unsealed plates were used for the street. The visit was guided by Mr. Ding Yueyuan from the Beijing Water Resource Bureau. The technical equipment was produced in China.

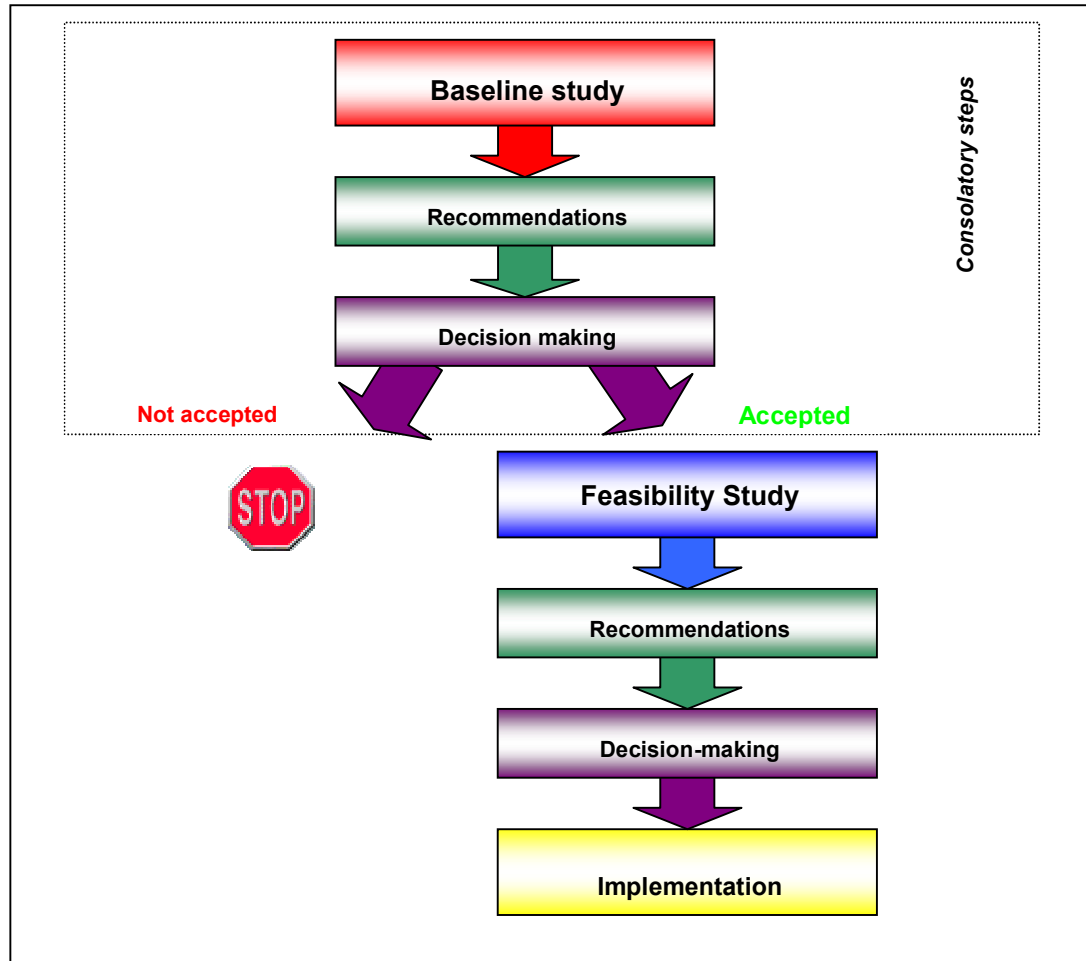
6. A wastewater treatment and rain water harvesting system in an urban complex in West Beijing was the last site of the excursion. For 2 apartment blocks with 400 inhabitants a treatment plant was equipped with modern German technologies. Wastewater is treated with lamellas and is reused for toilet flushing. Comparisons about the costs and technologies were made between the Chinese and China-German sites. Further the future potentials of decentralized wastewater treatment and recycling systems in Beijing were discussed.

### **3. Recommendations**

#### **3.1 Final recommendation of the participants**

During last day of the meeting the focus point of the discussion was the continuation of the started ecosan project for Yang Song. The precondition was the acceptance of the results from the base-line study by the governmental organizations. Also the possibilities for both sides regarding the fund-raising and the implementation of the feasibility study have been discussed.

The diagram below shows the strategic decision making process with the consolatory steps during the base-line study and after.



*(Original diagram by Ina Jurga, see the base-line study “Application of closed-loop sanitation approaches in the township of Yang Song “)*

On behalf of the governmental institutions and representatives Mr. Jiao Anqi (Secretary General of Huairou District) explained the valuable recommendations of the base-line study and the full acceptance of it. He also expressed the willingness of the Government to continue the investigations with the feasibility study.

He was referring to the actual problem situation in the township and named the important sectors as:

- human and animal waste treatment
- solid waste treatment
- sanitary systems.

For the feasibility study Mr. Jiao made several suggestions that should be considered by the investigating experts:

- the ecosan system of YS township should have a integrated scope
- the worked out proposal should contribute to the social and economical growth
- the ecosan system should contribute to the improvement of the living quality.

The feasibility study should achieve the following objectives:

### **Feasibility Study**

**Objective:**

ecosan demonstration village is set up on national and international standard

**Content:**

- Human and animal waste treatment and utilization
- Solid waste treatment and utilization
- ecosan integrated system (water protection, water saving, wastewater treatment)

**Financial resources (allocation of funds)**

- Application for the feasibility study
- Demand evaluation
- Chinese contribution
- German support

Several options for the implementation of the feasibility study have been discussed as well as possibilities for a project funding. The Chinese side explained that the local capacity and capability is not strong enough to implement the feasibility study. With an external support better and higher standards could be reached and the defined objectives could be achieved. The Chinese side explained their possibilities to contribute to the feasibility study, with local traveling, transport, accommodation, office facilities and workshop and symposium facilities. It was agreed that the expert team should consist of 4 persons, two international and 2 national experts. Among them one should be a local expert of the area, supported by the local government.

Finally it was agreed that during the next three month both side should evaluate the funding possibilities, suggestions for the composition of the expert group and the needed time.

This workshop was seen as the finish of the consultatory steps, and as a first step in an implementation process. After the time of three months a workshop should be conducted with the scope of setting the instruments and mechanisms for further measures.

### **3.2 General recommendations**

The workshop was excellent prepared by the involved agencies and all necessary equipment and nutrition's for the participants had been available. This might be also one of the reasons for the active and constructive contribution of the participants. After three days discussion it seemed that most of the opinions and suggestion of the participants have been expressed.

A pleasant work atmosphere could easily be created and the applied procedures gained good acceptance among the discussion partners. The participants have been well informed on the schedule and the content of the workshop.

The moderator received full support from all participants and translators and would like to express its sincere gratitude for the excellent cooperation.

*Beijing, im April 2003*

*Dr. Peter Seibert*

Pictures



*Group photo*



*Workshop location*



*Presentation of Mrs. Li Xianghong*



*Field visit on Yang Song landfill*



*Wastewater technology for decentral treatment*