ECOSAN - Ecological Sanitation in Mongolia

Result-oriented monitoring, August 2008

– rapid appraisal

gtz

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Abbreviations

ADB	Asian Development Bank
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development)
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Development Cooperation)
IFRC	International Federation of Red Cross and Red Crescent Societies
IYS	International Year of Sanitation
JPOI	Johannesburg Plan of Action
MDG	Millennium Development Goal
MNT	Mongolian Tugrik
NSOM	National Statistical Office of Mongolia
UDCP	Urban Development, Construction Sector and VET Promotion Program
UDRC	Urban Development Resource Center
UNCRD	United Nations Center for Regional Development
UNICEF	United Nations Children's Fund
USD	US-Dollar
WHO	World Health Organization
WWDP	World Water Development Report

Phrases

Aimag (mong.)	Province
Khashaa (mong.)	fence; synonym for fenced piece of land
Khudag (mong.)	water distribution point, water kiosk

1 Executive Summary

Sanitation in Mongolia is a major problem. While urban apartment-areas are normally connected to the central grid connected to sewage plants, in the countryside and in urban ger-settlements, sanitation is solved via simple pit-latrines. High groundwater-contamination in urban settlements is a result of untreated infiltration of into the ground. Hence, alternative solutions are urgently required.

Ecological sanitation (ECOSAN) is a decentralized, resource-efficient dry sanitation solution, where urine and dry feces are separated and treated. German Technical Cooperation (GTZ), disposing of experiences with ecological sanitation gathered worldwide, has adapted the concept to the environmental and cultural conditions in Mongolia and disseminated approximately 40 ECOSAN-toilets among ger-area residents and institutions in Mongolia.

However, the experiences and results of this study demonstrate that up to now the ECOSAN-concept could not reach a broader acceptance among the target-groups (ger-area inhabitants, tourist-camps, public institutions) in Mongolia.

- Costs (690.000 MNT, 600 USD[1]): the target-groups are tourist-camp operators and ger-area inhabitants. Particularly the latter belong to the lower urban income-strata. The price of the ECOSAN-toilet exceeds several monthly family-incomes. People cannot and are not willing to spend such amounts of money.
- Mongolian Climate: During the long and cold Mongolian winter, the ECOSAN-toilet is partly unusable due to frozen conducting-lines into the urine-tank. However, the appearance of 'stalagmites' in the toilet-bowl and very chilly windflows are other undesirable side-effects.
- Unsolved Disposal: there are no possibilities for the ger-area residents to discharge their collected excreta. Agriculture in urban areas is comparably rare. Due to lacking alternatives, ECOSAN-users discharge their feces into the old pit-latrines or soak-pits on their piece of land. The underlying principle of reuse in agriculture is hence not reached.
- Technical and constructional aspects: The construction of ECOSAN is criticized by many users, especially in regard to heavy smell-development and the size of the canisters which require frequent emptying

[1] In August 2008, 1 USD equals roughly 1150 MNT

- Feces: The frequent emptying and the side-effects in the wintertime demand a comparably high dealing with one's own feces.
- Utilization: the lack of disposal-facilities and the users' dissatisfaction lead to inappropriate utilization of the ECOSAN-toilet. Only tailor-made solutions with individual designs are expected to lead to the desired results. But so far, neither the local producers nor the UDCP-team can provide this service.
- Social acceptance: People show skepticism towards the reuse of human excreta in agriculture. Additionally, ECOSAN demands much dealing with the own feces which is neither desired nor should it be asked from the people.
- ECOSAN-Concept: ECOSAN only offers a solution for the accumulating feces, the problem how to discharge greywater remains unsolved. While it is only slightly polluted and not contaminated with fecal bacteria, it aggregates in large amounts. In context with the future connection of ger-settlements to central water-supply lines, even higher amounts of greywater will raise the demand of adequate wastewater-treatment.

Although the UDCP-Program has continuously improved the ECOSAN-toilet, it could not be adapted adequately to the 'Mongolian conditions'. The request by the target-group remains low.

The experiences made during this study lead to the conclusion that in the majority of cases, ECOSAN is not a suitable solution for Mongolian users. The UDCP-Program consequently ends its efforts for ECOSAN. However, the UDCP-Team offers its advice for holistic utilization-and disposal-concepts on individual request and is preparing new approaches for the community-based ger-area development. Recently, preparing research for the erection of a pilot bathing house is undertaken.

2 Introduction

2.1 Adequate sanitation – a worldwide challenge for the 21st century

Worldwide, 2.6 billion people have no access to adequate sanitation. At the World Summit on Sustainable Development[2], access to basic sanitation became a centerpiece of the poverty eradication commitments. The aim to halve the proportion of people without access to safe drinking water and basic sanitation is stated in target 10 of the Millennium Development Goals (MDGs).[3]

Despite significant efforts by governments, progress in this area has been slow and uneven. Over two billion people still need to gain access to basic sanitation if the international sanitation target shall be reached. The UN General Assembly, deeply concerned by the slow and insufficient progress in providing access to basic sanitation services and conscious of the impact of lack of sanitation on public health, poverty reduction, economic and social development and on the environment (in particular water resources), decided to declare 2008 the International Year of Sanitation (IYS).[4]

In Mongolia, especially in the countryside and in urban ger-settlements, sanitation remains a major concern. Commonly-used pit-latrines hold several risks for the users and pollute the living-surroundings.

In the context of its approach for the development of urban ger-areas, the GTZ 'Urban Development, Construction Sector and VET-Promotion Program' (UDCP), has been adapting the concept of ECOSAN for Mongolia since 2006.

[2] The World Summit on Sustainable Development was held in Johannesburg from August 26th until September 4th, 2002. It is also referred to as the Johannesburg Summit 2002.
[3] UNDP (2008): Millennium Development Goals. MDG targets and indicators. Online: http://www.undp.org/mdg/goallist.shtml.
[4] UN (2008): International Year of Sanitation 2008. Online: http://esa.un.org/iys/index.shtml.

3 Rationale

The towns and cities in Mongolia, especially Ulaanbaatar, face serious problems in providing adequate sanitation, sewerage and wastewater management systems for their inhabitants. Human wastes and greywater are collected in simple pit-latrines or soak-pits. These are mostly self-constructed by the owners and hold personal risks for any user, especially children, elderly and pregnant women.

They initiate a loop of polluting ground water and drinking water resources and consequently lead to environmental and hygienic threats. More than 600.000 Ulaanbaatar citizens do not have access to adequate sanitation. The huge demand for adequate wastewater-removal can not be met by conventional sanitation systems due to the enormous costs for a piping network, lack of water[5] and difficult access to the structures in the ger-settlements.

The ECOSAN-toilet, successfully invented in various countries worldwide (for example in India, Ethiopia, Kenya, Peru, South Africa)[6], apparently offered a solution and was adapted for the use in Mongolian ger-settlements and tourist-camps by UDCP. Recognizing constructional problems and low request by the Mongolian target-groups, UDCP surveyed the acceptance of ECOSAN among users, target-groups and administrative institutions. This study reflects the outcomes of the survey.

3.1 Urban Development, Construction Sector and VET Promotion Program (UDCP)

The Urban Development, Construction Sector and VET Promotion Program (UDCP) is implemented in cooperation with Mongolian partners, the Ministry of Construction and Urban Development (MCUD), with the Ministry of Education, Culture and Science (MECS) and with the Ulaanbaatar City Government (UBCG). The program is carried out by German Technical Cooperation (GTZ) and financed by the German Federal Ministry of Economic Cooperation and Development (BMZ).

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[5] The drinking water resources in Ulaanbaatar are scarce. It is assumed that by 2012 the demand for drinking water will exceed the supply.

[6] GTZ (2005): ECOSAN – Recycling-oriented wastewater management and sanitation systems. (= Topicsheet).

The program contributes to the Millennium Development Goals (MDGs) and poverty alleviation through advisory service in basic infrastructure development, improvement of the sanitary conditions, affordable housing, facilitation of credits, vocational education and training and small and medium enterprise promotion, improving the living-conditions of the middle and lower urban income strata.

3.2 Methodological Approach

In order to receive result-based information for assessment of the acceptance of ECOSAN in Mongolia, different groups of persons involved have been addressed for this survey: Users, authorities and people who do not use ECOSAN so far.

The information gathered is based on narrative and standardized interviews. Narrative expert-interviews were held with competent authorities and private persons and afterwards analyzed hermeneutically, in the sense of 'understanding interpretation'. A standardized questionnaire was worked out in order to gather the opinions and experiences of ECOSAN-users.

Additionally, people without experiences with ECOSAN-toilets have been interviewed. They were given detailed information about the underlying ideas and the operating mode of the ECOSAN-toilet by the use of an information brochure. All standardized questionnaires were analyzed with MS EXCEL.

The interviews have been carried out in July and August 2008 in the cities of Ulaanbaatar and Erdenet.

4 Living circumstances and sanitation in Mongolia

4.1 Urban Ger-Settlements

Mongolia has faced a rapid urbanization-process during the 20th century, mainly concentrating on Ulaanbaatar.

Ongoing in-migration to the Capital has led to a rapid growth of urban ger-areas in the outer fringes of the city. A significant number of in-migrants have settled down informally. The 'Law on Mongolian Citizen's Ownership of Land', approved in 2002, strongly promotes rural-urban migration as it provides families the right to legally obtain 0.07ha of land in the city. They receive an ownership-title which is accepted as collateral by the banks.

Due to lacking control, unsupervised spatial expansion is the aftermath.[7] Ger-settlements cover hill slopes and flood plains and are endangered by erosion, particularly during summertime, when flash floods appear after heavy rainfalls and carry away landslides with rubble and waste (see Figure 1).

Figure 1: View on peripheral ger-settlement

The ger-areas lack basic infrastructure and services. There is a considerable deficit in adequate technical infrastructure provision, including water-supply, sanitation, heating and waste-disposal. Roads are in a permanent state of disrepair and lack streetlights. Solid waste collection is haphazard and soil and land pollution are ubiquitous as a result of the open dumping of solid waste. Heating is solved by individual ger-stoves which

[7] JANZEN, J., TARASCHEWSKI, T., GANCHIMEG, M. (2005): Ulaanbaatar at the Beginning of the 21st Century. Center for Development Research (CDR), National University of Mongolia (NUM) (= Research Papers 2). Ulaanbaatar. P. 14.

are fueled with wood, pit/coal or even waste. Due to their low heating storage capacity, fuel-consumption is very high.[8] Particularly during wintertime, emissions of 140.000 ger-households highly contribute to the severe air-pollution in Ulaanbaatar.[9] Inhabitants buy their drinking-water at water distribution-spots, the so-called khudags[10]. This task is mostly done by children (see Figure 2).

Figure 2: Water-supply in urban ger-area

While the central ger-areas with their consolidated structures dispose of a dense net of khudags, dwellers of peripheral ger-areas need to overcome rather long geographical distances, often more than 500m,[11] to supply themselves with drinking-water. The water-consumption among ger-area residents is consequently low. According to ADB et al. (2005: 2), the daily consumption per person reaches 5.2 liters.[12] This is far below the assessed daily minimum of 15 liters per person (THE SPHERE PROJECT 2004: 63) and the hygienic situation is consequently low.

Sanitation is solved simply in the ger-settlements: People themselves construct their own on-site pit-latrines and soak-pits without adequate knowledge of technical features and requirements on how to build a latrine properly.

Ger-area residents are additionally confronted with a lack of social infrastructure mainly in regard to education and employment-facilities. The number of poor is significant.

[8] For detailed information on approaches for energy-efficient stoves for the use in ger-settlements, see GTZ 2008a and GTZ 2008b.

[9] In the heating-period between November and April, emissions of Particulate Matters (PM) in Ulaanbaatar are up to 20 times higher than WHO-standards recommend. Inhabitants 'renamed' their Capital City Ulaanbaatar, the 'Red Hero' into Utaanbaatar, the 'Smoke Hero'. By October 2008, GTZ will install four ambient air quality monitoring stations in Ulaanbaatar, financed by the German Government. These will identify the sources, composition and volume of pollution in Ulaanbaatar on the base of a reliable air-pollution-monitoring-system.

[10] Khudag (mong.): water distribution point, water kiosk

[11] In the ‚Humanitarian Charter and Minimum Standards in Disaster response', the SPHERE-Project assesses the maximum distance for water-supply at 500m.

[12] At the same time, water-consumption in apartments is 328l per person per day (ADB et al. 2005: 2). It exceeds consumption in industrialized countries like Germany (128l per person per day) several times. The high water-consumption has to be traced back onto the many leakages in Ulaanbaatar's piping system.

Even though it would be inappropriate to compare the Mongolian ger-settlements with the slums in developing countries, increasing socio-spatial segregation leads to social downgrading-processes and growing marginalization of the inhabitants.[13]

Any approach on the development and improvement of the living-conditions in the ger-settlements hence should consider the socio-economic background in order to find the adequate solution.

4.2 Sanitation and Hygiene

The inadequate sanitation situation in Mongolia is often underestimated. People tend to undervalue the importance of adequate sanitation, bringing forward the argument of the vast, sparsely populated country. This argumentation oversees the fact that the Mongolian population is not equally distributed within the country, but reaches an urbanization-rate of approximately 60% of which the overwhelming majority lives in Ulaanbaatar.[14] There is a large disparity in access to adequate sanitation between rural and urban population. Further, within cities, especially Ulaanbaatar, there is another large disparity between modern apartments and traditional ger-areas. Ger-area residents and the rural population are not connected to any central water-grids, neither fresh- nor wastewater. Sanitation in the countryside and in the urban ger-settlements is until now solved via pit-latrines. The wooden construction of the latrine stands above a hole in which the human wastes are collected. The construction is very simple, often lacking roof or door and privacy, and with poor dirty squatting slabs. Several latrines appear rather dangerous, especially for children, elderly and pregnant women.

In regard to hygiene, environmental pollution and investment-costs, a pit-latrine is a reasonable option in the sparsely populated countryside. But the thousands of pit-latrines concentrated in the urban ger-settlements and the summerhouse-area at the urban fringe of Ulaanbaatar highly pollute the groundwater and create an environment for the transmitting of diseases via vectors or smear infection.

[13] TARASCHEWSKI, T. (2007): Stadtentwicklung in Ulaanbaatar im Zeitalter fragmentierender Entwicklung. Aktuelle Migrations- und sozioökonomische Prozesse unter besonderer Berücksichtigung der Jurtenviertel. (= unpublished PhD-Thesis Freie Universität Berlin). P. 149.
[14] NSOM (2007): Mongolian Statistical Yearbook 2006. Ulaanbaatar. P. 76.

Figure 3: Typical pit-latrine

Especially migrant-populations who settle in the city's outskirts have very poor access to safe drinking-water and sanitation. 'If this challenge is not addressed now, we are increasing the likelihood of having a major environmental disaster at hand with even higher incidence of water borne diseases such as infectious diarrhea and Hepatitis' said Mr. DESMOULINS, UN Resident Coordinator a. i. and UNICEF-Representative due to the launch of the International Year of Sanitation in Mongolia.[15] It becomes obvious that there is an urgent need for increased access to improved water supply and sanitation in order to raise hygiene and living-circumstances, to protect and restore the freshwater resources and to reduce the vulnerability of populations to water-related diseases.

4.3 Consequences of inadequate sanitation

The combination of inadequate wastewater-treatment, particularly in regard to feces, and very low water-consumption leads to a rather poor hygienic situation in the ger-settlements. Hygiene is understood as the practice of desirable personal behaviors that will promote good health and prevent sickness, i. e. washing hands with soap before eating and after using the toilet, taking regular bath and maintaining body cleanliness.[16] (HYGIENE AND SANITATION REPORT FOR GER AREAS 2006: 10).

[15] UN Mongolia (2008): Launch of the International Year of Sanitation in Mongolia. Online: http://www.un-mongolia.mn/web/news200308.html.

Rates of diseases transmitted by smear infection are considerably higher among ger-area residents and especially children are affected. There are 10.000 cases of diarrhea in Mongolia each year, dysentery is the second most prevalent disease. The rate of infections with Hepatitis A in Ulaanbaatar reaches 7 times the international average.[17] Open defacation, unsanitary latrines, open discharge of greywater, vestors and inadequate personal hygiene lead to unsanitary conditions which build the breeding ground for the spread of diseases.

It is hence very important to concentrate on the one hand on healthy sanitation solutions and on the other hand on the promotion of an adequate hygienic behavior, especially regular hand-washing, among the target-group.

[17] THE WORLD BANK (2006): Hygiene and Sanitation Report for Ger Areas. Ulaanbaatar. P. 6.

5 ECOSAN – Ecological Sanitation

The underlying idea of ecological sanitation is to 'close the loop' between agriculture and sanitation.[18] Sanitation problems can be solved sustainably and efficiently by making use of the nutrients contained in wastewater and human excreta in agriculture (see Figure 4).

Figure 4: Principle of ecological sanitation. (Source: WERNER 2007)

Fertilization of land with human feces has been practiced for centuries. Even today the application of sewage sludge from sewage plants onto field is common practice[19].

Basically, there are two different kinds of treating human wastes. They either fall under the category of waterborne systems or pit latrines. The design of these 'flush and discharge' respectively 'drop and store' technologies is based on an understanding that regards human excreta as waste which only is suitable for disposal.[20]

[18] WERNER, C. (2007): Ecological sanitation: introduction and health aspects of the reuse of wastewater and excreta. Presentation on January 18th, 2007. Eschborn/Germany. Online: http://www.gtz.de/de/dokumente/en-water-health-ecosan.pdf.

[19] The German law on treating sewage sludge ('Klärschlammverordnung') precisely regulates the application of sewage sludge onto agricultural crop land or gardening fields in regard to amount, way of application and precondition of the soil.

[20] WERNER, C. (2007): Ecological sanitation: introduction and health aspects of the reuse of wastewater and excreta. Presentation on January 18th, 2007. Eschborn/Germany. Online: http://www.gtz.de/de/dokumente/en-water-health-ecosan.pdf.

Textbox 1: The different colors of wastewater. (Source: CONRADIN 2007: 17)

The different colors of wastewater

Greywater is only slightly polluted water from dishwashing, showers, laundry and sinks etc. It normally is not contaminated with fecal bacteria. Greywater makes up the largest amount of wastewater. The amount of greywater is highly depending on the available fresh water.

Yellow water is urine. Urine contains most of the nutrients that are excreted again, but only has a very low, if at all, pathogen count. However, micro-pollutants (e. g. from medication) or endocrine substances are also excreted through urine. The total annual amount of urine per person is roughly 550l.

Brown water refers to pure feces or feces mixed with flushing or anal cleansing water. It does not contain urine. This fraction contains most of the pathogens; in fact, more than 120 different types of viruses can be found in feces. The amount of feces per person per year varies between 55 and 190kg according the digestibility of the diet.

Black water is a mix of urine and feces and can additionally be combined with toilet-flushwater. In contrast to sewage and wastewater, it does not contain the general greywater from the household. It contains all excreted nutrients, but also a high number of pathogens.

At first sight, waterborne systems offer advantages as they allow the transport of excreta, used water and rain water far away from their origin. The hygienic situation at the location of origin is thereby improved. But as soon as these systems are not applied and maintained correctly, they threaten the environment. This holds true as well for many developing or newly industrializing countries as for developed countries, too.[21]

But conventional sanitation technologies have been exposed to increasing criticism for their lack of economical and ecological sustainability as well. In light of the world water crisis with increasing scarcity of drinking-water, the wasting of water for flushing toilets also reveals ethic questions.

ECOSAN improves health by minimizing the introduction of pathogens from human excrements into the water-cycle. It makes safe use of nutrients, organics, trace elements and water, preserves soil-fertility and improves agricultural productivity. ECOSAN enables a material flow instead of disposal.[22]

In the ECOSAN-toilet, urine and feces are collected in two separate tanks. The concept intends the application of diluted urine and dried feces on agricultural farmland.

[21] The first UN World Water Development Report (WWDP) released in 2003 ranks 122 countries according to their access to clean water. The list is topped by Finland and Canada. On the opposite of the list there are countries one rather might expect: Morocco, India, Jordan and Sudan. But at the very bottom, ranked worst, is not a drought desert land, but instead modern industrialized Belgium (UNESCO 2003).

[22] WERNER, C. (2007): Ecological sanitation: introduction and health aspects of the reuse of wastewater and excreta. Presentation on January 18th, 2007. Eschborn/Germany. Online: http://www.gtz.de/de/dokumente/en-water-health-ecosan.pdf.

Greywater, collected in the households, can be used for subsurface irrigation of plantations, too. The ECOSAN-concept has been successfully implemented in warm climates with busy agriculture and water-scarcity.

5.1 Rationale for the implementation of ECOSAN in Mongolia

In Mongolia, climate and limited water availability, a sparsely populated countryside and uncontrolled urban sprawl, ongoing desertification and growing tourism build framework conditions which must be regarded when considering alternative sanitary solutions. It becomes obvious that conventional centralized sanitation systems may not be suitable to solve the difficult questions of sanitation in the countryside and in urban ger-settlements. As demonstrated, ECOSAN offers a decentralized, sustainable and user-friendly system for anyone not connected to central gridlines. Due to GTZ's positive experiences in other countries, it was rather self-suggesting to adapt the ECOSAN-concept for Mongolia, too.

5.2 Challenges for the implementation of ECOSAN in Mongolia

The implementation of ECOSAN offers many advantages, however there is also a broad skepticism among target-groups and administrative institutions. This became obvious during many discussions and interviews held. Hence, frequently mentioned considerations and counter-arguments shall be reflected in the following.

Overabundance of Animal Dung

It is often referred to that there is enough animal dung in Mongolia due to livestock-breeding, and there is no need for reusing human feces in agriculture. Indeed, the number of animals exceeds the number of inhabitants by far. In 2007, 2.6 million people were registered in Mongolia[23], whereas the number of animals was 40.2 million in 2008.[24] But on the one hand, the dung would have to be collected from vast areas, on the other hand it is needed as fuel, especially in the treeless steppes and desert zones of the country.

[23] NSOM (2007): Mongolian Statistical Yearbook 2006. Ulaanbaatar. P. 76.
[24] BORMANN, R. (2008): Neuigkeiten aus der Mongolei – Juli 2008. Online: www.mongolei.de

Limited farmland and short vegetation period

Another argument is the limitation of areas for farming. The semi-arid climate leads to limited arability of the Mongolian countryside and holds the threat of summer-droughts and high snow covers in the wintertime. In 2008, 180.100 ha cropland have been farmed.[25] A third land reclamation program has been released in spring 2008 and by 2010 it is expected that Mongolia can self-supply its demand on potatoes and vegetables. Hence, the demand for fertilizer and irrigation water is expected to grow in the near future.

In principle, the reuse of human excreta or greywater should not be reduced to fertilize cropland, but consider a manifold application spectrum, for example in tree nurseries, forests and reforestation. Then, ECOSAN can be an option in countries with little agriculture and in societies with ethic hesitation against agricultural reuse of human excreta, too.

Transport

Transport of human excreta or greywater to distant farmland is an obstacle, as arable land or forestation are reduced to few provinces in Mongolia. Roads, providing the main option for transport, are often in bad condition. Fuel-prices are expected to further rise in the future. Transport of fertilizer (and greywater) must hence be arranged carefully, sustainably and in a market-oriented way.

Acceptance of Excreta

The concept of reusing human excreta as fertilizer usually meets with skepticism and disapproval at the first time. People express hygienic or ethic doubts. Mongolians have begun farming land since the days of communism and agriculture does not seem to be deep-rooted in the culture until today. This surely complicates the acceptance of human fertilizer in comparison to agrarian societies. Education must be sensitive in order to reduce refusal and raise awareness and acceptance among the society.

If the acceptance cannot be reached, it could be considered to promote fertilization of tree-nurseries or reforestation-areas.

[25] BORMANN, R. (2008): Neuigkeiten aus der Mongolei – Juli 2008. Online: www.mongolei.de

5.3 The implementation of ECOSAN by UDCP

ECOSAN is regarded an approach which offers a solution for those who lack adequate sanitation in Mongolia.

In close cooperation with Mongolian craftsmen, the 'Urban Development, Construction Sector and VET-Promotion' Program has adapted ECOSAN-toilets to the Mongolian framework-conditions. ECOSAN is a solution for individual households or institutions not connected to the central sewage-systems such as:

- Gers and individual houses in the ger-settlements
- Summer houses in the outskirts of the city (e.g. Ulaanbaatar)
- Tourist Camps
- Schools, Colleges, Health Centers etc.

Four pilot-project-toilets have been erected in Ulaanbaatar's ger-settlements in October 2006. So far, ECOSAN-concepts had mainly been implemented in warmer climates and there had been almost no experiences in cold climates especially in regard to the effects of long winter-periods.[26] The aim of the pilot-phase was hence the adaptation of the ECOSAN-concept to climatic conditions of Mongolia.

The ECOSAN-toilet is built above ground in order to facilitate the easy emptying of the feces and urine-vaults. A cement slab prevents any infiltration into the ground. The toilet model itself consists of a urinal and a urine-separating two-vault toilet-bowl and thereby offers a seating-accommodation and more comfort for the users. The pilot ECOSAN-toilets have been constructed solidly out of precast concrete blocks. Toilet-bowl and urinal were easily moveable to facilitate the alternating use of the two vaults for feces.

The second generation (see Figure 5) is constructed of pre-fabricated wooden construction-elements on a concrete base. The size of the vaults has been reduced in order to facilitate a fast drying-process (feces) respectively reduce the smell while emptying the urine-canister (urine). Erection of the toilet is less time-intense and costs have been reduced. The concrete base is constructed within 2-3 hours and needs 48

[26] In Ulaanbaatar, monthly average temperatures fall below 0°C by October and rise over 0°C by April. January is the coldest month with an average temperature of -25°C (MÜHR 2007).

hours of curing. The erection of the toilet then is easily done within 2 hours.

Figure 5: Outside and inside view of a second generation ECOSAN-toilet in Ulaanbaatar.[27]

The third generation of ECOSAN-toilets (see Figure 6) consists of pre-cast sandwich-panels.[28] Further improvement of the containers led to a more comfortable emptying. Urinal and toilet-bowl do not need to be moved anymore.

Figure 6: Third generation ECOSAN

[27] CONRADIN, K.(2007): Ecological Sanitation in the Khuvsgul Area, Northern Mongolia: Socio-Cultural Parameters and Acceptance. (= unpublished Master's Thesis at University of Basel, Institute of Geography). P. 36.

[28] Pre-cast sandwich-panels do not show signs of warping and hence are better adapted to the extreme climatic conditions.

The ECOSAN-toilet provides an environmentally friendly solution. At the same time it offers a user-friendly and safe handling.[29] The Mongolian Public Health Institute has approved the hygienic harmlessness of the collected excreta of UDCP's ECOSAN-toilet in 2007.

Parallel to continuous improvement of toilet-construction, awareness-creation and promotion are taking place. Reports about ECOSAN have been broadcasted in Mongolian TV and articles published in newspapers.

So far, ECOSAN-toilets are mainly requested by tourist-camps. Especially around Lake Khoevsgoel, tourist-camp-owners need to install environmentally friendly sanitation solutions to receive permission for running their camps.[30] The Ministry for Transport, Tourism and Roads has recently released a corresponding regulation.

The Ministry for Construction and Urban Development (MCUD) has shown high interest to promote ECOSAN-toilets along cross-country-roads for petrol-stations, shops and restaurants. The summerhouse-area at the fringe of Ulaanbaatar is undergoing a process of privatization. Regulations for environmentally friendly sanitary solutions are being worked out and ECOSAN is recommended a suitable solution.

So far, 40 ECOSAN-toilets have been disseminated among Mongolia by the UDCP-Program. In the course of this, 30 ECOSAN-toilets have been purchased by tourist-camp-owners, World Vision and other NGOs.

With a recent price of 690.000 MNT (600 USD) ECOSAN-toilets are rather expensive. For the future it is important to work out subsidy-programs in cooperation with the program partners and the private sector.

[29] Wide-spread pit-latrines dispose of a very poor construction. Unfirm wood-panels and over-dimensioned wholes in the ground contain an imminent danger especially for children and elderly persons of falling down.

[30] The tourist-camps around Lake Khoevsgoel collect their grey- and blackwater from flush-toilets and showers in holding-tanks which are emptied regularly by a wastewater-truck. The waste-water is disposed in Kharagana, around 8km south of Khatgal, rather improperly in a large soak-pit (CONRADIN 2007: 63).

6 Results of the survey

6.1 Case studies

The following case-studies provide examples of positive and negative experiences and recommendations made by ECOSAN-users.

6.1.1 ARVIN Saving-Community in Erdenet

One component of the UDCP-Program focuses on community-driven ger-area-development. In June 2007, UDCP has visited ARVIN (mong.: 'prosperous') Saving-Community in Erdenet. The Saving-Community consists of approximately 20 member-families who save a daily amount of 100 MNT. The money flows into a common saving-account which serves as a loan-facility.[31]

The approach and the good progress of the ARVIN Saving-Community have convinced the UDCP-Team to support the community with 5 ECOSAN-toilets. These toilets have been erected in August 2007. One year later, in July 2008, the UDCP-Team revisited the community in order to monitor their experiences with ECOSAN.[32]

The visit took place during the summer-holidays when the majority of the families had left for the countryside; however, only six families out of 20 could be interviewed. Two of them were equipped with an ECOSAN-toilet and made regular use of it. The UDCP-Team was told that one other family uses their ECOSAN-toilet whereas two families do not use their toilets.

It can be stated that there is an ecological awareness among the community-members which has been the driving–force to request the ECOSAN-toilets in 2007. Their recent attempts for adequate waste-disposal and separation of waste underline this.

The two visited toilets have been in very good condition, they were well-maintained and clean (see Figure 7). Both families added ashes to fasten the drying-process of the feces. In the evening chill, only little smell was notable in both toilets. But due to sun-exposure, both toilets developed very strong smell during daytime. This was sharply criticized by the two families.

[31] For detailed information, see GARDEMANN 2007.
[32] Another aim was to reveal the group's development within the last year. A report is recently under preparation.

Figure 7: Inside view of ECOSAN-toilet with ashes-bowl.

Excreta-disposal is not solved adequately in both cases. Even though the two families grow several vegetables on their khashaas[33], they would not use their natural fertilizer because of hygienic doubts. They would also not apply greywater on their vegetables. In both cases, urine is directly led into the old pit-latrines. Figure 8 shows one of the self-constructed conducting-lines. Dried feces as well as greywater are also put into the old pit-latrine.

Figure 8: Conducting urine into the former pit-latrine.

The two interviewed families showed general confidence with their ECOSAN-toilets, but stated that the toilets have not really met their expectations. Only the seating-pan was regarded very positively by them. Technical aspects such as the small size of canisters and the question of disposal were assessed very negatively.

Initially, ECOSAN was regarded a contribution to community-development approaches. This hypothesis could not be reconfirmed as the toilets are situated on private khashaas and used by the individual families only. Experiences with a public usage of ECOSAN in Mongolia are up to now not available.

[33] Khashaa (mong.): fence; synonym for fenced piece of land

6.1.2 Khandgait Children's summercamp

In the case of a children's summer camp in Khandgait near Ulaanbaatar, the toilet was financed by the camp-owner himself. Regarding this and the very dirty, inadequate and dangerous condition of the pit-latrines, it is quite difficult to understand why the ECOSAN-toilet is not used. The toilet was purchased on behalf the arrival of youth groups from Japan and South Korea in summer 2007. These children should be offered a clean toilet, hence the camp-owner decided to install an ECOSAN-toilet.

A fence around ECOSAN and the locked door witness that the toilet is not in use. The feces collection grid was almost empty. Emptying of the toilet until now has not been necessary.

The camp-owner so far has not been interested in using the ECOSAN-toilet. During the interview he was suggested to consider the re-opening of the toilet as it could be a solution for the camp-workers and the dried feces could be applied to the large forests surrounding the camp. It can be assumed that the purchase of ECO SAN was intended only to meet the official standards for nature reserves (see chapter 9.4).

6.1.3 Gardener in Ulaanbaatar

The ECOSAN-concept is quite suitable for people with large land or agriculture, as the following example shows: Mrs. CHULUUNTSETSEG is running an agricultural business in the outskirts of Ulaanbaatar where she grows several vegetables.

Figure 9: Mrs. Chuluuntsetseg in front of her vegetable bed

Her husband is a teacher at the agricultural college, giving practical exercise for gardeners at his plot. The couple has been looking for a suitable sanitary solution for their workers and has been equipped with an ECOSAN-toilet by UDCP. Mrs. CHULUUNTSETSEG says she is very content with the toilet, especially because of the improved hygiene and user-comfort. The dried feces are put onto trees and bushes on

her piece of land and there are noteable positive effects due to the fertilization, she says. For her, an ECOSAN-toilet not only protects the environment, but improves the living-standard of ger-area residents.

6.2 Standardized interviews with ECOSAN-owners

15 persons or institutions disposing of an ECOSAN-toilet have been interviewed with standardized questionnaires in order to get their experiences and opinions of ECOSAN.

Usage of ECOSAN

The 15 interviewed families, respectively institutions, have been equipped with ECOSAN-toilets free of charge.[34] During the survey it turned out that only in 8 cases the toilet is regularly used and emptied. In the 7 other cases the toilet either had not been used at all or it was used until the canisters were full and the question of emptying arose. Figure 10 displays reasons why people did not use the ECOSAN-toilet. Technical deficits, a general better satisfaction with the pit-latrine and the unsolved question of disposal were the main reasons. The three institutions having an ECOSAN-toilet (children's summer-camp, children's day center, hospital for curing alcoholism) did not use the ECOSAN at all. The contact persons explained that with a huge number of potential users, the canisters would be filled very soon. This would require very frequent emptying. Furthermore, they had no possibility to dispose the feces and finally decided not to use the ECOSAN-toilet.

This underlines that it is important to elaborate utilization- and disposal-concepts with the individual user in advance and after the installation of an ECOSAN-toilet.

[34] The only exception is the children's summer camp in Khandrait which purchased the ECOSAN-toilet for the full price.

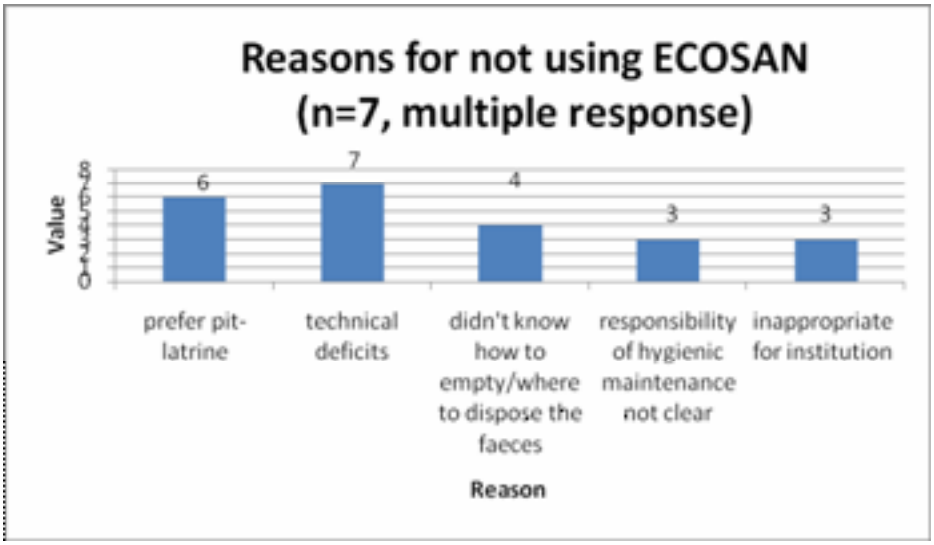

Figure 10: Reasons for not using ECOSAN

Disposal of excreta

The disposal of excreta turned out to be the crucial point hindering the people of using their ECOSAN-toilet. Figure 11 displays how users dispose the collected excreta. Distinction is made between urine and feces. Urine generally is regarded less harmful among the interviewed persons. During the interviews several mentioned they would prefer the usage of urine to the usage of feces. Urine and feces were used as fertilizer in three respectively two cases.

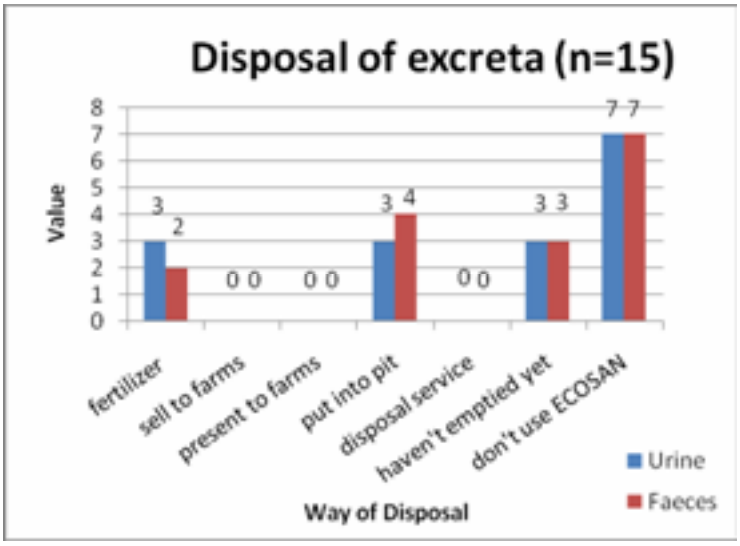

Figure 11: Disposal of excreta

All interview-partners mentioned they had observed positive effects on the trees or bushes they were fertilizing with the excreta. But they stressed they would not use the

human fertilizer for agricultural products because they have doubts in regard to pathogene germs. Seven persons do not use the ECO SAN-toilet and three said they had not emptied their canisters yet. Four families empty their canisters into the old pit – lacking of trees or agriculture, they said they had no alternative. One of these families at least m ade use of the urine.

These results again stress the importance of adequate disposal or options for application. If people do not know how to treat or where to bring the excreta to, they will either not use the toilet properly or they will handle the disposal pretty much the same as before. This is not 'adequate sanitation'. It will be a central challenge to solve the question of adequate disposal of collected excreta properly.

Comparison of pit-latrine and ECOSAN

The ECOSAN-users were asked to compare the pit-latrine and the ECOSAN-toilet in regard to design, hygiene, development of smell and user-friendliness. Generally, ECOSAN has achieved better results. 14 interviewed regarded the ECOSAN-design better. In regard to hygiene, development of smell and user-friendliness, both toilets achieved similar results (see Figure 12).

A sample of 15 persons naturally only allows vague speculations about the totality, but the distribution reveals that construction-improvements and concept-adjustments are urgently required in order to create an obvious or felt advantage.

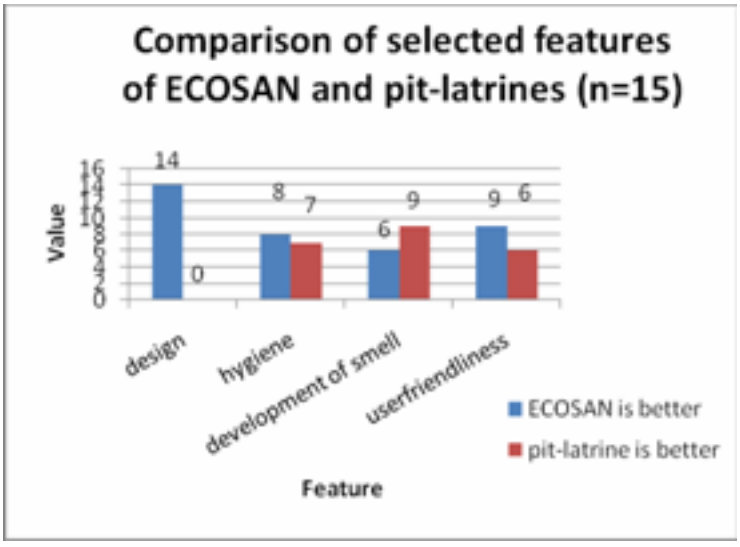

Figure 12: Comparison of selected features of ECOSAN and pit-latrines

Advantages of ECOSAN

The users were asked to name any advantages of the ECOSAN-toilet. Figure 13 points out that hygiene, user-friendliness and environmental friendliness were regarded advantages of ECOSAN. The convincing advantage is the seating-accommodation which was regarded positively among all users.[35]

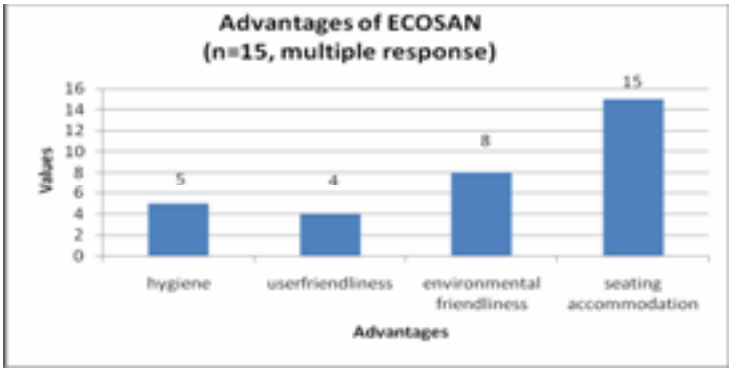

Figure 13: Advantages of ECOSAN

Disadvantages of ECOSAN

The question about disadvantages of ECOSAN is very important in regard to improving constructional aspects of the toilet. Users mentioned the following disadvantages: Smell development, cold draft especially in wintertime, development of 'stalagmites' in both vaults, small size and frequent emptying of canisters and slippery stairs in winter.

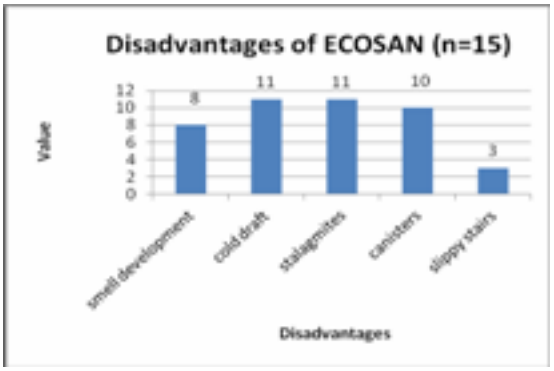

Figure 14: Disadvantages of ECOSAN

[35] Several people without ECOSAN showed interest in purchasing merely the toilet-seat to improve their pit-latrine.

6.3 Awareness among ECOSAN-users and persons not using ECOSAN

Some questions in regard to awareness of ecological and hygienic problems among the target-group have been asked from both, ECOSAN-users and persons not using ECOSAN. Even though the sample of 32 interviewed persons is quite small, it was interesting to figure out whether there are obvious differences in the groups' opinions.

Ecological awareness and assessment of ECOSAN among ger-area residents

Are ger-area residents aware of the ecological and hygienic problems in their living-surroundings? How do they evaluate the use of pit-latrines and would they like to be connected to central supply-grids? The answers given are displayed in Figure 15. It becomes obvious that recent sanitation does not at all fulfill people's demands. All interviewed agree that pit-latrines and soak-pits pollute the ground and groundwater and lead to unhygienic living-surroundings. People say it is important to improve sanitation and they would rather appreciate to be connected to the central gridlines. The pit-latrines are regarded harassing in smell and rather uncomfortable in using. ECOSAN instead is regarded to be more convenient among the interviewed. But only half of the interviewed were convinced that ECOSAN is an adequate solution for the ger-settlements.

These answers reveal awareness among the ger-area residents. It is related to a general dissatisfaction with recent sanitation in regard to the simple structure of pit-latrines. People see a need to improve sanitation in order to increase the hygienic situation in the ger-settlements. The awareness among the target-group is a good base upon which further information campaigns, marketing of alternative sanitation and dissemination can follow.

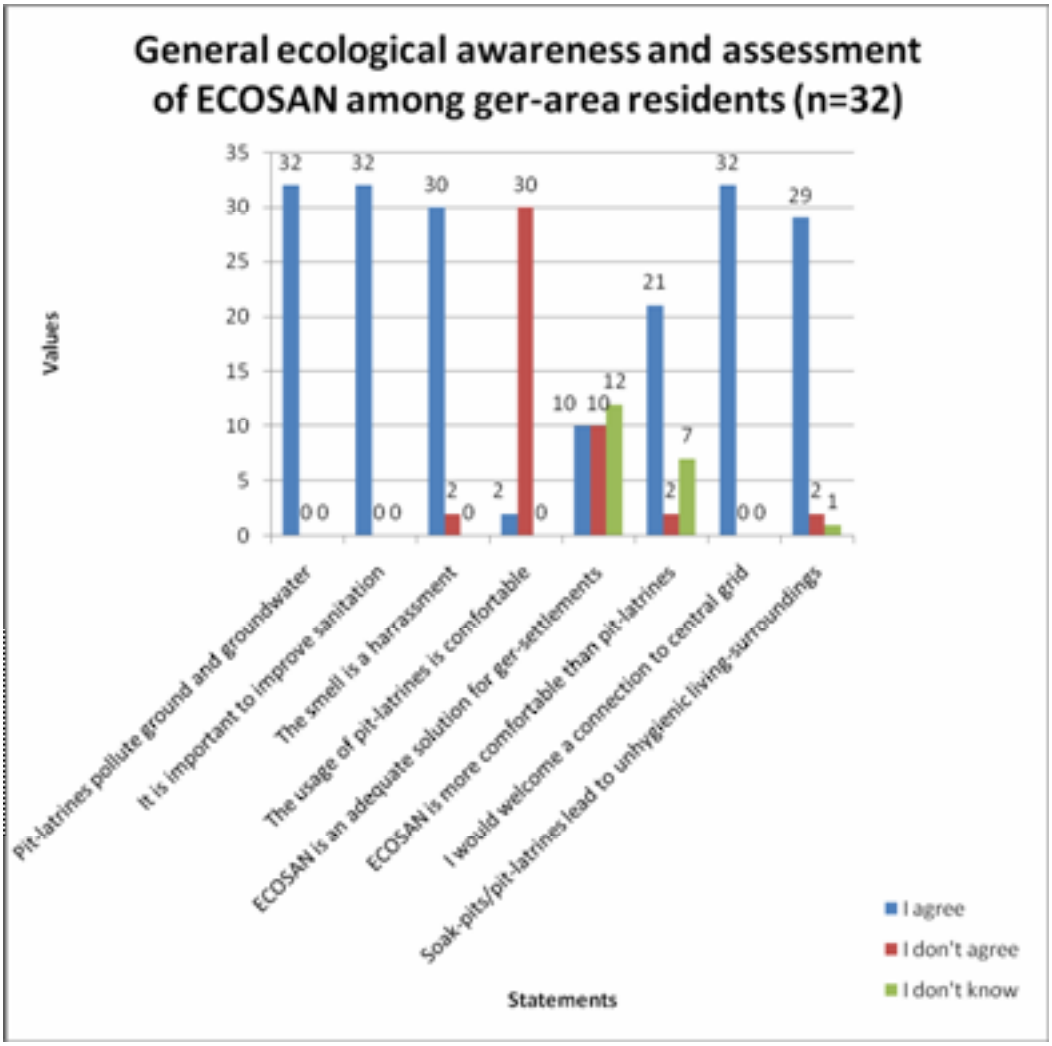

Figure 15: General ecological awareness and assessment of ECOSAN among ger-area residents

Acceptance of reuse of human excreta in agriculture

The ECOSAN-concept intends the reuse of human excreta in agriculture for 'closing the loop' between sanitation and agriculture. Hence it is important to figure out the general acceptance of human excreta as fertilizer among the target-group.

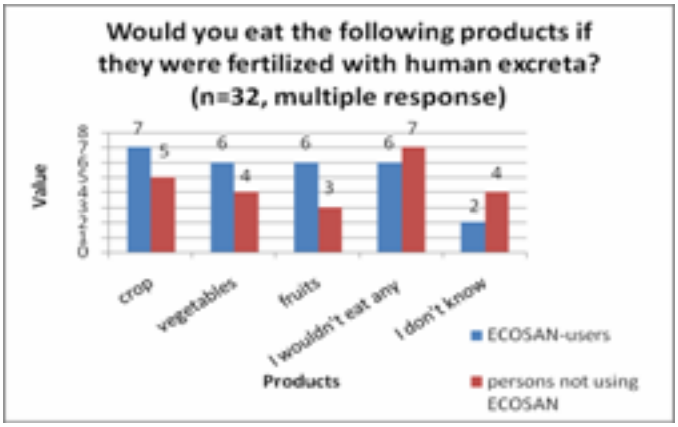

Figure 17: Possible consumption of products fertilized with human excreta.

Disposal of greywater

The ECOSAN-toilet can only be an answer to the question of disposing human feces. But the disposal of large amounts of greywater remains unsolved. As displayed in Figure 18, greywater is either filled into soak pits, into pit-latrines or it is simply disposed on the road. Even though greywater holds much less hygienic risks than blackwater, urgent attempts need to be undertaken.

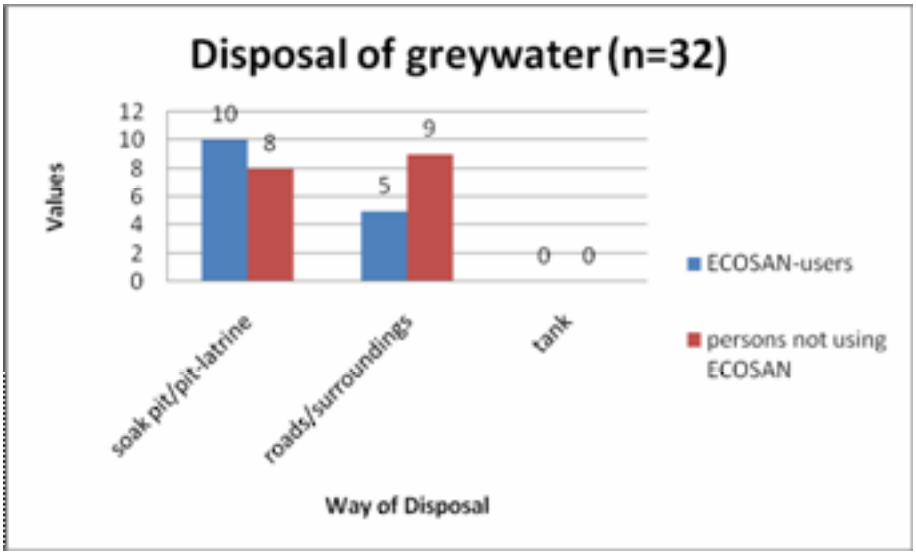

Figure 18: Disposal of greywater

Interest in purchasing ECOSAN

ECOSAN-users and persons not using ECOSAN were asked whether they were interested in purchasing an ECOSAN-toilet for the price of 690.000 MNT. Only two users said they would buy an ECOSAN-toilet, while 3 persons not using ECOSAN showed interest in buying a toilet. The majority of interviewed said they would not purchase ECOSAN for different reasons: Seven persons said they would not be willing to pay such much money for a toilet, 10 persons said they could not afford it and seven persons showed no interest in having an ECOSAN-toilet (see Figure 19). Important measurements must hence focus on further improvement of ECOSAN, a better marketing as well as make it available for the target group: A further reduction of the price and loan-facilities must be brought on the way.

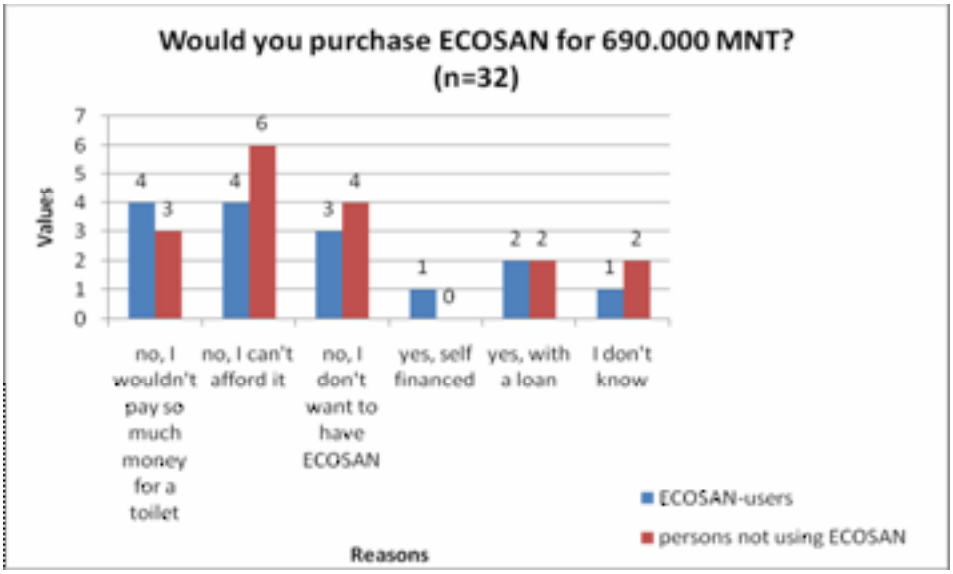

Figure 19: Interest in purchasing ECOSAN

Figure 16 demonstrates the opinion about the reuse of human excreta as fertilizer in agriculture. It is interesting to note that ECOSAN-users are not overall convinced of human fertilizer. Only five persons said they appreciated it, whereas six had hesitations. As expected, persons who do not use ECOSAN have even more hesitations. It is interesting to note that both groups mainly refer to hygienic doubts (only one person stated ethic reasons). This is a good initial position as it is expected that information campaigns about the harmlessness of human fertilizer could lead to a broader acceptance among the target groups.

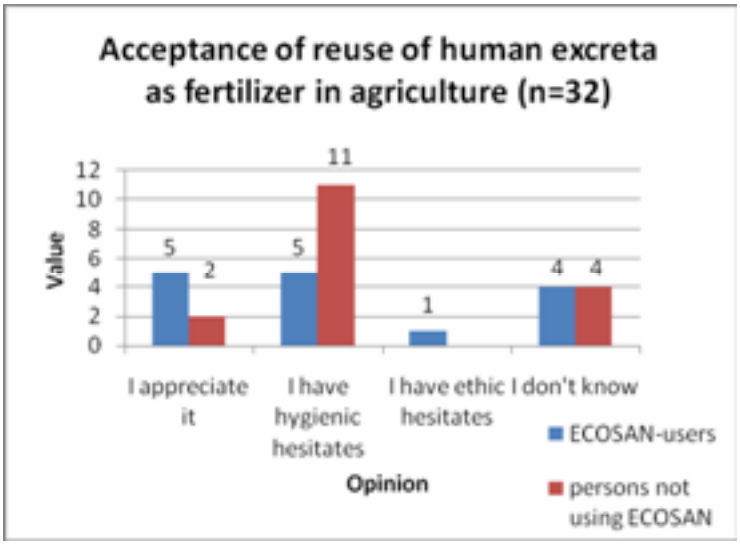

Figure 16: Acceptance of human excreta as fertilizer for food-products.

Possible consumption of food fertilized with human excreta

13 persons refused they would eat food fertilized with human excreta. 6 of them are using ECOSAN (see Figure 17). This stresses the before-mentioned scarce knowledge about the harmlessness of human fertilizer even among the ECOSAN-users.

Referring to the common practice of using human fertilizer in China and the high amount of food imported from China, several persons answered that they already eat products fertilized with human excreta. It seems that the handling of own, dried human excreta or the application on own land is an obstacle for the people.

Figure 17: Possible consumption of products fertilized with human excreta.

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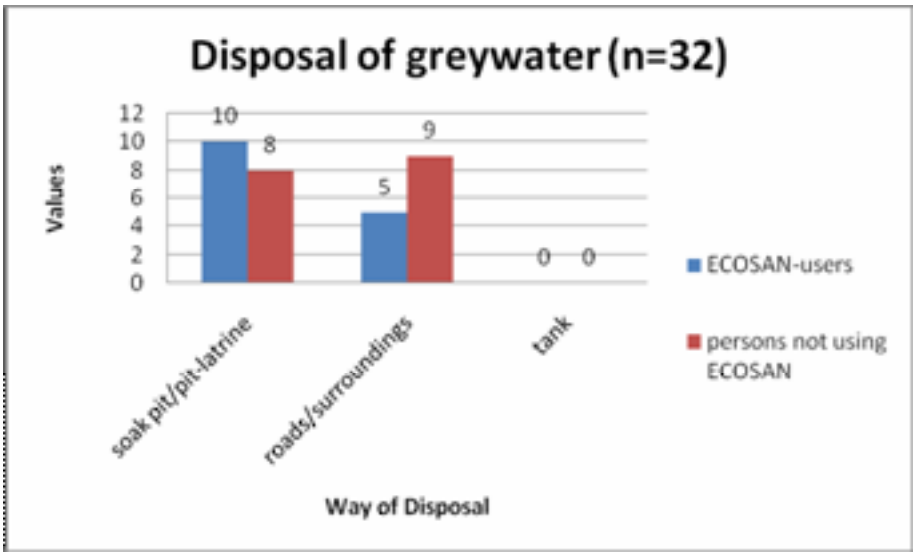

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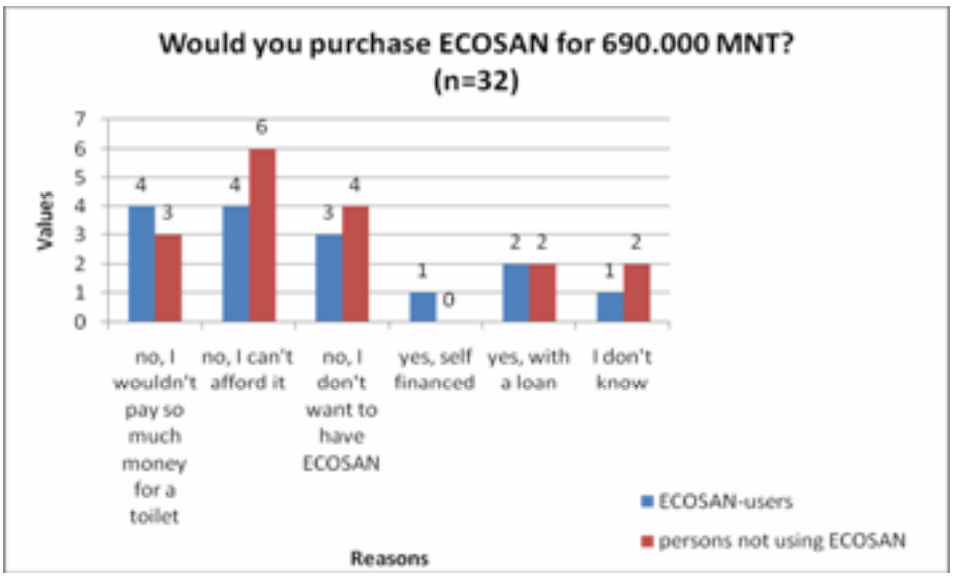

Figure 19: Interest in purchasing ECOSAN

6.4 Expert interviews

Ulaanbaatar City Government

Mr. CHIMID-OCHIR is in charge of questions about water and wastewater-management in the Ulaanbaatar City Government.

Currently, research is undertaken in order to figure out suitable solutions for different ger-areas. A main aim is the construction of a supply-water-line which serves the khudags. Wastewater-management concentrates on small sewage works, pit-latrines with a concrete basement, compost-toilets and ECOSAN-toilets. A regular withdraw by soaking should then be facilitated in cooperation with the private sector. But until today, there are no definite plans for (waste-)water management in Ulaanbaatar's ger-settlements.

Ministry of Construction and Urban Development

The interview-partner, Mrs. OYUNCHIMEG, is working in the Construction, Housing and Public Utilities Policy and Coordination Department and is in charge of questions related to sanitation.

The MCUD has recognized the urgent problems of sanitation in the countryside and urban areas. In 2006, a program for improving sanitation has been initialized. It focuses on the planning and construction of central water-supply respectively sewerage-lines, alternative toilet-solutions and small sewage works for individual families or neighborhoods. On the other hand, a law to prohibit the construction of pit-latrines which infiltrate into the ground-water is under elaboration. For the Ministry it is important to dispose of adequate and affordable solutions until the law will be launched. These concentrate on the improvement of pit-latrines, namely a concrete basement, as this seems to be the only solution affordable for the majority of ger-area residents. It is easily constructed and it would prevent any infiltration into the groundwater. A regular disposal service is already established by the Department of Water management and can be improved in cooperation with the private sector. The wastes can so far be disposed in the central sewage plant.[36] An alternative could be small sewage works for individual

[36] The Ulaanbaatar sewage plant will reach its capacity soon. However, in view of the urban-wide construction-activities, an enlargement or the construction of a second sewage-plant will be necessary in the near future.

families or neighborhoods. The advantage of shared sewage is the shared price which would reduce costs for the families.

Compost- and ECOSAN-toilets are regarded ecologically friendly and useful in general, but Mrs. OYUNCHIMEG has shown skepticism in regard to two issues: The price is almost unaffordable for the average ger-area-family and hesitations towards the reuse of human excreta as fertilizer are too high among the Mongolian society.

In 2004, the Government of Mongolia has announced to subsidize any attempts to sanitation undertaken by private businesses by giving tax credits. These tax credits shall at the same time lead to reduced prices for the end-user. But up to now, no attempts have been made by the private sector. The low engagement in this topic might be traced back to the fact that no promotion of this subsidy-program has taken place up to now. Simply-constructed pit-latrines are soon to be prohibited by law in certain areas where they cause severe pollution to the ground- and streaming-water. An according draft master-plan is under elaboration. The compliance with regulations will be controlled by an inspection-authority. But in order to launch these laws and master-plans, it is very important to coordinate the different parties involved. As long as alternative toilets are unaffordable for the target-group, no master-plans and laws can work out properly.

Ministry of Nature and Environment

Mrs. BAASANKHUU is Deputy Director of the Special Protected Area Administration Department of the Ministry of Nature and Environment. She welcomed the ECOSAN-concept especially for protected areas. If a new tourist camp shall be opened in a nature reserve, the operator must develop a business-plan which contains a strategy for water-management. So far, most tourist-camps collect their wastewater in tanks or use pit-latrines on concrete-base. Some tourist-camps have made use of alternative solutions such as compost-toilets, small sewage plants, biological addictives or ECOSAN-approaches out of own interest. Local authorities are in charge of controlling the utilization of the sanitary solutions.

The Ministry cannot provide information on reasonable sanitary alternatives. Mrs. BASANKHUU expressed a big interest to initiate cooperation with UDCP and provision of information material on ECOSAN and improved ger-stoves for dissemination among tourist-camp operators.

Ministry for Roads, Traffic and Tourism

Mrs. ENKHNASSAN, Deputy Director of the Department of Tourism, is responsible for the tourist-infrastructure and ger-camps.

So far, there are no legal standards for the opening of tourist-camps.[37] But there is a voluntary ranking initiated by the Ministry in which the tourist-camps can take part. The camps are then rated in regard to three major topics: Construction and security, health standards and sanitation, management and service.

Mongolia as a travel-destination mainly addresses ecologically conscious tourists, hence it is expected that any efforts on eco-tourism will be rewarding. The Ministry has quite a good overview on the rising request on environmentally friendly solutions for tourist-camps. In advance of the opening of a new tourist-camp, the persons in charge are requested to draw up a business-plan. The permission to run the new camp will be given by the local or Aimag[38]-authority. If the camp shall be built in a nature reserve, a permission by the Ministry for Roads, Traffic and Tourism is required.

So far, the Ministry has not figured out adequate solutions for waste- and wastewater-management. It is intended to erect a model tourist-camp with testing-purpose, where ecologically friendly sanitation and waste-management solutions shall be practically demonstrated. Further, secure and attractive construction as well as contemporary management and service shall be worked out.

Mrs. ENKHNASSAN assessed ECOSAN a suitable option for tourist-camps and requested cooperation with UDCP. In order to adapt it for tourist-camps, she recommended to develop a 'toilet-house' and a regular professional disposal-service.

Ulaanbaatar City Health Authority

Mrs. ATARMAA is Deputy Director of the Ulaanbaatar City Health Authority.

Before wastewater-management, the rise of personal hygiene is crucial for an improved living-situation in the ger-settlements, as this is the breeding ground for smear infections. Large family-sizes, low education, low access to fresh water and poor living-circumstances lead to inadequate hygiene in the ger-settlements. Infections of the

[37] As mentioned before, only tourist-camps in protected areas need to develop a business and wastewater-management plan.
[38] Aimag (mong.): Province

digestive system, mainly originating from the ger-settlements, are among the main diseases in schools and kindergartens.

Hence the improvement of hygiene is of absolute importance. A good maintenance of the simple pit-latrines can already contribute to improve hygiene, Mrs. ATARMAA explained. It is unlikely that the ger-area residents can afford alternative sanitation, hence the Ulaanbaatar Health Authority focuses on improving the existing structures. A main aim is to facilitate regular handwashing, for example before eating and after using the toilet. People need to be reminded to wash their hands. Awareness-creation campaigns are being undertaken and the Ulaanbaatar City Health Authority has recently distributed 200 sinks among ger-area-families. If a family is willing to afford the money for ECOSAN, they should get a 'complete set' with improved toilet and handwashing-facility. Mrs. ATARMAA has hence requested the installation of a simple sink into or outside the ECOSAN-toilet.

Erdenet City Government

Mrs. NARANGEREL is Urban Development Officer in Erdenet.

The City of Erdenet today faces steady population-growth as a result of rural-urban in-migration and high fertility. This is visible in the development of large ger-areas around the nucleus of the city. Erdenet disposes of a relatively well-developed urban infrastructure with 71% of the inhabitants living in apartments and only 21% living in urban ger-areas. Thereby, Erdenet is the Aimag-center with the highest rate of population in apartments with access to full utility services. Besides, ger-settlements are not connected to central water supply and sewage systems and the waste removal services are inadequate.

In the context of the 'Strategies for Secondary Cities' Project funded by Cities Alliance and implemented by Planning and Development Collaborative International (PADCO) under World Bank Contract No. 8001943, the City of Erdenet has elaborated a City Development Strategy (CDS) in which the improvement of living conditions in the ger-settlements is formulated. This includes street-lighting, pavement and water supply for the western ger-settlements.

Efforts are being made in regard to water-supply. The ger-settlements shall be connected to a central grid. It will be supplied by three water reservoirs which are to be built in the north of the city. Recently, suitable groundwater-resources are explored. Central grid-lines will be laid according to the main roads. The project is financed by

Orkhon Aimag and the ADB. Dwellers can also directly connect their khashaa to the central grid-lines, but they have to bear for the costs themselves. ADB offers loan-facilities for the dwellers.

But as soon as water-supply is improved, the water-consumption will rise, too. Regarding hygiene, this is a very positive development. At the same time, the amount of wastewater will increase, too and there are no solutions for wastewater-treatment up to now. So far, a simple concrete basement under a pit-latrine and a separate concrete basin for greywater seem the best solutions, as they are easily constructed, affordable for the target-group and prevent infiltration into the groundwater. The waste could be removed by a waste disposal service and be brought to the central sewage plant which has free capacity.

Mrs. NARANGEREL expressed doubts whether ECOSAN is the right solution for the ger-settlements. It is far too expensive and not suitable for the target-group: Large family-sizes in the ger-settlements require frequent emptying, especially of the urine-tanks. In cooperation with the private sector, the City of Erdenet is exploring suitable solutions for wastewater-treatment and welcomes the establishment of Public Private Partnerships. One idea is to share costs between the City of Erdenet and private companies: waste-workers could be trained and paid by the city, while a private company would provide the vehicles and maintenance.

7 Required improvements and recommendations

As demonstrated, ECOSAN-toilets have achieved very different results in regard to users' opinion and satisfaction. Reasons can be found in regard to constructional aspects and their adaptation to the climatic conditions of Mongolia, to the question of disposal, to the price, to cultural issues and last but not least to awareness among the people. For a successful dissemination of ECOSAN it is important to combine continuous improving of the ECOSAN-toilet itself, establish cooperation with institutions and administration, at the same time provide possibilities to regulate the disposal of the human wastes properly and to run awareness-creation- and marketing-campaigns.

Constructional improvements

Constructional improvements relate to different parts of the ECOSAN-toilet. The interviewed users all either used the first or second generation of ECOSAN. A toilet to sit on is very welcomed among the interviewed. The possibility is not only comfortable and safe in general, but meets the demands of children, elderly, disabled persons and pregnant women. At the same time, the three steps remain a hindrance especially for elder persons. During wintertime, the steps become slippery and dangerous for the users. A first improvement could be the installation of a banister. If the storage could be situated in the ground, the whole toilet could be constructed at ground level. This would contribute to a barrier-free 'design for all'.

Users have complained about the size of the containers which require regular emptying. It is suggested to create a volume of approximately 300 liters which enables to empty the canister every 3 months. The drying-process of the feces could be fastened by the alternating use of two drying meshes: One mesh is in use while the other one can be exposed to the sun.

Airing needs to be improved. Of high importance in this context is the maintenance and regular cleaning of the toilet's interior by the users. But even in a very proper ECOSAN, the summer-heat develops harassing smells.

As mentioned earlier, improved sanitation must go along with elementary personal hygienic behavior. The installation of an ordinary water-sink could very easily contribute to an improved hygienic situation among the ger-area residents. Personal hygiene implies washing hands after having been to the toilet. Only if the opportunity to wash hands is given on spot, people will develop the habit of washing hands.

A participatory approach to improve ECOSAN should be considered. It should address ger-area residents, tourist-camp operators, producers and experts.

Cooperation with institutions and private sector

The introduction of a new concept such as ECOSAN cannot and shall not be solved by a comparably small program alone. If institutions, administration and the private sector favor the ECOSAN-concept, they should cooperate to bring up entire production- and marketing-concepts.

Legal framework

As long as environmentally friendly and hygienic sanitation is not prescribed by law, there is only little cause to consider alternatives to their reasonable pit-latrines for the target-group.

In order to improve sanitation in Mongolia, it is necessary to make adequate sanitation obligatory by law. Particularly the City of Ulaanbaatar should consider the prohibition of pit-latrines in the ger-settlements and in the summerhouse-areas. As long as pit-latrines remain a legal and cheap solution, the majority of the people will not purchase a more costly toilet. In coordination with the legal framework, above-mentioned subsidy-programs must be brought on the way.

Service improvements

The results of the survey have shown that in seven cases, the ECOSAN-toilet was not used at all. Some people said they had used their toilet until it was full and did not know where to put the feces. Others had not tried the toilet once. The question of excreta-disposal is the crucial point. If users do not know where to dispose the excreta, they cannot and will not use ECOSAN. Many households throw the excreta into their old pit-latrines in lack of agricultural land or due to hygienic hesitations. They also put their greywater into the pits or on the road. It is crucial to work out 'tailor-made', holistic sanitation concepts which also consider the disposal of greywater.

The installation of a regular disposal-service could highly contribute to a broader acceptance of the ECOSAN-toilet, as the users wouldn't have to handle their own feces. The transmission of diseases would further be reduced if treating excreta was done professionally. Last but not least, the installation of a disposal-service would create new labor opportunities and support the development of small and medium enterprises. Here, the cooperation with institutions and municipal administrations is urgently required. It could also be done in form of a Public Private Partnership with costs shared between the administration and the private company.

Subsidy-program

A crucial point in disseminating the ECOSAN-toilet is the price, which recently amounts to 690.000 MNT (600 USD). The target-groups, especially the inhabitants of the ger-settlements, can hardly afford this amount of money. It is urgently required to

bring subsidy-programs on the way in cooperation with the administration and the private sector. These could be embedded into other subsidy-approaches for the development of the ger-settlements.

Awareness creation and maintenance

Even though people recognize the pollution of their surroundings and mention the pit-latrines as being a danger for the ground-water-resources, they lack information on alternative solutions in general or they do not know whom to address with their evoking questions.

It is important to bring information-campaigns on the way. The first step must be to inform about the necessity for alternative sanitation. Broadcasting on radio, TV and newspaper-articles as well as information-brochures are useful instruments.

The second step must be to provide a contact point for interested persons where they are individually advised in any questions about construction, purchase, possibilities of subsidies and disposal of excreta. The question of disposal should urgently be solved individually in advance of the construction!

The results of this study have shown that supervision is needed even after the installation of the toilet. The contact point should further be available as an advisory service for ECOSAN-users.

ECOSAN for tourist-camps or institutions

Experiences from other countries have shown that ECOSAN is a reasonable option as an institutional toilet.

In order to make ECOSAN an alternative to public pit-latrines in schools, summer-houses, tourist camps or health centers, certain adaptations need to be undertaken. A 'toilet-house' with several ECOSAN-toilets and large canister-sizes will be required. Sinks should be installed inside the 'toilet-house' or at least very close-by. Maintenance and disposal must be dealt with by well-trained and equipped professionals. To make ECOSAN a clean, convenient and environmentally friendly solution, a social sense of responsibility in regard to maintaining a toilet must be taught among the users as well.

Marketing

Right from the beginning, the ECOSAN-marketing has concentrated on the ecological friendliness of the concept. But people are motivated by other reasons than health or environmental friendliness. For them, no smell, safety, security, comfort, privacy, convenience and a minimum handling of excreta are motivating factors. Marketing should utilize the big advantage, the user-comfort ECOSAN offers, to promote ECOSAN in Mongolia. This means that marketing for ECOSAN should not be different than for any other product: it should promote that the users have personal advantage when they use the product. A recommendation would be to market ecological sanitation through its social advantages and convenient usage rather than through its ecological friendliness and reuse-options; especially the latter might rather lead to deterrance.

It might be useful to distinguish between two groups addressed: Ger-area residents and tourist-camp operators. The first are mainly interested in a comfortable toilet. Tourist-camp operators are also interested to offer their guests comfortable toilets, but they also need to provide ecologically friendly sanitation, especially in protected areas. Marketing for ger-area residents should hence focus on the convenience of the toilet, while marketing for tourist-camp operators should combine user-friendliness and ecological harmlessness.

Nevertheless, it should be the aim to enable people to choose a technology, not to tell them what they should accept.

8 Conclusion and future prospects

The results of this study demonstrate that up to now the ECOSAN-concept could not reach a broader acceptance among the target-groups in Mongolia. The UDCP-Team has continuously improved the ECOSAN-toilet, but several problems could not be solved and it would be rather resource- and cost-intensive to continue the work on improvements. Additionally, it will be very difficult to realize the underlying concept of ECOSAN. The request by the target-group remains consequently low.

It has to be doubted that the ECOSAN-concept can actually work out successfully in Mongolia. It is based upon the idea to 'close the loop' between sanitation and agriculture. However, farming is rather underrepresented in national agriculture. It takes place in large distance of the Capital City, the potential main producer of human fertilizer. Whether ecologically and economically sustainable solutions for transport can be established, appears to be questionable.

Sanitation does not only relate to human feces, but also to greywater – which remains unconsidered in the ECOSAN-concept for Mongolia. However, an adapted, hygienic sanitation-concept urgently has to regard all wastewaters and follow a holistic approach.

The experiences of the UDCP-team and the results of this study lead to the conclusion that in the majority of cases, ECOSAN is not a suitable solution. UDCP will consequently end its efforts for further adaptation of ECOSAN. On individual request, the UDCP-team will design holistic utilization- and disposal-concepts in close cooperation with the users.

This decision illustrates that many obstacles remain when trying to find adequate solutions for the Mongolian ger-settlements and tourist-camps. It also underlines that sanitary provision and disposal must never separately be considered. This should urgently be kept in mind when countrywide several ger-settlements will be connected to central water-supply within the next years. Supply always results in the question of disposal!

The UDCP-Team has revived the idea of designing a new bathing house or rehabilitating an old bathing house in the ger-settlements. Concepts will be elaborated in cooperation with the operator and the local users. These naturally include intensive market-analysis to figure out the economical profitability and potential request by the target-groups.

Due to the implementation of the 'Mongolian-German ECO-City' and the rehabilitation of a pre-cast panel building in Ulaanbaatar, UDCP disposes of best experience and practice in the application of energy-efficient and environmentally friendly technologies (solar energy, membrane-technology).

A pilot bathing house with clean sanitary facilities, energy-efficient, ecologically and hygienically friendly water-supply and –disposal and with associated services (hairdresser, launderette, internet café, etc.) can certainly contribute much better to the sustainable development of the Mongolian ger-settlements and their inhabitants than a well-intentioned, but not appropriate sanitation-concept.

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Mrs. BASANKHUU	Ministry for Nature and Environment	August 28th, 2008
Mr. CHIMID-OCHIR	Ulaanbaatar City Government	August 20th, 2008
Mrs. ENKHNASSAN	Ministry for Roads, Traffic and Tourism	August 25th, 2008
Mrs. NARANGEREL	Urban Development Officer, Erdenet	July 18th, 2008
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