

Women in Europe for a Common Future



From pit latrine to ecological toilet

Results of a survey on dry urine diverting
school toilets and pit latrines in
Garla Mare, Romania
Experience and Acceptance

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Content

Summary	7
Acknowledgements	8
Introduction	9
1. Sanitation in the project area	10
1.1 Sanitation in Europe and Romania	10
1.2 Sanitation in Garla Mare	10
2. Exploring sanitation	11
3. Ecosan in Garla Mare: Project Description	14
4. Education and sanitation: How can education help?	16
5. Gender and sanitation	17
6. Methods of research	18
7. Results: Experiences and opinions of the ecosan users	19
7.1 Students about their ecosan school toilets.	19
7.2 Teachers	22
7.3 Ecosan caretaker	22
7.4 Citizens of Garla Mare on ecosan toilets	23
8. Conclusions and recommendations	27
Annex	30
Annex 1.	30
Annex 2	32
Annex 3	35
Annex 4	37

Summary

Inadequate sanitation causes negative effects on both public health and the environment. Diseases transmitted by the faecal-oral route threaten in particular children at a young age. Unsafe drinking water and lack of hygienic sanitation are resulting in several intestinal diseases like diarrhoea or typhoid fever.

To improve the sanitary conditions, to prevent infection and the pollution of groundwater, dry urine diverting toilets were built at a primary school in Garla Mare, Romania.

A users survey of this project and the ecosan toilets turned out to be positive: Pupils and teachers are content with the ecosan toilets and find them easy to use and clean. The proper use of the ecosan toilet by the pupils shows that ecosan toilets can be implemented at schools with young children. Typical problems found with a pit latrine, such as flies and bad odours, are virtually non-existent in the new toilet room. After one year of experience with the ecosan toilets, a majority of the pupils would prefer an ecosan toilet at their school and home.

Most people prefer a toilet outside of the house or school due to the bad odours they have experienced with pit latrines. Although, ecosan toilets can be built indoors, and do not have an odour problem, the citizens don't have the financial means to invest in a better sanitation system for their homes.

Half of the interviewed citizens of Garla Mare were willing to use urine and composted faeces as a fertiliser in their fields and gardens. However, they would prefer only to use it in their fields rather than in their gardens. They would also be more willing to use urine as a fertiliser than they would composted faeces. These citizens think their gardens will benefit from the use of sanitized human waste.

More education about the ecosan toilet is needed in the community. Although half of the respondents considers ecosan toilets environmental friendly, a fair amount of people consider the water flush toilet the best solution for the environment. In addition to that, nobody mentions the lack of hygiene or the pollution to the groundwater, which is caused by the pit latrines. Although an ecosan toilet can solve problems like bad odours, flies and poor hygiene, people still think the best place for an ecosan toilet is outside. Education on the advantages of an ecosan toilet might also increase the interest in having a comfortable, clean and safe toilet in their homes.

Women are an important key factor in the successful implementation of ecosan toilets, since it are women who teach their children about hygiene, and women who would benefit most from improved sanitation inside the house. In addition, the interviewed women prefer ecosan toilets above water flush toilets and are more willing to use the composted excrements in their fields.

Acknowledgements

We would like to sincerely thank Claudia Tulei from Garla Mare, who supported this survey with engagement, patience and enthusiasm. We would also like to thank all of the people interviewed for their kindness and willingness to share very personal information about sanitary conditions and their insights on this topic.

WECF did not accomplish the pilot on ecological sanitation in Garla Mare alone. Together with the Romania partner, Medium et Sanitas (M&S), this project was carried out during a two-year multi-stakeholder project from November 2001 to February 2004. Thanks to the financial support of the MATRA program of the Dutch Ministry of Foreign Affairs, there is a better and healthier sanitation system at the primary school in Garla Mare. Finally, we would like to thank the Institute of Wastewater Management Hamburg University of Technology, Germany (TUHH) and Stefan Deegener (TUHH) for their technical support.

Introduction

Environmental sanitation means keeping the surroundings clean and safe and preventing pollution, for example, by the proper treatment and disposal of human waste. Ecological sanitation (also called 'ecosan') is structured on recycling principles that keep the eco-cycle in the sanitation process closed. This system uses human excreta as a resource: human waste is processed on site until they are free of pathogenic (disease-causing) organisms. After this process, the sanitised excreta can be used for agricultural purposes. The use of this method is not new; in China for instance it has been used for thousands of years. It is important that these principles are not regarded as a second-rate solution for less developed or developing countries. Ecosan principles can be applied across a range of socio-economic conditions.

The goal of this report is to evaluate the experiences with, and the acceptance of, an ecological sanitation system built for a primary school in Garla Mare, Romania. WECF, and its Romanian partner Medium et Sanitas (M&S), built dry urine diverting toilets in this village in 2003, based on the principles of ecological sanitation. The Technical University of Hamburg Harburg (TUHH) provided technical support. Deficient sanitation has a severe impact on the health of children. This is why they deserve extra attention and education about the new sanitation system and proper hygiene in their school and at home. The experience and opinions of the users of the ecological sanitation are of great importance since they experience the advantages and disadvantages at a daily basis. The success of this project depends to a great extent on their willingness to use the ecosan toilets and whether they perceive the toilets as comfortable and useful. In addition the survey should give insight into the current situation (the use of pit latrines) and the preferences to different sanitation systems. Other issues that will be addressed are the willingness or the ability of citizens to invest in ecological sanitation and use the sanitised excreta on their fields.

Garla Mare has no central drinking water or sewerage system. Its 3500 citizens rely on groundwater for drinking water, which is extremely polluted with nitrate and faecal bacteria. This pollution is, amongst others things, caused by the use of pit latrines nearby water wells. Dry urine diverting double vault toilets were constructed in order to show how to improve sanitation, to improve the health of the children in the primary school *and* to protect ground water against infiltration of human waste in an affordable way.

A year after the implementation of the ecosan system, WECF went back to the project site for evaluation. The results are written down in this report. In Chapter 2 we will describe different sanitation systems, with the emphasis on ecological sanitation, to illustrate the reasons for selecting this particular system. In Chapter 3 and 4 we will explore the sanitary situation in Garla Mare, to provide a framework in which the project can be placed. Chapter 5 refers to the relation of gender and sanitation and chapter 6 and 7 contains the survey results and evaluation of the ecosan project in Garla Mare.

More detailed information about the MATRA project in Garla Mare, as well as the economical, social and environmental circumstances in the area, can be found in the reports on our website: <http://www.wecf.de/cms/projects/romania.php> and http://www.wecf.de/cms/projects/ro_garlamare.php

1. Sanitation in the project area

1.1 Sanitation in Europe and Romania

In the WHO European Region¹, 120 million people do not have access to safe drinking water, and even more lack access to proper sanitation, resulting in diseases transmitted by the so-called faecal-oral transmission routes: diarrhoea, hepatitis A, dysentery, cholera, typhoid and skin diseases. The consequences of inadequate sanitation and hygiene have been recognised as a primary concern throughout the European Region. Better management of water and sanitation would prevent over 30 million cases of waterborne diseases per year in the region (WHO, 2005)².

In Romania there is no proper environmental protection management to protect groundwater from pollution from latrines and solid waste, nor is there a proper wastewater management system. Poor sanitary conditions and mismanagement of human waste causes ground and surface water pollution with nitrates faecal matter and bacteria. The health effects of this pollution are both long term (thyroid dysfunction) and immediate (blue baby disease, diarrhoea, parasites diseases) and can affect the whole population, but babies, children and elderly have a higher risk.

In the rural areas of Romania, 7 million people depend mainly on private wells for their drinking water. As a sanitation system, people in rural areas use conventional pit latrines that are placed in their yards. The pit latrines that are used are not hygienic. Hand washing is extremely important, but with a lack of running water not always practised. In addition to that, latrines attract flies that spread dysentery, cholera, typhoid and diarrhoea³. In Romania more than 10 million people lack adequate sanitation⁴

1.2 Sanitation in Garla Mare

The village Garla Mare has no central drinking or sewage system for its 3,500 inhabitants. People rely on extremely polluted groundwater; a high concentration of nitrate and faecal bacteria was detected in this water. Households have latrines in their yard, which are considered a source of pollution for the groundwater (see Fig. 1). The latrines, for the most part, are not adequately sealed and emptied.

In the school where the new toilets were built, students used to use pit latrines located in the schoolyard for their sanitary needs. Because of the way the floor was constructed, rain and

¹ *The Member States of the WHO European Region are: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, the Netherlands, Norway, Poland, Portugal, the Republic of Moldova, Romania, the Russian Federation, San Marino, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, the United Kingdom and Uzbekistan.*

² *WHO Press Release EURO/05/05 Copenhagen, Rome, 21 March 2005*

³ *National integrated pest network, Public Health Pest Control, Public-Health Pesticide Applicator Training Manual for the USA and its Territories, 2005.*

⁴ <http://www.wateraid.org.uk/documents/StateOfWorldToilets.pdf>

wastewater formed water pools in and around the latrines. The latrines were often so dirty that some students decided to use the field behind the school to defecate. There was also no place for them to wash their hands after toilet use. For drinking purposes, the students of the primary school usually brought drinking water from their home.



Fig.1 The latrines in Garla Mare are mostly not sealed and thus leaking nitrates and bacteria in the soil and groundwater (Source WECF)

2. Exploring sanitation

In order to improve the situation of sanitation in Garla Mare several options were considered:

- Improving existing latrines.
- Installing septic tanks.
- Providing water flush toilets.
- Building dry urine diverting toilets.

These different options will be discussed in the section below in the same order.

Improving the existing latrines would mean having to build in the latrine pits with waterproof floor and walls. This could protect the groundwater from pollution with nitrates and faecal bacteria. The problem is that the human waste in the latrines has to be removed when the latrine is full. This is not safe because it has not been composted in the proper way and contains pathogens. Removing, transporting and disposing of primary human waste involve health risks. The human waste cannot be reused and pollutes landfills and groundwater.

As shown in Fig. 2, a septic tank consists of one tank that holds the solid particles and another tank from which the water content is drained into the soil. Unfortunately, nitrates are highly soluble in water and disperse in the groundwater. Existing septic tanks in Romania and in other countries show that when emptying is not done in time, the tanks flow over and pollute both the surface and ground water. People solve this problem by making holes in the septic tank. The remaining sludge cannot be reused and is land filled.

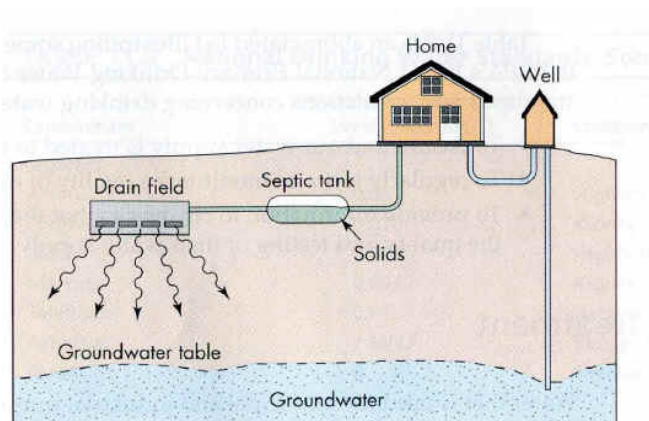


Fig. 2 Septic tanks disperse nitrates and faecal bacteria in the soil and ground water

Providing water flush toilets in Garla Mare would mean constructing a (drinking) water system and a wastewater management system consisting of sewage pipes and a wastewater treatment plant. In small rural villages like Garla Mare there is not enough money or expertise for building and maintaining such a system. The local water authorities would have to research whether there would be enough groundwater for sustaining water flush toilets in Garla Mare. Otherwise the fields would suffer from decreasing groundwater levels. Water from the Danube could also be used, but industrial activities and improper wastewater management in Romania and other countries affect the quality of this water. The use of such water demands high investment costs. The sludge from the wastewater treatment plant would not be able to be reused safely since it wouldn't be sanitised properly and eventually substances added for cleaning the wastewater would pollute the sludge as well.

The above mentioned options cannot be considered sustainable options since they contaminate the environment with nutrients and pathogens. Furthermore, these systems produce waste instead of recyclable nutrients for the food chain.

Building double vault dry urine diverting sanitation (referred to as 'ecosan toilets' in this survey), see design fig. 3. in Garla Mare provides advantages that the other systems do not provide.

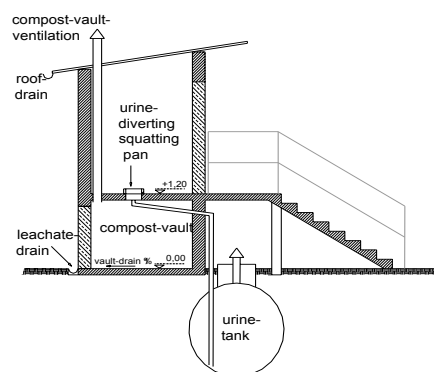


Fig. 3 Schematic cross-section of school toilet facility. Garla Mare (Source: S. Deegener, TUHH)

By using urine diverting seats or slabs, nitrogen rich urine and pathogenic holding faeces are diverted and stored separately, so that the urine is not contaminated by faecal bacteria. The urine from healthy people is free of pathogens from the start and can be reused as fertiliser. For public toilets, storage of urine is recommended for at least 6 months, which removes eventually low concentrations of micro organisms. The faeces are covered with soil and ashes or lime; this causes a dry alkaline environment where bacteria will cease to exist. The dried faeces form a small amount of solid waste (ca. 50 kg per person per year) and can be reused if treated properly. After one year, the faeces chamber will be replaced by an empty one. The full chamber will be left resting for one more year before emptying.

The use of the sanitised excrement is still being discussed. During the composting process not all micro organisms are killed and remnants of medication might reduce the quality of the compost and urine.

Guidelines on the safe use of urine and faeces are published by EcoSanRes⁵, in addition the World Health Organisation (WHO) will publish guidelines on the safe use of human excrement in agriculture in mitt 2006.

The ecosan system does not require water for flushing and the disposal of human waste is safe and can be reused on agricultural crops or in horticulture. The system is also easy to build and inexpensive. It can be built outside in a yard, but also inside a house. An excellent organic fertiliser and soil conditioner is obtained, and nutrients are reused in the food chain (see fig. 4.).

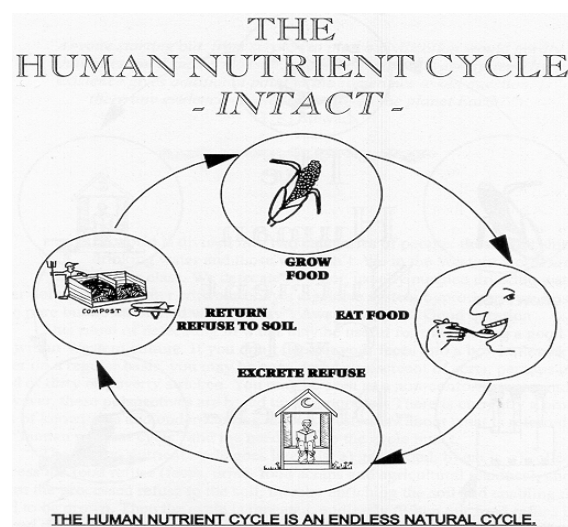


Fig. 4 Human waste is reused in the food chain

We can conclude from the above analysis of various sanitation systems and by taking the current situation in the project area into consideration that the implementation of an ecosan system would be the best option to improve the sanitary conditions in Garla Mare in the short term.

Since children suffer from waterborne diseases the most, it was decided to implement an ecosan system at a primary school in Garla Mare. The project has provided an adequate low-cost solution to the sanitation system problem by installing double vault dry urine diverting toilets in the school.

⁵ www.ecosanres.org

3. Ecosan in Garla Mare: Project Description

The practical implementation of the ecosan will be described in the following paragraphs.

Approximately 200 pupils between the ages of 6-11, attend the school five days a week from 9:00 am until 1:00 pm. To provide enough facilities for this amount of pupils, 4 double vault urine diverting toilets and 3 waterless urinals were installed in a new toilet building in the schoolyard. Because of hygienic reasons, urine diverting squatting slabs were chosen (see Fig. 5).

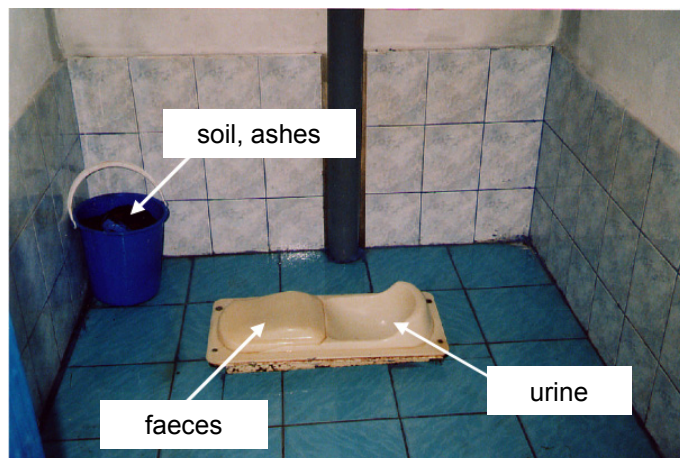


Fig. 5 Design of the interior of the ecosan toilet in Garla Mare (Source WEFC)

The urine and faeces are diverted, stored, and treated separately to eliminate pathogens. For each toilet there are two easily accessible faecal composting-chambers (vaults) with a sealed floor. One chamber will be used for approx. 1 year and then allowed to rest for one year while the other chamber is being used. For the proper function of the dry urine diverting toilets, the user has to add a cup of dry mixture consisting of soil and ashes, lime or wood dust after defecation. Ventilation pipes with fly nets were installed from the composting-chambers reaching to above the roof. These two measures prevent bad odours, the attraction of flies and improve the composting process. The composted faeces will be used as soil conditioner after a storage/composting time of at least 2 years.

The urine from the separation toilets and the waterless urinals is collected in a urine tank. This urine tank is divided into two chambers of 3m³ each. The two compartments are, similar to the composting chambers, necessary for the resting time in which many pathogens are killed or at least reduced. The urine is stored for 6 months in a reservoir that is buried under the soil before it is used as a fertiliser (see fig. 6).



Fig. 6 Front: Urine reservoirs buried under the soil (Source WECF).

One citizen of Garla Mare was contracted to maintain the toilets for the next 5 years. He will clean the toilets daily and supervise the compost chamber and urine reservoirs. The Technical University of Hamburg and WECF continued with observing and controlling the ecosan toilets in the school after the end of the project as well. Stored urine and faeces samples were taken to analyse the concentration of the nutrients and bacteria. Until now the results show that in stored urine and faeces the bacteria concentration are low and that it is safe to use them for fertiliser and for agricultural crops.

To incorporate proper hygiene and hygiene education into this sanitation project, water taps were installed in the school, linked to a well and pump. The use of ecosan toilet facilities by the pupils and the teachers of the primary school started in November 2004 (see fig.7). For teachers, parents and children, workshops about the proper use and maintenance of the ecosan toilets were organised during that time. Education material have also been published to explain the benefits of the dry toilets and how to use and build them (for private families).

After one year of using the ecosan toilets, WECF conducted an evaluation that will be presented in the next few chapters.



Fig. 7 Opening ceremony of the ecosan toilets in Garla Mare (Source WECF).

4. Education and sanitation: How can education help?

To illustrate the importance of education in ecological sanitation there are several lessons that can be learned from other projects. The problems that occurred after these projects were implemented show why education, like in any development project, is absolutely crucial. For instance, an interesting lesson can be learned from the three year Swiss-Indian collaboration with an ecosan, separation toilet in a slum in Bangalore. After more than three years of operation of the nutrient transport scheme and the composting facility, many recommendations are no longer strictly adhered to. The workers' motivation and awareness of their own role as nutrient managers had faded away. Without the proper sense for horticulture, agriculture and nutrient management, it was sometimes easier to dump a whole drum of urine at the foot of one single banana tree instead of storing and “managing” the nutrients (IRC, 2005)⁶.

It is therefore not only important to give enough information on *how*, but to put as much emphasis on *why* as well. The positive consequences of ecosan are not only the availability of a functioning toilet, but also the reduction of waterborne diseases, the availability of water for drinking instead of flushing it down a toilet and the recycling of nutrients. The educational approach should be as holistic as possible and include sanitation as a part of the ecological cycle and such themes as hygiene during toilet use, food preparation, and while working with animals on the fields.

Unfortunately, the outcome of the Indian project described above, is the fate of many development programs. This is also the reason why WECF stays active in the project area and is developing a long-term education program to keep the people who are involved motivated.

WECF recognises the crucial role children play in sanitation and their vulnerability to hygiene and sanitary related diseases. One of the places where WECF started education is in the schools (see fig. 8) This includes providing facilities that are needed for sanitation and providing education in hand washing and the importance of hygiene in general. Education on the cycle of nutrients can be incorporated as well. The children can share their new knowledge, skills and improved attitudes at home and use it when they become parents themselves.



Fig.8 Education at school(Source WECF).

⁶ Baier, U. & Baumeyer, A. When Indian Ecology meets Swiss Engineering: Lessons learnt from Ecosan in Rajendra Nagar slum Bangalore, in: *EcoEng Newsletter No 11*. 2005, Waedenswil.

5. Gender and sanitation

In sanitation both physical and gender differences between men and women are of importance. (When we refer to gender differences, we mean the social and cultural differences between the sexes.)

Physical characteristics make a difference in the sanitary habits of men and women. While a man can stand during urination, a woman has to squat or sit. This can lead to different demands when it comes to sanitation. Because of the physical differences, women are, in general, more concerned with the hygienic conditions of the toilet. Women are also more vulnerable to the unhygienic conditions during their monthly periods, during and after pregnancy.

The gender topic is more variable and complex. Gender and sanitation issues differ between countries, culture, religion or socio-economic class. In some countries, privacy and protection of girls and women while using sanitation facilities might be the greatest concern; in other countries, the unequal distribution of work related to sanitation (disposing of human waste, collecting water for hand washing) might be an issue. A proper sanitation facility in a school can even reduce inequalities between the sexes: girls become more equal because they no longer have to walk far and drop out of school for lack of proper sanitation (Westerhof, 2005)⁷.

Gender is important to consider, not only when we think in terms of the user, but equally in the case of the construction, implementation, development, financing and maintenance of sanitation systems. With small scale projects, the citizens are usually both the users of the toilet and the implementers, financiers, maintainers etc. To meet the needs of both men and women, both parties should be involved in the processes mentioned above, otherwise a lack of motivation of either one of the sexes can make a project fail.

Not only do the needs and the level of involvement of men and women differ, but practical experiences and the knowledge about water sources and water use differ as well. In most developing countries, women are usually the ones who are occupied with the tasks of water fetching and sanitation. In general women are still the primary caretakers of their children. This has several consequences: first of all, women are the main educators of their children when it comes to sanitation and hygiene. Secondly, women have to toilet-train and help their children during toilet use, which could influence their demands about whether the toilet should be inside or outside the home. Thirdly, women are very close to their offspring: (waterborne) diseases caused by improper sanitation or hygiene that can harm or even kill their child are felt most by them as the primary caretakers. Finally, women are often the ones concerned with all tasks related to domestic (human) waste, water and food. All these are very closely related to sanitation and hygiene. Last, but not least, when it is the goal to involve women in a sanitation program it is important to keep in mind that they usually have a less flexible schedule than men because of their responsibilities towards their children. Meetings and educational programs should be scheduled with that responsibility and restriction in mind.

All the factors mentioned above show that there should be special attention paid to both men and women and their special needs and attitudes. Being a women's organisation, WECF looked closely at the specific opinions and attitudes of both sexes during the survey in the project area.

⁷Westerhof, B. *Sanitation and Gender: A Gender approach for effectiveness and equality*, IRC, Delft, 2005

6. Methods of research

After the villagers had one year of experience with the ecosan toilets, WECF carried out a survey on the toilets among the villagers, teachers, pupils at the school and the caretaker of the primary school.

Those interviewed were:

- 8 seven-year-old children from class 1 of the primary school: four girls, four boys.
- 7 eight-year-old children from class 2 of the primary school: four girls, three boys.
- 8 nine-year-old children from class 3 of the primary school: five girls, three boys.
- 8 ten-year-old children from class 4 of the primary school: four girls, four boys.
- 4 teachers from the school.
- 21 female citizens with ages ranging from 22 to 79 were interviewed in their homes.
- 19 male citizens with ages ranging from 24 to 69 were interviewed in their homes.

The citizens were sampled by randomly choosing a house in every neighbourhood. The person interviewed in the household was selected by age so that various ages would be represented in the survey. Everybody was interviewed with a questionnaire at hand. The questionnaire had fixed answers and possibilities for remarks on the subject mentioned. (See annex 1, 2, 3, 4)

The interviewer is the head of a newly found non-governmental organisation for environmental protection. She visited the children at school and the citizens at their homes. When needed, she explained the principles of the ecosan toilets at the primary school to citizens.. She then translated the answers into English and send them to WECF for further investigation.

Most figures are given as percentages; this is done for a better overview. Given the small sample size, we can only conclude about general trends.

7. Results: Experiences and opinions of the ecosan users

Below are the results of the survey held in Garla Mare among users of the ecosan school toilets. The following questions and more will be answered in this chapter: Were the school children willing to use the new toilets? Did they prefer them over the ones they had at home? Are citizens willing to use the sanitised human waste as fertiliser on their land? Were the teachers satisfied with the results of the project?

7.1 Students about their ecosan school toilets.

Use and design

All 31 of the children interviewed had a conventional pit latrine at home. After their experience with the new ecosan toilet at the school, the majority of the children would now prefer this type of toilet over the pit latrine they have at home (see fig. 9). When asked about the toilets, the children tended to mention the beauty and the cleanliness of the ecosan toilets. The girls put the emphasis on the absence of bad odours; the boys emphasised the ease in using them.

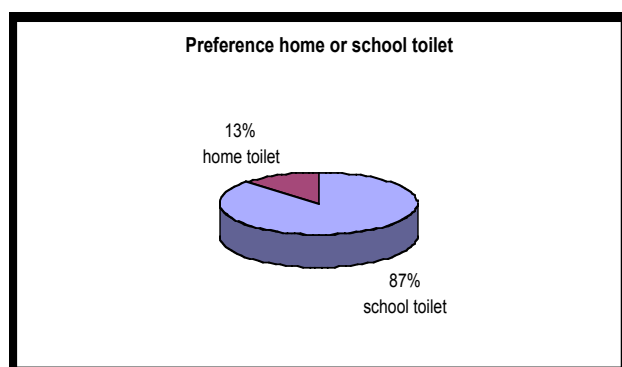


Fig. 9 School children preference of home or school toilets

The survey revealed that the teachers instructed 80% of the students on the use of the ecosan toilets. However, in some classes children were not instructed. Apparently this topic is not one that is discussed amongst friends because none of the children reported discussing how to use the toilets with friends.

All of the children surveyed use the school toilets daily or weekly: 73% use the school toilet daily for urine and 65% daily for defecation. The girls tended to use the toilets slightly more often than the boys.

Almost all of the children (94%) find the ecosan toilets easy and pleasant to use. Only 6% of the children said the toilets are complicated or unpleasant (see fig. 10). The children also like the design of the toilets. Almost all of the children (90%) also agreed that there is always enough material (a mixture of soil and ashes) available to cover the faeces, while 10% said there is enough material most of the time.

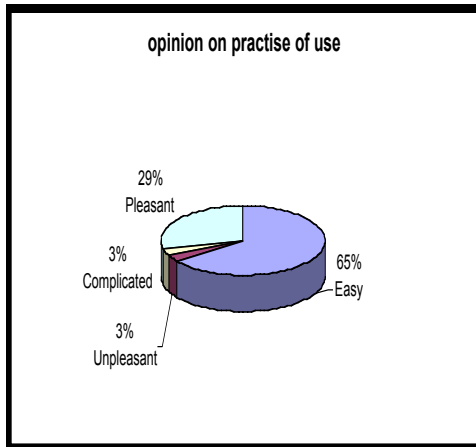


Fig.10 Children's opinion on the practise of use

Complaints on flies, odour and cleanliness

While flies are a problem in and around the conventional pit latrines, the dry diverting toilets do not have this problem. Only 3% of the children complained about a weekly appearance of flies, 3% do not know if flies are a problem and 94% of the children never see flies in or around the urine diverting toilets (see fig.11).

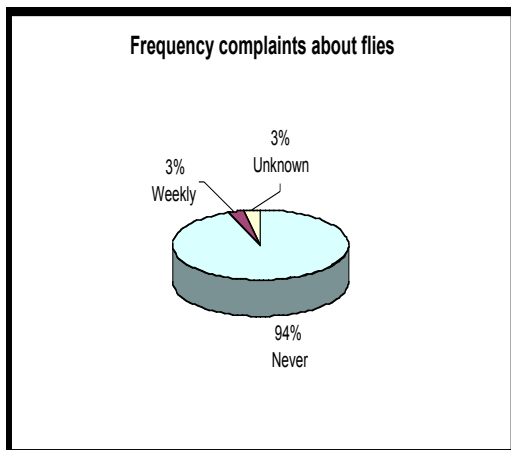


Fig. 11 Frequency of children's complaints about flies

Before the survey was held, nobody complained about bad odours. Although the majority of students (66%) never had complaints, 3% were bothered monthly by bad smells, 13% weekly and 16% daily. The results of the survey did reveal that odour was a problem in the boys' toilet room. This odour problem is now solved. The conventional designed urinal bowls, located in the boy's bathroom turned out to be the cause of the relatively frequent occurrence of bad odours. These urinals had many flow-off holes, which allowed an ammoniac smell to escape from the urine reservoirs into the restrooms. These holes are now sealed; just one hole is left for the flow-off of the urine (see fig.12).

Overall the school toilets are considered clean and 84% of the interviewed pupils never complained about the cleanliness.



*Fig. 12 Improved waterless urinal with one small hole; the other holes have been closed
(Source S. Deegener, TUHH)*

Number of toilets

All of the girls interviewed were satisfied with the 3 ecosan toilets that were available for them, and 71% of the interviewed boys were content with the three urinals and one slab for defecation that was made available for them. The boys who were less content suggested that two or three slabs would be better. Considering the fact that approximately 65% of the children defecate daily during the school day, one slab for the boys indeed doesn't seem enough.

Preference of type toilet and location

The pupils were asked which toilet they would prefer to have at school and at home. No one reported that they would prefer a pit-latrine. Instead, half of the children would prefer an ecosan toilet, and the other half would prefer a water flush toilet at both locations. However, girls tended to prefer an ecosan toilet at home over a water flush. The students gave the following arguments for preferring the water flush toilet: They are better than an ecosan toilet, more beautiful and it is 'so nice when the water flushes'. Student also gave arguments for the use of the ecosan toilet over a pit latrine stating that they are more beautiful, easier to use, don't have bad odours and are 'better for the groundwater'.

It is the children's experience that their home latrines always have a bad odour. Therefore it is not surprising that, despite the cold Romanian winters, 74% of the respondents would prefer the toilet to be located outside in the yard instead of in their houses or inside the school building.

Use of human fertilizer

On the topic of using human fertiliser for use in their gardens, the students are divided: 43% of the respondents are willing to use the fertiliser and 40% are not. The remaining respondents do not like the idea or are not sure yet.

7.2 Teachers

A separate ecosan toilet was built for the teachers at the primary school. This meant that the teachers could base their answers, unlike the citizens, on their own experience. Naturally, this gives their opinion extra weight.

All four interviewed teachers find the toilet easy to use and had received enough information on usage and maintenance. Two teachers thought there were enough urinals and toilets for their students; the other two teachers thought that two slabs for the boys might have been better.

With regard to the complaints, two teachers heard complaints about bad odours, one weekly and one monthly. According to them, it seems that the toilets smell more when the temperature rises. However, they never hear complaints about uncleanliness or flies and all seem to like the design. The four respondents agree that the improved sanitary situation will be better for the health of the pupils.

Two teachers think the ecosan toilets should be used for every school; the others think they are only suitable for rural areas. The argument for their use in rural areas is that there is more agriculture making it more practical to use the waste matter as fertiliser. Three out of the four teachers would ideally prefer a water flush toilet for their school because it would be more practical stating that the children would not have to use soil to cover their faeces. One teacher would prefer a squatting model toilet because it prevents transmission of micro organisms, but the other teachers would like a seat model for themselves.

The teachers are divided about the right place for the school toilet. Two of them would like to see it inside; the other two would prefer to have it outside because of the odour and the lack of room in the school building. Neither of the teachers could agree on what would be the most environmental friendly toilet. Two teachers chose the ecosan toilet because it does not affect the groundwater; the others chose the water flush toilet.

Three teachers do not want to use the composted excrement for fertiliser, though they are convinced that the garden would benefit from it. Three teachers think there is a hygienic risk (the risk of getting ill by physical contact with pathogens) involved in the use of the products of the ecosan toilets.

7.3 Ecosan caretaker

The caretaker cleans the ecosan toilet daily and checks the urine and faeces chambers weekly. At first he found the toilets hard to clean, but now he has become used to it. The adjustment problems, however, were not due to a lack of information. He was instructed on how to clean the toilets and told not to moisten the compost chamber and to use soda water for cleaning the tiles, urinals and the urine bowl of the slab. To avoid sedimentation of urine salts he puts some vinegar in the urinals at the end of the school day.

The caretaker checks the urine and faeces chambers. In general the pupils separate their urine and faecal properly, he only finds urine in the faeces chamber and faeces in the urine bowl weekly. The urine piping never blocks, but the large pipes (the many holes of the urinals) caused an odour problem. The caretaker has complaints about odour weekly, but never has complaints about flies. In his opinion using the toilets is a pleasant experience and the amount of toilets is sufficient.

For the school, he prefers the ecosan toilets because they are cleaner and don't smell badly. He would also prefer an ecosan toilet at home as well because it is cleaner than the latrine. He thinks the toilets should be placed inside the school, but he would still prefer to have his home toilet outside in the yard.

As for using the waste matter as a fertiliser, he is afraid he wouldn't eat the vegetables if urine from the school had been used on them, but he would eat the vegetables if the urine from his own family had been used on them. He would like to use the compost from the school and his family toilet on the fields, but not in his garden because it should work better on wheat and corn and increase production.

7.4 Citizens of Garla Mare on ecosan toilets

Awareness of the ecosan toilets at the primary school in Garla Mare

The data gathered on the topic of people's awareness of the ecosan toilets gives us some important information. The majority of the citizens heard about the ecosan project in the school and most of them got the information from children. Many more women heard about the project than men (respectively 90% and 68%). This points to the importance of the role women and children, who can serve as carriers and transferees of information (see chapter 5). Having knowledge about the ecosan toilets, though, doesn't seem to make people curious enough to go out and see it for themselves: only 32% of the respondents had seen the toilets in the primary school. Interestingly enough, there is a small positive correlation between seeing the ecosan toilet and preferring one at home.

Sanitation at home

The average size of the households of the respondents was 3,6 members. All 40 respondents had a conventional pit latrine in their yard, although there was one respondent who had a water flush toilet in addition to a pit latrine. In Garla Mare, a water flush toilet means, that the owner has built a water reservoir on his roof, has bought a pump to pump water from the well to the roof, and from there a pipe to the water flush toilet. The wastewater of the toilet is lead into a soak-away pit in the garden.

The owners of the pit latrines all agree that the bad odour is the biggest disadvantage of a latrine (see fig. 13). Other problems that are generally mentioned are the nuisance of the flies and the emptying of the pit latrine. It is interesting to note that nobody mentions anything about the pollution or poor hygienic conditions, probably because they are not visible. They only mention the practical annoyances for their daily life. Obviously education about these unseen issues seems to deserve a lot more attention. Taking into account these results, it is not surprising that 80% of the respondents prefer their toilet to be outside and not inside their homes. Given the chance, 98% of the citizens would prefer another type of toilet other than a pit latrine.

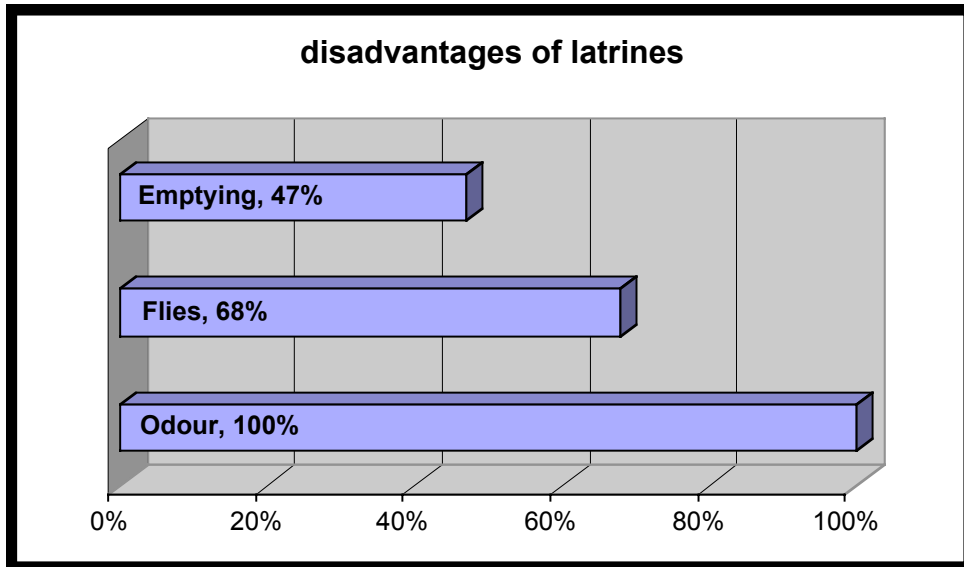


Fig. 13 Disadvantages of pit latrines

Preferences on toilets at home

Among the citizens of Garla Mara, the water flush and the ecosan toilets appear to be the most popular toilets, leaving the pit latrine far behind (see fig. 14).

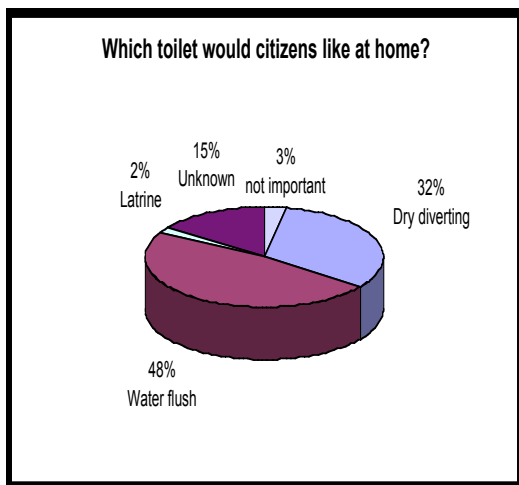


Fig. 14 Citizens preferences on toilets at home.

Building new toilet costs money and poverty prevents most respondents from investing in their sanitary conditions. The income level of most families is so low that they can hardly provide enough food for themselves. So is it understandable that only 3% of women are willing to invest in another toilet. It is surprising though considering the financial situation that 20% of the men are willing to invest in another type of toilet. Only 10% of the women would consider building a new toilet, if the costs would fit into their budget (see fig. 15 and 16). To summarise, the majority (80%) of the respondents are not able or not willing to invest in another type of toilet, but 15% answered that they could eventually be willing to do so but it would depend on the costs. Some of the men interviewed gave no comment on this topic.

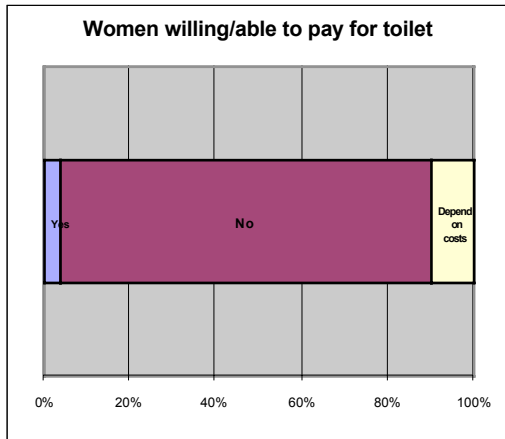


Fig. 15 Women willing to pay for a new toilet.

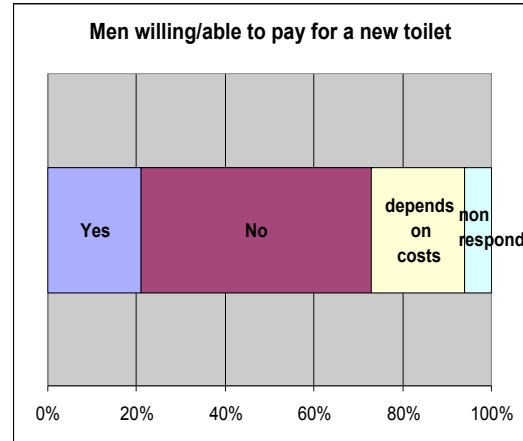


Fig.16 Men willing to pay for a new toilet

The citizen's pit latrines are placed outside in their gardens. The majority (80%) of citizens wish to keep it there. Men mentioned hygienic reasons, bad odours and flies as an argument to place the toilet outside their home. Women mentioned that there is no room in the house. The arguments mentioned by the women for putting the toilet inside were the walking distance to the pit latrine and the uncomfortable trip during bad weather. The major complaints (bad odour, emptying the pit latrine and the flies) can be prevented with an ecosan toilet. The main arguments the men had for keeping it outside the house could also be eliminated. Installing ecosan toilets could also satisfy the interest women have who would like a toilet inside of their home. Since almost nobody wishes to hold on to their pit latrine, the ecosan toilet could be, when affordable, a solution that satisfies everybody's needs.

Preferences on school toilets

Most citizens chose the ecosan toilet as the best choice for toilets at the school (66%), followed by the water flush toilets (26%), and finally pit latrines (2%). The others had no preference (8%).

There is an interesting difference between men and women: 74% of the women as opposed to 58% of the men want dry urine diverting toilets for the school. Whereas 32% of the men and 17% of the women would prefer a water flush toilet. (see fig. 17 and 18). The arguments mentioned for preferring a dry diverting toilet are that they are good for children's health, there are less odours, and children are happy with them.

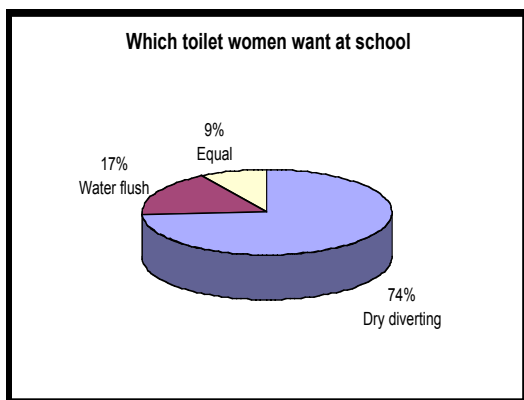


Fig. 17 Women's preferences on school toilets

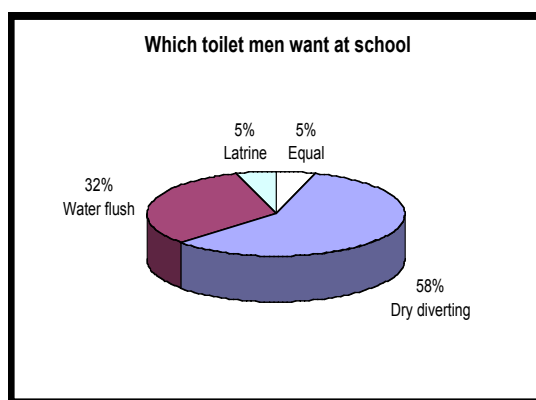


Fig. 18 Men's preferences on school toilets

The above data gives us a reason to investigate why women's attitudes towards the ecosan toilets are more positive than men's and how their positive attitude can help WECF to turn the project into a project with long-term lasting success. It is also interesting to observe that school girls prefer the ecosan toilet in their homes and the women at their children's school.

Impact of ecosan toilets on the environment

Half of the citizens think the ecosan toilet is the most environmentally friendly toilet and 35% consider the water flush to be the most environmentally friendly. Only a small portion of the respondents had no idea which toilet would be better. This data again points to the importance of education in a project of this nature.

The use of ecosan products in agriculture

For the future construction of more urine diverting toilets in the village, it is important to have some insight into the willingness of the citizens to use the ecosan products as a fertiliser and compost in agriculture.

The attitude towards using urine collected from the school toilets as fertiliser is fairly positive since 60% of the respondents wouldn't mind using it on their fields. However, they were more reluctant about using faeces on the fields: 43% would want to do this and 40% answered with an absolute 'no', others were undecided. Data showed, however, that the attitude becomes slightly more positive when it concerns using sanitised faeces from their own families.

Although the majority of citizens don't think any hygienic risks are involved in using urine as a fertiliser, there are still 17% who think there are risks and another 30% who are not quite sure. Education about the risks of using sanitised urine and faeces could increase the willingness of the citizens to use ecosan products. Perhaps they can be reminded of the old practice used by some of the elderly people in this region of using animal products on the fields, such as animal urine and dung.

Other issues that were brought up by the respondents were the logistics of the project: How does one handle those large amounts of urine and compost without a machine? What is the danger of using a high concentration of urine for plants? Would Romania be ready for a topic such as recycling urine? All of these remarks give insight on some of the lingering issues in the citizen's minds and deserve consideration.

Despite all of the doubts and questions, the general opinion about the benefits of using human urine and compost is positive. 64% of the respondents agree that the garden or crops can benefit from this kind of fertiliser and compost. Only 11% don't share that opinion. Others feel they have to think it over.

8. Conclusions and recommendations

Improving sanitation in Garla Mare

Most citizens in Garla Mare are unhappy with their pit latrine at home. The latrines cause problems with flies, bad odours and groundwater pollution. To solve this problem, we explored different sanitary systems and can conclude that ecosan is, at the moment, the best sanitary system for Garla Mare. Under current circumstances, it provides a hygienic and environmentally safe sanitary solution. After building and using ecosan toilets at the primary school in Garla Mare, the pupils hardly have any problems with flies, bad odours or cleanliness. The ecosan toilets improved the sanitary conditions for the pupils, and the children at the school are satisfied with the new toilets.

Design and amount of the toilets

Most children like the design of the new school toilets. In fact, the design and looks of the toilets are mentioned as the most important arguments for either ecosan or water flush toilets. Therefore, the design and atmosphere of the restrooms are an important factor in the acceptance of ecosan toilets.

The teachers prefer flush toilets for their pupils because they think it will be easier for the children. The results of this survey prove otherwise: the children find the ecosan toilet easy to use and would like it for their school. Young children use Ecosan toilets properly and age doesn't seem to be an issue when implementing an ecosan toilet system at schools. The fact that teachers experienced more odour problems than the children did when temperatures rose should be investigated.

One squatting toilet for the boys proved to be too little, two or three would have been better. The waterless urinals function better with only one small hole in order to prevent bad odour in the toilet room.

Education on hygiene and environmental care

It is not clear what citizens define as hygienic or environmentally friendly. No one spontaneously mentions bad hygiene or groundwater pollution as a disadvantage to latrines. Citizens don't mention hygienic risks when using composted human waste either. On the other hand, almost all of the citizens surveyed, find the ecosan toilets better for their children's health, which suggests that people are at least aware of the unhygienic situation of the previous toilets and the potential danger for their children's health. There does seem to be a lack of knowledge about hygiene and prevention of diseases that are transmitted by the oral-faecal route, but before starting an educational program the knowledge deficiencies should be more clearly defined.

Citizens and teachers mention water flush toilets as being environmentally friendly toilets. This might indicate that the teachers had a lack of awareness about the negative effects of water flush toilets. It might be useful to show them different sanitary systems and the environmental effects of the different options.

Education on hygiene will promote the use of ecosan toilets but it will also raise questions about the safety of the use of composted excrement. Therefore, information and instructions on how to treat and where to use human excrements in a safe way are of a high priority.

The importance of women and children

Apart from elderly people, women and children suffer most from unhygienic and environmentally unfriendly sanitation. Therefore, education and sanitary improvements should be directed towards these groups.

Many citizens heard about the new toilets from children, showing that it is possible to reach private households through the education of children. The results show a gender specific pattern: women prefer ecosan toilets while men prefer water flush toilets. Women are also more willing to use the fertiliser in their fields and gardens. Therefore, women could play an important role in motivating others to use ecosan toilets. They might also be more open to receiving education. From all this, we can conclude that women and children play an important role overall in motivating and educating people about the use of ecosan toilets.

Women complain about the toilet being outside most often, possibly because the way women need to use the toilet makes an outside toilet more inconvenient for them. If a pilot shows that ecosan toilets can be built inside the house without causing odour problems, we could possibly convince people to build the toilet inside their homes, which, in the end, would benefit women the most.

Organisation

Few citizens saw the school toilets themselves or went to see them after they were told about them. It seems that people don't walk around the village or aren't curious about new activities. There also doesn't seem to be much 'village-talk' or at least not about the subject of toilets. Therefore, it seems education cannot rely on the informal transfer of information.

Further investigation about the potential financial means to build new toilets will be necessary: Men feel that there is enough financial means to invest in new sanitary options but women do not. This raises questions about budgeting: Who is in charge of the money? Where can men see options for saving money whereas women see no options?

As far as organising things for the cleaning of the toilets, hiring a local worker for general maintenance works well. The children find the toilets clean and there is always enough material to cover the faeces.

The use of fertiliser

During the communist period, farmers were not involved in animal waste management. However, before this period farmers used animal waste as a fertiliser. Maybe this history could be mentioned in overcoming some of the hesitations people have about using human waste as a fertiliser. Of course using one's own excrement, even if composted and odourless, could be more difficult to accept culturally, but pointing out the benefits and relating the practice to habits from the past might help.

Since people are more willing to use the fertiliser in fields than in gardens, future projects might focus on the use of fertiliser for cultivation of corn in fields more, so that it will be easier to convince people. Using examples from other countries like Sweden, Norway or China may help to overcome barriers.

Importance of this survey

Spontaneous remarks made during the interviews show the importance of the survey. The citizens brought up new topics, problems and solutions that take into consideration their local circumstances. For instance, is Garla Mare ready for ecosan toilets? Are there connections to old customs, which make it easier to implement ecosan toilets at a large scale? How do we ease implementation? How do we solve logistics? How do we solve the ability of the citizens to invest in an improvement of their sanitary facilities?

Annex 1

Questionnaire concerning the dry urine diverting toilets of the primary school in Garla Mare, intended for the children of this school.

Children 6 –10 years old, 4 classes with totally app. 200 children
Please, note age and sex of the interviewed children

Age **Male** **Female**

1. Which kind of toilet do you have at home?

- Latrine
- Flush toilet

2. Which toilet do you prefer to use?

- At school
- At home

Why?

3. Who did you inform how to use the school toilet?

- My teacher
- My friends
- Nobody

4. How often do you use the school toilets?

	Never	Daily	Weekly	Monthly
Urine:				
Faeces:				

Remarks

5. What is your opinion about the practise of use of the school toilets?

Easy	Complicated	Have to draw too much attention on the right use	Unpleasant	Pleasant

Remarks

6. Do you like the design of the toilets?

yes	No	Not important	Could be improved

Remarks

7. What is the frequency of your complaints related with bad odour of the toilets?

Never	Daily	Weekly	Monthly

Remarks

8. What is the frequency of your complaints related with cleanness of the toilets?

Never	Daily	Weekly	Monthly

Remarks

9. What is the frequency of your complaints related with flies in the toilets?

Never	Daily	Weekly	Monthly

Remarks

10. Is there always enough material in the bucket to apply on the faeces?

Yes	Not	Mostly	Important

Remarks

11. Are there enough toilets?

- Yes
- No

If no, how many toilets should be there?

12. Which kind of toilets do you like for your school?

- Latrines
- Dry diverting toilets as used for this school
- Water flush toilets

Why?

13. What is the right place for school toilets?

- Inside of the school
- Outside of the school

Why?

14. It is known that

- Latrines pollute groundwater; they smell bad and attract flies
- Urine diverting toilets need more care in use and a treatment of the excrement
- Water flush toilets waste water and nutrients, pollute surface water and are more expensive

Which kind of toilets do you like to have at home?

- Latrines
- Dry diverting toilets as in your school
- Water flush toilets

- Seat models
- Squatting models

Why?

15. What is the right place for family toilets?

- Inside of the house
- Outside in the yard

Why?

16. Can you imagine, the urine of the school is used as a fertiliser in your garden or fields?

Yes	May be	No	I don't like the idea	I don't know

Remarks

Annex 2

Questionnaire concerning the dry urine diverting toilets of the primary school in Garla Mare, intended for the teachers of this school.

Please, interview the teachers of the primary (church) school and note sex.

Male

Female

1. What is your opinion about the practise of use of the school toilets?

Easy	Complicated	Have to draw too much attention on the right use	Unpleasant	Pleasant

Remarks

2. Are there enough toilets?

Yes

No

If no, how many should be there?

3. Did you get enough information about the use and maintenance of the new toilets?

Yes	Not sufficient	Not at all

Remarks

4. How often do you use the school toilets?

	Never	Daily	Weekly	Monthly
Urine:				
Faeces:				

Remarks

5. What is the frequency of your complaints related with bad odour of the toilets ?

Never	Daily	Weekly	Monthly

Remarks

6. What is the frequency of your complaints related with cleanness of the toilets?

Never	Daily	Weekly	Monthly

Remarks

7. What is the frequency of your complaints related with flies in the toilets?

Never	Daily	Weekly	Monthly

Remarks

8. Do you like the design of the toilets?

Yes	No	Not important	Could be improved

Remarks

9. Do you think that the improved sanitary condition in the school have an impact on the health of the children?

Yes	No	Partly	I don't know

Why?

10. Do you think, that the dry diverting toilets of this school are to promote and to be built in other schools in Romania?

Yes, every where	Yes, only in rural areas	No

Why?

11. It is known that

- Latrines pollute groundwater; they smell bad and attract flies,
- Dry diverting toilets need more care in use and a treatment of the excrement
- Water flush toilets waste water and nutrients, pollute surface water and are more expensive

Which kind of toilets do you like for a school?

- Latrines
- Dry diverting toilets as used now for this school
- Water flush toilets

12. What is the right place for school toilets?

- Inside of the school
- Outside in the school yard

Why?

13. Which kind of toilets do you like for a family?

- Latrines
- Dry diverting toilets like we have now for this school
- Water flush toilets

Why?

14. What is the right place for a family toilet?

- Inside of the house
- Outside in the yard

Why?

15. Which kind of toilet is more environmental friendly

Latrines	Dry diverting toilets as used for this school	Water flush toilets	No idea	No difference

Why?

16. Do you like to use the urine of the school as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

17. Do you like to use the urine of your family as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

18. Do you like to use the composted faecal material of the school toilets as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

19. Do you like to use the composted faecal material of your family as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

20. Do you think, that there are hygienic risks related to the use of the compost or urine of the school toilets in garden or for cultivating crops?

Yes	May be	I have to think about	No	I don't know

Why?

21. Do you think, that the compost or urine of the toilets could benefit gardens or for cultivating crops?

Yes	May be	I have to think about	No	I don't know

Why?

Annex 3

Questionnaire concerning the dry urine diverting toilets of the primary school in Garla Mare, intended for the caretaker of these toilets.

1. Are the toilets easy to clean?

Very easy	Easy	Complicated	Very complicated

Remarks

2. What kind of cleaner do you use for the squatting pans?

3. How often do you use vinegar for the urinals?

Daily	Weekly	Almost never	Never

Remarks

4. Is there sometimes urine in the faeces-chamber?

Daily	Weekly	Almost never	Never

5. Are there sometimes faeces in the urine bowl?

Daily	Weekly	Almost never	Never

6. Did the urine-piping ever block?

Daily	Weekly	Almost never	Never

Remarks

7. What is your opinion about the practise of use of the school toilets?

Easy	Complicated	Have to draw too much attention on the right use	Unpleasant	Pleasant

Remarks

8. Are there enough toilets?

- Yes
- No If no, how many should be there?

9. Did you get enough information about the use and maintenance of the new toilets?

Yes	Not sufficient	Not at all

Remarks

10. What is the frequency of your complaints related with bad odour of the toilets?

Never	Daily	Weekly	Monthly	Seldom

Remarks

11. What is the frequency of your complaints related with flies in the toilets?

Never	Daily	Weekly	Monthly	Seldom

Remarks

12. Which kind of toilets do you like for a school?

- Latrines
- Dry diverting toilets as used now for this school
- Water flush toilets

Why?

13. What is the right place for school toilets?

- Inside of the school
- Outside in the school yard

Why?

14. It is known that

- Latrines pollute groundwater; they smell bad and attract flies
- Urine diverting toilets need more care in use and a treatment of the excrement
- Water flush toilets waste water and nutrients, pollute surface water and are more expensive

Which kind of toilets do you like for a family?

- Latrines
- Dry diverting toilets like we have now for this school
- Water flush toilets

Why?

15. What is the right place for a family toilet?

- Inside of the house
- Outside in the yard

Why?

16. Do you like to use the urine of the school toilets as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

17. Do you like to use the urine of your family as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

18. Do you like to use the composted faecal material of the school toilets as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

19. Do you like to use the composted faecal material of your family as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

Annex 4

Questionnaire concerning the dry urine diverting toilets of the primary school in Garla Mare, intended for the citizens of Garla Mare

Please, interview as far as possible citizens, spread over the whole village, of different ages, with different social-economical position.

Equal amount of male/female

Totally 40 questionnaires

Please, note age and sex

Age	Male	Female
-----	------	--------

1. How many persons are living in your household?

2. Which kind of toilet do you have?

- Latrine
- Flush toilet
- Nothing

3. Are there disadvantages of your sanitation?

- Odour
- Flies
- Emptying
- Others (please, specify)

4. Do you know about the new dry diverting toilets of the primary school next to the church?

- Yes
- No

If yes: Whom from did you hear about?

5. Did you see the dry diverting toilets of the primary school?

- Yes
- No

Remarks

6. It is known, that

- Latrines pollute groundwater; they smell bad and attract flies.
- Urine diverting toilets need more care in use and a treatment of the excrement
- Water flush toilets waste water and nutrients, pollute surface water and are more expensive

7. Which kind of toilets would you like to have at home?

- Latrines
- Dry diverting toilets as in the school
- Water flush toilets
- Not important
- Seat models
- Squatting models

Why?

8. Are you willing /able to pay for another type of toilet?

- Yes
- No

Remarks

9. What is the right place for family toilets?

- Inside of the house
- Outside in the yard

Why?

10. Which kind of toilets do you like for a school?

- Latrines
- Dry diverting toilets as used for the primary school
- Water flush toilets
- equal

Why?

11. What is the right place for school toilets?

- Inside the school
- Outside in the schoolyard

Why?

12. Do you think, that the improved sanitary condition in the school have an impact on the health of the children?

- Yes
- Partly
- No

Why?

13. Which kind of toilet is more environmental friendly

Latrine	Dry diverting toilets as used for this school	Water flush toilets	No idea	No difference

Why?

14. Do you like to use the urine of the schooltoilets as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

15. Do you like to use the composted faecal material of the school toilet as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

16. Do you like to use the urine of your family as a fertiliser in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?

17. Do you like to use the composted faecal material of your family as a soil conditioner in your garden or fields?

Yes	May be	I have to think about	No	I don't like the idea

Why?