Title of abstract: **Ecological Sanitation: Solution for the public places and mass events, experiences from Nepal**

Author's name and affiliations:

1. Bipin Poudel*
   District Environment, Energy and Climate Change Coordinator
   Nepal Climate Change Support Programme,
   Ministry of Science, Technology and Environment
2. Kamal Adhikari
   Sociologist
   Department of Water Supply and Sewerage, Government of Nepal

Contact name: Bipin Poudel
Postal address: P.O.Box 8973 NPC 444, Kathmandu, Nepal
E-mail address: poudelbipin@gmail.com ; kamal.anthro@gmail.com
Telephone and / or Skype: bipin.poudel (Skype)

Abstract

In Nepal, Ecological Sanitation (EcoSan) toilets were first introduced to the households of Siddhipur in 2002 by the Department of Water Supply and Sewerage (DWSS) with the support of WHO Nepal. These toilets were dry toilets and were not easily accepted as Nepalese are anal cleansers. Hence, with some modifications DWSS piloted urine diverting toilets, also known as Wet-EcoSan toilets, in Birgunj, Nepal so that the anal cleansers also adopt the new technology. There was a long debate on the hygienic perspective and the safety of the users of EcoSan. For few years, it was out of imagination to think it as a solution for the public places or mass event.

DWSS and UN Habitat constructed a first public EcoSan toilet at Sunwal, Nawalparasi. It was constructed in the busy highway and hundreds of passengers used it. Urine was collected in big tanks and was transferred to the vegetable gardens using Rickshaws. There was a competition among the vegetable producers to use the Urine in the field as fertilizer. There was a system established of using one after another.

Similarly, with the support of DWSS and different stakeholders, few public EcoSan toilets were constructed in Darechowk, Chitwan. The campaign "take a pee and get one rupee" was famous as the EcoSan toilets build in Darechowk awarded one rupee to the users while other public toilets charged 2-5 rupees.

Mr. Shreerendra Pokhrel, a sanitation champion, for the first time collected urine in the mass event. He collected urine from the Maoist Plenum (first after the Maoist became public) where thousands of people had gathered. This got highlighted in local and National Newspapers. This news was spread all over the country and people started talking about urine as a fertilizer. Excited from this, Mr. Pokhrel with the support of different stakeholders, started to collect urine from different fairs and festivals that occurs frequently in Nepal in different cities. These days Urine collection has become a fashion in every mass event.

Proper maintenance of the public toilets, storage, transport and proper use of the collected urine are the big challenges faced. There are no scientific studies in Nepal about the safety of the users using urine collected from the public places and the mass event. It would be easier to convince people if we could prove scientifically that the urine collected are safe to handle and use.

Keywords: EcoSan, urine, mass event, public places

1. BACKGROUND:

Ecological sanitation (EcoSan) is a paradigm in sanitation that recognizes human excreta and household wastewater as resources that can be recovered, treated and safely reused to generate additional incomes. EcoSan represents a holistic approach towards ecologically and economically sound sanitation and is a systemic approach as well as an attitude. The applied technologies may range from natural wastewater treatment techniques to compost toilets, simple household installations to complex, mainly decentralized systems (Otterpohl, 2004).

EcoSan is also a system that focuses on reuse of waste as a resource. Use of compost, foliages and waste water in the farms are some common examples of EcoSan. Likewise, utilization of human urine and faeces through use of urine diverting toilets is important for waste management, organic farming and ecosystem management.

Flow of energy between animal and plant is a basic law of ecosystem. Similar law applies in the field of sanitation. For example, human beings take food from nature and excrete urine and faeces in the form of waste which later on becomes a food for plants. This flow of energy helps minimize pollution, retain energy and maintain environmental sustainability.

EcoSan toilets :

- Provide a barrier to the transmission of excreta related diseases and contribute to improved health of the community.
- Provide a form of sanitation that is accepted by users in terms of its level of comfort and hygiene.
- Reduce environmental impacts and costs associated with the disposal of human waste.
- Promote recycling of nutrients contained in excreta to grow fruits and vegetables; thus enhancing food security and reducing the need to rely on artificial fertilizers.

EcoSan toilet is thus an environment friendly toilet and a manifestation of the harmony of indigenous knowledge with modern technology. Hence, it stands as a strong link between human culture and nature to utilize the so called waste as a precious resource. Ecological approach in sanitation has been adopted mainly due to three reasons: a) it builds the individual's positive attitude in treating waste as a resource because of the economic value inherent in it b) it maintains ecological balance due to reciprocal flow of energy from plant to people and vice versa and c) it enhances the agricultural productivity and makes the adaptation more comfortable through the use of waste as a resource.

Nepalese soil is very much deficient in Nitrogen content, low to medium in Phosphorus content and medium to rich in potassium content (Joshi, 2002). Hence Nitrogenous fertilizer is the necessary supplement in soil in order to increase the productivity of the country (Upreti et.al 2011). Nepal is a potential area for EcoSan approach as its numerous areas are reported lack of enough water for sanitation and under supply of chemical fertilizer for agriculture.

A total of 2,095 EcoSan toilets have been installed in 19 districts in different ecological regions showing potential for scaling up in diverse socio-cultural setting and geography (Aryal et.al. 2015).

2. METHODOLOGY:

The methodologies below were adopted while preparing this paper:

- The paper was prepared based on the observation, experience of the authors and findings of the studies the authors were involved.

- Besides this, additional sources of information i.e. various available literature, research papers, articles and reports on various sanitation options including ecological sanitation; re-use of human excreta, pathogen die-off, etc were reviewed to shape this paper
- Field observations through visits to the public toilets and interaction with toilet users, and Ecosan promoters were also conducted to hone this paper with field-based experiences.
- Personnel communication with urine harvesters who had collected urine during the mass event and fairs

3. RESULTS AND DISCUSSIONS:

3.1 Traditional Practices of reuse in Nepal

There are many traditional examples of wastewater and excreta management in several parts of Nepal. Sherpas in mountains still feed their faeces to pigs, Jayapu of Kathmandu valley still use faeces in producing vegetables, a farmer in middle hill still uses grey water in his kitchen garden.

Local people are worried about the use of chemical fertilisers, as they believe that these fertilisers cause soil compaction, which hinders other farming operations. Although cows, buffaloes, sheep, goats, and donkeys are the main sources of manure, in most of the cases, human excreta and poultry manure is also collected. Human excreta, called chaksa, are considered to be the richest manure and are collected in a special dry latrine pit. In some areas, kitchen ash and manure are mixed together and are used for kitchen gardening and for increasing the productivity. However, these traditional practices are slowly diminishing as the younger generations hesitate to adopt it in the name of modernization.

Grey water in Kitchen Garden

This is an approach of managing wastewater by households in their kitchen /vegetables gardens. Kitchen Garden in Nepal is small plot where mainly vegetables are grown rather than flowers. For kitchen gardening water and manure is essential, without water the garden cannot be imagined in the country like Nepal where the country has uncertain climate. The practices of using grey water in kitchen garden are very popular among those who are aware of the above facts. The practices are commonly seen in the middle hill as well as in high hill settlements. Normally they make traditional washbasin made up of wooden planks and a ditch below it (JUTELNU) in front of the house. The water after wash is diverted with small canal towards vegetables/ kitchen garden. In some places the water is collected into a small pot and the water is transported time to time to the garden. Furthermore in some cases a small pond is made to collect water, which is later transported, to the garden.

Feces as Animal food

This is very traditional practice of managing excreta. Here the excreta are taken as good food for pigs. The toilet is made above the pig shelter. Defecation is made through a hole made above the shelter and is consumed by the pigs.
In mountainous regions where open defecation is difficult due to the very cold weather condition toilets are made inside the house, generally in the ground floor, which is connected with the pig shelter in the basement. These so-called toilets are made up of thin wooden planks. By removing one plank a place is created to defecate. In such cases water is not used but special green grass or leaves are used as wipes.

Composting of feces

Knowledge of using urine and faeces as agriculture fertilizer is not new for Newar community in Nepal.

The practices is not only limited to the surrounding of Kathmandu valley but the farmers of high hill (normally Sherpas Gurungs and others of high hill) use human excreta as manure to the fullest advantage for mountain farming. Sherpas in the high Himalayas have a traditional composting toilet either attached to the house or somewhere very nearby.
In the case of these traditional toilets, compost is made from human urine and faeces collected together with additives such as dried leaves, food waste and various green plant residues. After defecation or urination, dried leaves, locally known as 'sottar', are added to the vaults. To maintain some moisture in the compost, food and vegetable wastes from the kitchen are added from time to time. In this area, compostable materials such as paper, leaves and corn shells are used for anal cleansing rather than water.

Use of animal feaces in the field

Traditionally all the farmers in Nepal, use cattle dung mixed with urine and remains of grasses and hay as a manure after composting it in a manure pit.
Thus, the indigenous tradition of using excreta stands as the legacy of the ancestors on the front of waste management. Use of cattle dung mixed with urine as manure in the field proves that our ancestors were aware about the fertilizer value of the urine and feaces. The traditionally held practices of composting of foliage (*sottar*), use of kitchen waste, *Kopara Falne, Nauga, Khichamonga* , *Bhakaro, Rachhyan* and existences of *Chyakhang* (manure house) are therefore the foundations of the EcoSan toilets. The use of human urine as an anti septic for healing cut wounds and urine therapy for curing several abdominal pains and ailments are the characteristics of some of the Nepalese communities.

3.2 ECOSAN: Modern technology and traditional practice

Although use of human excreta as a fertilizer is a common practice of some of the communities in the country, urine diverting dry EcoSan toilet were for the first time piloted in Siddipur in Kathmandu valley in 2002 by the Department of Water Supply and Sewerage and WHO. Both dry and wet urine diverting toilets are promoted in the country. In dry EcoSan, faeces are separated from urine and collected in a vault chamber. And in wet EcoSan, offset twin pits with water seal and urine-separating pan is used. The eco-san toilet types adopted in the country consists of double vault urine diversion toilets, two vault solar model, single vault movable container type and urine diversion pour flush toilets (ENPHO-2008). Since its introduction in Nepal, there are several modifications in eco-san toilet pans in terms of materials and types in order to suit local culture and ecology.

3.3 Experiences with Public EcoSan toilets:

Following are some of the experince that Nepal has regarding the EcoSan toilets in the public places:

Experience 1: Take a pee and get one rupee: Successful campaign at Darechowk

With the support of DWSS and different stakeholders, few public EcoSan toilets were constructed in Darechowk, Chitwan which is developing itself as a open EcoSan resource centre. The Dahrechowk Ecosan Resource Centre has initiated the "Take a Pee, Make a Rupee" campaign to recognize the economic value of urine and spread awareness on EcoSan and the value of urine. The resource centre has started paying people Rs. 1 for urinating in its EcoSan toilets. In contrast, most public toilets in Nepal charge Rs. 2 for urination.

Shreerendra Pokhrel, a school headmaster in the village of Darechowk in the Chitwan District is well known in Nepal for his extraordinary work as a urine harvester. He has been campaigning to promote total sanitation in the country and to educate Nepalese farmers about utilizing their own waste as fertilizer on the farm.

Experience 2: Public Toilet at Sunwal:

DWSS and UN Habitat constructed a first public EcoSan toilet at Sunwal, Nawalparasi. It was constructed in the busy highway and hundreds of passengers used it. Urine was collected in big tanks and was transferred to the vegetable gardens using Rickshaws. There was a competition among the vegetable producers to use the Urine in the field as fertilizer. There was a system established of using one after another.

Due to availability of plenty of agriculture land, easy market facilities and availability of ground water, Sunwal was developing as vegetable production center. A wave for the construction of HH toilets is still on. Amidst this wave, about 100 households of the town had installed ecosan toilet to separate and use the urine as manure. The people were aware about the fertility value of urine. Some of the farmers living in town had started commercial vegetable farming to cope the growing demand of fresh vegetables in nearby cities. Erasing the myth that the Brahmin and Chhetry ethnic community are faeco phobic, the people of Sunwal were using the urines collected from public places in their farms to produce vegetables. The products were being popular and demand were increasing day by day. This was found during the field study in 2009.

However during the field study carried in November 2014, the system of collection was not in place, urine collected in the tank at public toilet was not used for years. Urine was overflowing and was discharged in the nearby stream.

Lack of monitoring, no any support for maintenace and operation of pumping motors and rickshaw were some of the reasons given. Further study is necessary to analyse the demotivating factors or barriers of using the urine in mass scale.

Experience 3: Public EcoSan at Syangja

Public Ecosan toilet was constructed with the support Rural Water Supply and Sanitation Project-Western Nepal at Syangja on the highway from Butwal to Pokhara targeting the passengers. It was urine diverting wet EcoSan.

Initially it was well maintained and operated. Later on there were some problem in the urine collection chamber. Because of the mud and other dirts, collected urine could not be drained. Hence the communities have blocked (cemented) the urine collecting bowl (see photo).

Photo : Blocked urinal of EcoSan Toilet at Syngja (Photo: RWSSP-WN Phase II)

Experience 4: Urine Collection at School

With the support of UNICEF, urine collection were done at one of the school of Tanahaun. This was one of the first example of urine collection in the school. Similarly, Janata Lower Secondary School of Nerpa VDC in Khotang District has been generating funds by selling urine. According to the school, the urine from more than 200 students fills a tank with the capacity of 1,000 liters in four to five months. Two tanks with capacity of 1,000 liters each have been placed near the toilets to collect urine.

Experience 5: Urine Collection House at Khotang District:

Urine collection house has been constructed in Diktel Bazzar of Khotang District in the eastern part of the country. This house was constructed to collect human and animal urine for using it as a fertilizer. About 220 litre of drum is used for the collection urine. It is located near the vegetable market and was initiated by an agricultural cooperatives.

3.4 Urine Collection in the Mass Events and Fair:

Following are some of the examples of urine collection done during the mass event:

Example 1: Chiwan Mahotsav (Chitwan Trade Fair):

For the first time Urine collection at mass event was initiated during the Chitwan Mela (Fair) during 2010. Mr.Shreerendra Pokhrel had initiated it in the support of different district and central level stakeholders and support organizations.

Example 2: Urine Collection at Bardia Mahotsav (Bardia Trade Fair)

Male urine was collected during Bardia Mahotsav by the Gulariya Municipality with the support of SWASTHA program. The fair started from 23 November 2012 and remain for about a week. About 1000 liters of urine was collected which was used by the farmers living in the municipality. Female urine was not collected. Male urine was collected by constructing a urinal (raised canal of metallic foil).

Example 3: Urine Collection at Party-Plenum

In the initiation of Mr. Shreerendra Pokhrel, urine was collected during the Maoist Plenum held in Palungatar, Gorkha. Urine was collected of over 6,000 cadres and leaders attending the sixth extended meeting of the Unified Communist Party of Nepal (Maoist) in Palungtar, Gorkha. There were more than 200 toilets constructed, costing Rs 500 (US$ 7.10) each for the meeting, which started on November 21, 2010. There were 300 funnels and jerrycans to collect urine. Collected urine were transported to Chitwan district and applied in the field. This idea of Mr. Pokhrel were highlighted by national Medias and it was matter of discussion among the people in tea-shops. It proved to be a good tools for creating mass awareness about the importance of urine.

Example 4: Urine collection at ODF declaration ceremony of Tanahun and Gorkha District:

Tanahun and Gorkha Districts are two adjoining districts in the Western Development Region of Nepal. Tanahun was declared as third Open Defecation Free (ODF) district on 18 July 2012 while Gorkha was declared ODF on 31st December 2014. There were 100s of people participating in the ceremony.

Photo: S. Pokhrel (Urine Collection in Jerry Cans)

The SEWA Nepal with financial support of different organizations had collected urine in both the events. About 500 litres of urine were distributed to the farmers.

4. CHALLENGES

These are only some of the examples of urine collection during the mass event and fairs. Many organization, Municipality office have started to collect urine from different fairs and festivals that occurs frequently in Nepal in different cities. These days Urine collection has become a fashion in every mass event. Mr. Shreerendra Pokhrel, famous as a urine harveter reaches in most of the mass events for urine collection.

Urine collection in the mass event have become a very successful in creating awareness of the people towards the value of the urine and that urine can be used as a fertilizer. Many people now have understood that urine can be used as a fertilizer and that it has a high content of nitrogen. However, very few people are practicing this (Poudel and Adhikari 2012).

Many EcoSan toilets contstructed for the public use got overwhelming response in the initial phase. However, after some months of operation are not maintained/used as expected. This is not just the case of EcoSan, this is the fate of most of the public toilets in Nepal. Recent baseline study carried by RWSSP-WN Phase II shows that out of 316 public and institutional toilets constructed in Phase I in western region of the country, 83% are currently in use. However, only 11% of the toilets demonstrate the perfect situation – they are used, clean and have water (RWSSP-WN-2015). Both general public toilets and EcoSan models are facing the similar types of management problems.

Collection of urine during the mass events are facing numerous challenges. Providing space for urination for 100s of people at a time, collection of urine, transportation, storage are some of the problems faced by the urine harvesters. Sometimes, urine are collected and the nearby communities hestitate to use the urine so it has to be transferred to a distant which increase the cost of transportation. Application of stored urine is also a challenge because many farmers do not easily accept to use it.
Many organization have supported to cosntruct urine diverting public EcoSan toilets. Many people are convinced about the benefits of urine use and there are huge demand of public toilets as the country is surging ahead to achieve universal sanitation by 2017. Yet, scaling up these systems in the country faces huge psycho-social, technical and capacity constraints.

Toilet pans made of Fibre-glass are less durable, unattractive and have many technological problems like blocking of urine draining pipe, breakage of pans and urine bowls etc. Many people still hesitate and others feel strange to eat vegetables grown with urine fertilizer. In many places there is social stigma towards using urine as fertilizer. However, positive attitude towards the use of urine as fertilizer is rapidly increasing in farming communities.

Cattle urine is included as organic material in Nepalese Standard of Organic Certification but human urine is not mentioned.

5. WAY FORWARD:

Still 30% Nepalese lack access to toilets. So, there is an adequate space for scaling up EcoSan toilets in the potential communities across the country. Consumer's growing concern towards organic agricultural products could also create a solid foundation for promoting EcoSan toilet and utilizing human excreta as a fertilizer for vegetables. And dry EcoSan toilets could be a good option for water scarce areas in the context of climate change.

On large scale, urine can be collected from the toilets at public places such as hotels, bus parks, schools, theaters, public toilets etc. and used in parks and agricultural fields. Municipalities need

policies and programs for large scale collection, storage and use. Since handling and use of large volume of urine is difficult there is a need of some improvement in technology for collection, storage and application.

Ecological toilets and urine collection systems can be a good option for the natural disasters like earthquakes and floods. Recent earthquake in Nepal, has given a lesson that we need to make plans for proper management of urine and feaces during the disasters when large number of people sit crowded in tents or are evacuated in in safe places.

There are no scientific studies in Nepal about the safety of the users using urine collected from the public places and the mass event. It would be easier to convince people if we could prove scientifically that the urine collected are safe to handle and use. And there is a need to include human urine in the certification system as an organic material.

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Biography

Mr. Bipin Poudel, with a masters on environmental science, is a young researcher and a practitioner in the field of environment, sanitation and EcoSan in Nepal. He has been working, since March 2008, in the field of environment, sanitation and Ecosan. He had coordinated the national level research on EcoSan conducted in 2009 and also has co-authored EcoSan promotion guideline published by the Government of Nepal and presented papers in National and International Conferences. Previously he had worked with the Department of Water Supply and Sewerage, Government of Nepal and he is currently working with Nepal Climate Change Support Program.

Mr. Kamal Adhikari

Born in 1967 A.D and holding Masters Degree in Anthropology and Bachelor's Degree in Law and Mathematics, Mr. Kamal Adhikari, is one of the founder promoters of ecological toilets in Nepal. He has been contributing to policy formulation, research works, knowledge management and capacity development. He has obtained training on ecological sanitation from Sweden in 2009. He is a co-author of guidelines on ecological toilet produced by the Department of Water Supply and Sewerage (DWSS). He has been working as a sociologist with the DWSS. He is the author of the book titled Sanitation in Nepal: Past, Present and Future 2012.