REPORT & RECOMMENDATIONS
FOR

2ND DUDES-SNV-JSC JOINT ASSESSMENT
for Three Small Towns in Bhutan
Chhukha district – Tsimasham, Tsimalakha and Gedu Towns
SANITATION AND HYGIENE FOR ALL – SMALL TOWN PROGRAM

(17-26 AUGUST 2011)

SNV
Connecting People's Capacities

JSC
Japan Sanitation Consortium
APWF KNOWLEDGEHUB
Solving sanitation issues in the Asia-Pacific

ACKNOWLEDGMENTS

The second assessment of the three towns of Tsimasham, Tsimalakha and Gedu under Chhukha Dzongkhag was jointly carried out by Department of Urban Development and Engineering Services (DUDES), Netherlands Development Organisation (SNV) and Japan Sanitation Consortium (JSC). This second assessment report represents the development of interventions and operationalisation of the Sustainable Sanitation and Hygiene for All (SSH4A) in Small Towns for ALL Programme. It is based on the first stakeholders meeting with Dzongkhag and Municipal officials, institutions, private individuals, site visits, other discussions and observations. DUDES and SNV will use relevant components of the report in the development of the programme.

The team would like to thank Mr. Rinchen Dorji, Director, DUDES for the guidance he provided to the team and making available his staff time for the second assessment in the person of Ms. Dechen Yangdon. The team would like to acknowledge all the cooperation and support received from the Dzongkhag Administration of Chhukha, Municipal authorities of the three towns the team visited, participants from the three towns (building/shop owners), School authority of Chhukha Higher Secondary school and college authority of Gedu College of Commerce and Business Studies, National Environment Commission and the City Corporation of Thimphu.

ACRONYMS

ADB: Asia Development Bank
ADPO: Assistant District Planning Officer
BPC: Bhutan Power Corporation Limited
Dasho Dzongda: Dzongkhag Administrator
Dasho Dzongrab: Deputy Dzongkhag Administrator
DHO: District Health Officer
DUDES: Department of Urban Development & Engineering Services
Dzongkhag: District
JSC: Japan Sanitation Consortium
MoH: Ministry of Health
MoWHS: Ministry of Works & Human Settlement
NEC: National Environment Commission
O&M: Operation & maintenance
RGoB: Royal Government of Bhutan
SNV: Netherlands Development Organisation
TCC: Thimphu City Corporation
UISD: Urban Infrastructure Service Division

TABLE OF CONTENTS **PAGE**

ACKNOWLEDGMENTS..... **2**

ACRONYMS..... **3**

INTRODUCTION..... **5**

1. SCOPE AND METHODOLOGY..... **6**

2. FINDINGS..... **7**

2.1 ON-SITE SANITATION – SEPTIC TANKS..... 7

2.2 GREY WATER DRAINAGE..... 14

2.3 OFF-SITE SANITATION – SEWAGE TREATMENT PLANT IN GEDU..... 15

2.4 FURTHER FINDINGS..... 19

2.4.1 Consultation with Communities..... 19

2.4.2 Search for Potential Sludge Disposal Sites..... 20

2.4.3 Learning from Septage Management in Thimphu..... 20

3. RECOMMENDATIONS..... **23**

3.1 SEPTIC TANK IMPROVEMENT..... 23

3.1.1 General Recommendations to Improve Septic Tank Structure and Treatment Efficiency..... 23

3.1.2 Water Usage with Toilets..... 23

3.1.3 Sludge Management..... 24

3.1.3.1 Sludge Collection and Transport..... 24

3.1.3.2 Sludge Treatment: Methods and Disposal Options 25

3.1.3.3 Septage Management: Service Organization..... 28

3.2 SEWERAGE SYSTEM..... 29

3.2.1 Revival of the Sewage Treatment Plant in Gedu and Consideration for Future Expansion..... 29

3.2.2 Consideration for Sewer System Implementation in Tsimasham/Tsimalakha..... 32

3.3 IMPLEMENTATION OF PUBLIC TOILET FACILITIES..... 32

3.4 IMPROVEMENT OF THE DRAINAGE SYSTEM..... 32

3.5 MANAGEMENT STRATEGIES FOR UNTREATED WASTEWATER DISCHARGE 33

4. NEXT STEPS..... **33**

ANNEX A **TOR FOR JSC 2ND TECHNICAL VISIT – 17TH- 26TH AUGUST 2011**..... **35**

ANNEX B **SUSTAINABLE SANITATION AND HYGIENE FOR ALL – SMALL TOWNS**..... **41**

ANNEX C **MEMBER LIST OF DZONGKHAG ADMINISTRATION OF CHHUKHA DZONGKHAG MEETING**..... **43**

INTRODUCTION

The 1st joint assessment mission between DUDES-SNV-JSC has been conducted from 8 to 17 May 2011, as an initial step for the development of the Sustainable Sanitation and Hygiene for All – Small Town Programme, aiming to enhance access to improved environmentally safe sanitation and improved hygiene practices for 9,500 people in 3 small towns in the Chukka district by mid-2013 (Annex B). For this new programme, three small towns of the Chhukha district have been selected: Tsimasham, Tsimalakha and Gedu. Following this assessment mission, a report has been made, submitted, and discussed with MoWHS-DUDES and later with the Chhukha district, during the 1st stakeholder meeting held on 18 August 2011. From the comments and opinions that have been expressed, a list of priority targets have been agreed, which served as the base for the 2nd assessment mission, organized from 17 to 26 August 2011 (please refer to TOR in Annex A). The key activities to follow up in terms of addressing the recommendations were:

- Contribute to the stakeholder workshop in collaboration with SNV, MoWHS and the Chhukha district in terms of developing a list of priorities and prioritized areas in towns for sanitation improvement and prepare a Work Plan, including sanitation targets and a schedule for implementation
- Assess how to organize septage management, including the financing, regulation and selection of sites for treatment and the feasibility of involving the private sector
- Understand in further detail the actual legal and institutional structure for sanitation
- Provide technical advice to the team in terms of the planning of sanitation mapping to be undertaken as part of the baseline process in September 2011

Apart from the field assessment, two meetings with local communities, including shop keepers and building owners have been organized to gather information on their sanitation conditions and issues they might face, as well as their willingness to pay for sanitation and more specifically for septage management.

After the field assessment, a final meeting was organized with the Chhukha district authorities, and a few days later at MoWHS-DUDES, to present the findings and recommendations of this second assessment mission, collect opinions and more detailed information on the desired way to tackle the priorities agreed for the Sustainable Sanitation and Hygiene for All – Small Town Programme.

In addition to the field assessment, the way in which septage management is conducted in Thimphu has been observed to gather information, build on the strengths of the existing system and learn from potential issues for the organization of septage management in the three targeted towns of the Chhukha district.

1. SCOPE AND METHODOLOGY

Team Members:

- Mr. Kinley Penjor, WASH Advisor, SNV
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- Mr. Pierre Flamand, Survey Staff, JSC

From the priority targets agreed in the stakeholder meeting held on the 18 August 2011, this 2nd assessment focused on measures to protect public health. This more specifically includes the preparation of septage management and how can be integrated other wastewater management systems, such as the sewage treatment plant in Gedu, or systems to overcome the lack of wastewater management for example in informal settlements. As in the 1st assessment mission, one of the goals of this mission was to propose different options for on-site sanitation improvement, which comprise alternatives to conventional piped sewerage.

More specifically, the following activities were conducted:

- 2nd assessment for sanitation improvement in three small towns – Tshimasham, Tsimalakha and Gedu – as part of the Sustainable Sanitation and Hygiene for All – Small Town Programme, supplemented by visits to different sites and meetings in Thimphu
- Meeting with the Dzongkhag administration of Chhukha Dzongkhag which consisted of Dasho Dzongrab, municipal engineers, head of environmental division and legal, building inspectors, and district health officer (refer to Annex C). Consultation meetings with community leaders, building owners and shop keepers. Other visits in Thimphu, included meetings with MoWHS-DUDES, delegates from the National Environment Commission , and Thimphu City Corporation (meeting with the heads

of the Sewerage and Water Supply Sections, and observation of desludging operations)

- Visits to assess available options for sludge disposal: the Alikha incinerator in Gedu and other potential sites in Gedu and Tsimasham. Interview with operators of sewage treatment plants and from the Thimphu City Corporation
- Two meetings with building owners and shop keepers organized in Gedu (20 August 2011) and Tsimalakha (22 August 2011)[1]
- Visits to households, including informal settlements and college hostels/accommodations
- Visits to institutions: the Tsimalakha Hospital, shops, restaurants, offices, the Chhukha Higher Secondary School. Interview with householders, shops keepers, restaurant owners, a school principal and vice-principal, and doctors
- Review of documentation on sanitation edited by the Royal Government of Bhutan (including the Water and Sanitation Rules, the Code of Practice for Sanitation, the Annual Health Bulletin 2010, the Environmental Discharge Standard 2010, and the Solid Waste Draft), and standard designs used for the construction of septic tanks in new buildings
- Gathering of available maps for Tsimasham, Tsimalakha and Gedu (including plans made by town officials during the 1st Stakeholder Meeting)

2. FINDINGS

2.1 ON-SITE SANITATION - SEPTIC TANKS

In the preparation process for the implementation of septage management, one of the targets of this 2nd mission was to further assess septic tanks and visually check the level and type of sludge accumulated. The first step of this assessment was to obtain the standard design that is used by district and municipal engineers to check and approve the design of the septic tanks that will be constructed with new buildings. This verification enabled our team to understand that, except for the 150 users-type, the capacity for the different scales of septic tanks is insufficient. In the field, the visualization of the plan of a septic tank built with a new construction in Gedu also indicated that the structure design was different than

[1] There were approximately 40 participants including 5 females from Tsimalakha/Tsimasham towns, and about 20 participants including 7 females from Gedu town.

what has been presented by the engineers in Chhukha. Indeed, the plan showed a septic tank with two compartments, contrasting with the standard design provided in Chhukha which included one small baffle wall. The number of users noted in the plan – thirty-five – was also not recorded among the standard number of users in the plan provided by the Chhukha authorities (although the constructions in Gedu are supervised by the same Chhukha district and municipal engineers/building inspectors). On the other hand, our calculation indicated that the capacity of the septic tank was far too small to serve thirty-five users. This highlights the need for standardizing septic tank design and making sure that all new constructions follow rigorously the same standards. This also adds to another issue that has regularly been mentioned to our team, which is the difference between the approved design (from the municipal engineer) and what is actually constructed. Due to the lack of remaining space in house plots, it appears that the implemented septic tanks are often smaller than they should be.

Figure 1: Standard design for septic tanks in Chhukha district

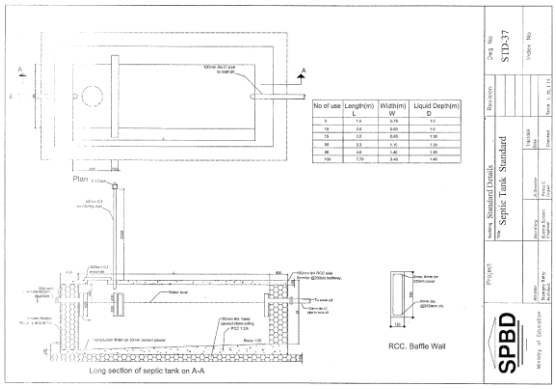


Figure 2: Septic tank design for a new building in Gedu

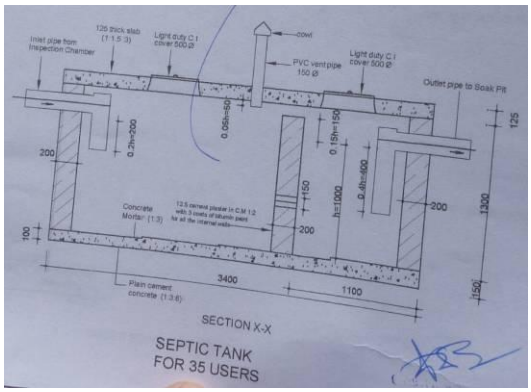


Table 1: Comparison between actual capacities of septic tanks and recommended capacities

Number of users	Actual capacity	Recommended capacity
5	0.56 m³	1.5 m³
10	0.90 m³	2 m³
15	1.4 m³	2.5 m³
20	2.0 m³	3 m³
50	4.5 m³	6 m³
150	16.6 m³	16 m³

Many of the septic tanks seen in the field could not be checked. Either the structure did not allow any visual inspection (e.g. a parking lot was constructed above one of the septic tanks), or the facilities were at a location difficult to access, sometimes even impossible, due to the steepness of the land or due to the presence of abundant vegetation.

Figure 3: Difficult access to septic tanks

In most of the tanks that could be observed, sludge was accumulated up to the manhole cover level, even, for example, for a house that has been occupied for only six months.

Figure 4: Accumulated sludge in septic tanks

Among the septic tanks opened and visually checked, one tank stood as an exception. The first compartment did not contain any sludge but a rather high ratio of liquid. It was found out that the sludge did not remain in this compartment and the lay of scum was rather thin. Different reasons could explain this result. Firstly, it has been observed that cistern flush toilets contain a rather high quantity of water (approximately 15 liters). Consequently, this, combined with the small size of the compartments inside the septic tank, prevents sludge from settling in the bottom of the tank and results in sludge being discharged with the effluent. The amount of sludge found in the discharge pipe of this tank, blocked at the time of the inspection, confirmed the theory that part or more of the sludge is discharged with the effluent. In addition, discussions with the householders indicated that toilets are in some cases used to dispose the water used for laundry. Even if it is unclear whether this is a widespread practice or not, this excess of water combined with the small capacity of the

septic tank can potentially increase the phenomenon of sludge not settling inside the compartments. In that case, it would be useful to reduce the quantity of water stored in cistern flush toilets, and to educate communities on the proper usage of water with toilets.

Figure 5: Opening of a sealed septic tank

Figure 6: Absence of sludge observed in one septic tank

Figure 7: Discharge pipe of septic tank with accumulated sludge (unclogged by the assessment team)

One of the issues found in the field was that it was particularly difficult to locate or see the discharge pipe of the septic tanks, whether they were connected to a leach pit/soak pit or not. In fact, the discharge pipe is very often buried into the ground and impossible to access. This prevents from assessing the discharge effluent and checking water quality, and makes maintenance operations difficult when the discharge pipe is blocked. As for the few discharge pipes that could be inspected visually, the diameter appeared small, which can

potentially lead to regular blockages.

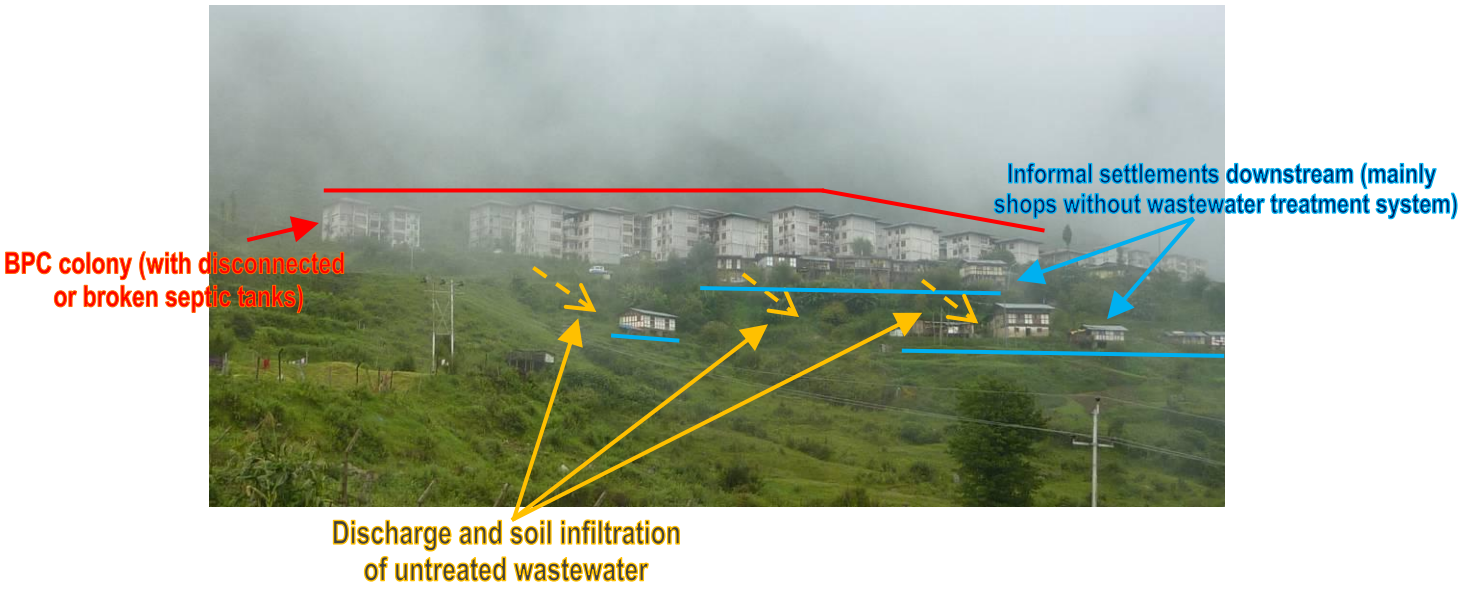
The three towns that were assessed for the programme have different profiles. Due to its strategic location on the highway connecting Thimphu to Phuentsholing, Gedu is a town with many shops and restaurants connected to a septic tank. The same conditions apply to Tsimasham; the lower town of Chhukha (to be officially recognized as a municipality by the parliament of Bhutan in the near future). However, Tsimalakha, the upper town of Chhukha, shows a very different profile with an important number of informal settlements (mainly shops) and households that are not connected to a septic tank or any wastewater treatment system.

Figure 8: Households and shops in Tsimasham

Figure 9: Shops in Gedu

Figure 10: Households in Tsimalakha not connected to a wastewater treatment system

Figure 11: Discharge of untreated wastewater in Tsimalakha



The most worrying areas were found in the BPC colony and the downstream settlements, and a few households closely located to the Chhukha Higher Secondary School. Unsanitary conditions – associating not only wastewater management but also solid waste management – were observed at the BPC colony with buildings connected to overloaded and overflowing septic tanks, or not connected at all (broken connections). This results in untreated wastewater from toilets (black water) being discharged somewhere between the BPC buildings and the settlements at close location downstream (only separated by a road).

Figure 12: Unsanitary conditions at the BPC colony (Tsimalakha)

Figure 13: Opening of septic tanks in Tsimalakha (BPC colony)

Figure 14: Overload of sludge in septic tank

Figure 15: Empty septic tank

Figure 16: Broken connection between a BPC building to a septic tank downstream

In some areas of Tsimalakha, grey water flowing from the BPC colony was also found passing next to few households located downstream, adding health threats to this hazardous situation (it has been indicated to our team that this area is where most of the diarrhea cases are accounted in Chhukha).

Figure 17: Passage of grey water from the BPC colony through downstream settlements

Figure 18: Repair of leak in water supply pipe

A few houses located upstream of the Chhukha Higher Secondary School also were of concern, as none of these were connected to a wastewater treatment system and were having untreated wastewater infiltrating the ground despite close vicinity to the school. This is a serious public health problem that could have a significant impact on students' health, as

the water supply network passing in this area can get contaminated if water pipes leak.

Figure 19: Houses without septic tanks upstream Chhukha Higher Secondary School

Figure 20: Chhukha Higher Secondary School

Figure 21: Distance between upstream houses and Chhukha Higher Secondary School

The next steps for assessment will be to precisely map all the septic tanks of the three targeted towns, and to collect information about their capacity, the number of users, the connection to a soak pit or other ground filtration system (if applying); to check where is discharged the effluent, where it goes as well as grey water, and assess potential impact to water users located downstream. Another target will also be to monitor the water quality of septic tanks effluent and to analyze samples of surface water and water supply taken from different areas of the towns.

2.2 Grey Water Drainage

It has been observed in some areas of Tsimasham and Tsimalakha that, due to faulty drains, grey water was sometimes passing through the garden of houses or stagnating next to few households located downstream. For example, and as explained previously, grey water regularly flows across a few shop keepers' houses located downstream the BPC colony. This is naturally a potential health threat to the populations living nearby, especially children. Consequently, drains in the three targeted towns of the programme need to be thoroughly checked to ensure that grey water is properly collected and drained, as well as stormwater

during rainfall events.

Figure 22: Improper drainage of grey water

2.3 Off-Site Sanitation - Sewage Treatment Plant in Gedu

Figure 22: Plan of the sewage treatment plant in Gedu

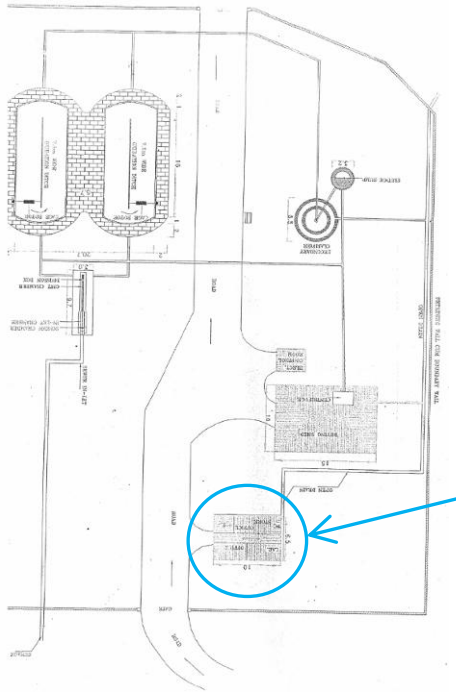


Figure 23: View of the sewage treatment plant

The sewage treatment plant of Gedu was implemented to serve the buildings built for the Tala Hydropower Project infrastructure. Currently, this system covers the student accommodations, the hospital of Gedu and the Gedu College of Commerce and Business Studies. This plant is not a municipal property and has been handed over to the Gedu College when the organization in charge of the Tala Hydropower Project stopped managing this facility and its associated sewer network.

Figure 24: Inlet of the sewage treatment plant

Figure 25: Student accommodations in Gedu (connected to the sewage treatment plant)

Figure 26: Accumulation of toilet waste due to blocked sewer pipes

Figure 27: Grey water overflowing from inlet

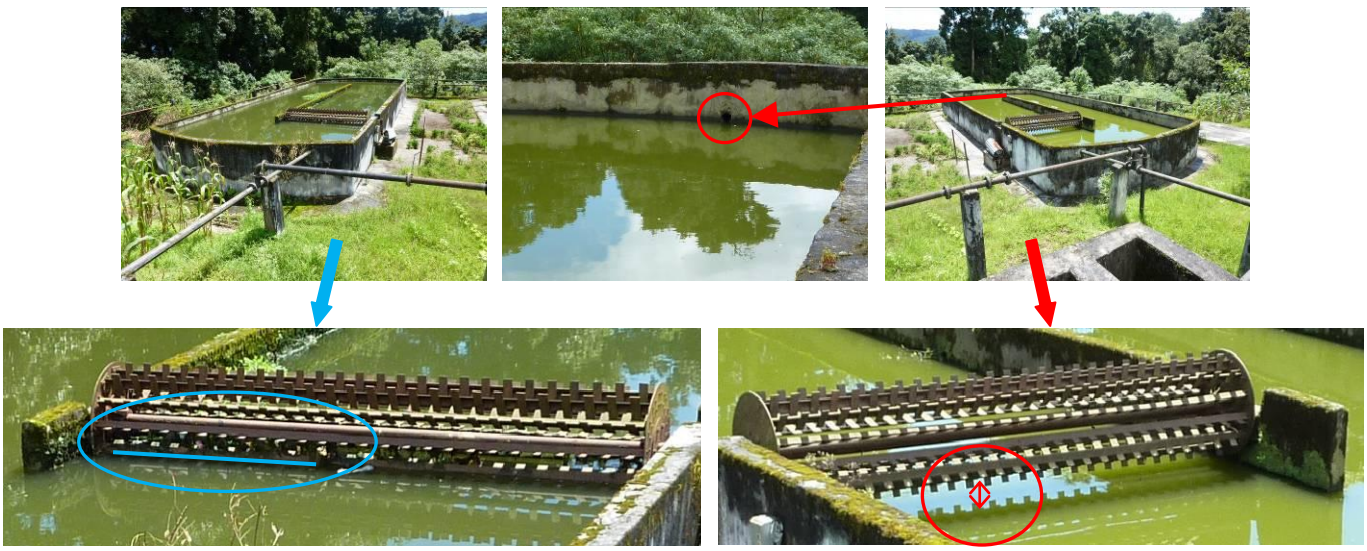
Figure 28: Sewer inspection chambers blocked due to the absence of maintenance

While the current number of users is unclear and will need to be further assessed (probably much more than 1,000 users as the College itself gathers 1,500 students), wastewater is presently not reaching the plant. Although a detailed assessment of the sewer network will be needed to identify why wastewater is not conveyed to the plant and where it goes, a discussion with local communities indicated that some of the inspection chambers of the

sewer network were blocked with garbage. These inspection chambers were previously maintained by the staffs of the Tala Hydropower Project but nobody has continued this work since they left (about two years ago). A visual check of one of the inspection chambers confirmed this statement. In addition, a visit to student accommodations also showed that sewer pipes were blocked, as toilet wastewater was accumulating in the sewer outlet next to the building. It is urgent to find where goes the wastewater of the buildings connected to the sewage treatment plant, as this poses a serious health threat to the population. It is crucial to thoroughly assess the sewer network to evaluate the state of the pipes, identify and repair damaged pipes, if any.

All electrical equipment of the sewage treatment plant has been tried out and is in working condition (i.e. the rotors of the two oxidation ditches, the scraper bridge of the sedimentation tank, and the dewatering machine). However, some parts of the plant would need repair, such as one of the oxidation ditch structure – showing cracks from wear – and the leaking pipe connecting the sedimentation tank to the dewatering machine. Furthermore, as the plant has not been used for the last two years, it would be beneficial to conduct a thorough maintenance check of the whole facility.

Figure 29: Issues with oxidation ditch design (below right)



A more detailed assessment of the plant showed issues that will require construction work, maintenance and repair. Firstly, one of the oxidation ditches has a problem that originates from the design of the plant. Indeed, the outlet pipe of the ditch connected to the sedimentation tank has been constructed at a too low level (see above). For that reason, the

rotor is not in sufficient contact with wastewater when operated and does not effectively aerate it. Another (less critical) design issue concerns the overflow weir of the sedimentation tank, which is not entirely flat. Consequently, during operations, wastewater overflows mainly from the two parts that are located at the lowest elevation, thus decreasing the time for sedimentation and the quality of treatment. Measures to improve wastewater treatment quality will be explained in the recommendation part.

Figure 30: Actual screening system at the sewage treatment plant

Figure 31: Irregular flow removal at the periphery of the sedimentation tank

Figure 32: Maintenance issue with the dewatering machine

Figure 33: Cracks in the structure of one oxidation ditch

During this 2nd assessment mission in Bhutan, local communities in Gedu and MoWHS expressed their interest in increasing the sewer connections and in serving the rest of the town with the sewerage system. In order to do so, the existing wastewater treatment capacity would naturally need to be developed. Therefore, along with the visit of Gedu's sewage treatment plant, a visual assessment was made to estimate if the existing plot of the plant and the available space around would be sufficient to accommodate the construction of a new sewage treatment plant next to the existing one, or the disassembling and the construction of a new plant with increased capacity on the site of the existing one. In both cases, it appears that enough space would be at disposal.

2.3 FURTHER FINDINGS

2.4.1 CONSULTATION WITH COMMUNITIES

Figure 34: Meetings with shop keepers and building owners in Gedu and Tsimalakha

A meeting with building owners and shop keepers has been organized in Gedu (20 August 2011) and in Tsimalakha (22 August 2011). The main goals of these meetings were to know communities' opinion about septage management and evaluate their willingness to pay a regular charge for this service. They also allowed our team to identify other issues than the ones observed during the assessment in the field. About forty participants from Tsimasham/Tsimalakha, including five women, gathered in the meeting in Tsimalakha; and about twenty participants, including seven women, attended the meeting in Gedu.

In Gedu, the communities showed a strong desire to be connected to the sewerage system, as they do not know how to handle the problems experienced with their septic tank which sometimes emits odor, overflows and is the cause of disputes between neighbors. They are willing to pay for the expansion of the sewerage system (up to 40 to 50,000 ngultrum) if the government provides assistance, as they cannot finance the system by themselves, and if this plan is sustainable in the long-term. However, they are also afraid of maintenance issues with the sewer pipeline, especially during the monsoon season.

For septage management and from what they have heard in Phuentsholing, they are worried that, even if they pay for septage management, the system would not function properly, for instance with the truck not coming on time. Concerns were also raised regarding the fact that the charge for such system might grow with the increase of the gasoline price.

Finally, the communities mentioned that they did not have much awareness on hygiene and sanitation, but that if they would be provided the opportunity, they would be willing to learn.

Tsimasham/Tsimalakha communities also mentioned about the problems encountered with their septic tank (overflow, odors, etc.) and their incapacity to solve them. Some of the people attending the meeting said that they sometimes employ Indian workers to empty their septic tank when full.

Although communities were not against the idea, the charge for septage management was one of their worries, as they mentioned that they would not be able to contribute as much as communities do in Thimphu or Phuentsholing. As Gedu, they also expressed some interest for sewerage but in a less determined manner.

During this meeting, shop keepers from Tsimasham requested the construction of public toilets to lower the load on their own facilities. Numerous questions on how sludge would be treated showed communities interest in the organization of septage management. Among the options that have been introduced, they were really enthusiastic about the utilization of compost sludge as a fertilizer.

2.4.2 Search for Potential Sludge Disposal Sites

Potential sites for sludge disposal have been searched and visited in Gedu and Tsimalakha/Tsimasham. Among the places that have been observed, the topography and difficulty of access of some sites were obvious challenges. One site in Gedu and in Tsimasham had an access road, and only the site in Tsimasham had a flat land and the potential for receiving a sludge treatment facility without heavy preliminary construction work.

2.4.3 Learning from Septage Management in Thimphu

To prepare the organization of septage management in Gedu, Tsimasham and Tsimalakha, the SNV and JSC teams visited the Thimphu City Corporation in charge of on-site and off-site sanitation management, as well as water supply, in the capital city. A consultation meeting with the heads of the Sewerage and Water Supply Sections indicated that about 70% of the population in Thimphu is connected to a septic tank and 30% to the sewerage system (100% to the water supply network equipped with water meters). The sewer user charge, which is applied to the buildings connected either to the sewerage system or to a septic tank, is collected together with the water bill and accounts for 50% of it. This cost of this charge is based on water consumption. It entitles each septic tank to be emptied once a year (up to three trips) without extra charge. If more trips for desludging are requested, they

are charged 1,000 ngultrum per trip. As an example, it has been cited that for a septic tank of a capacity of 20 m³, the user charge is on average 120 ngultrum per month. The collected charge, revised annually, was reported to be sufficient to cover the costs for operation and maintenance. No visual check of the septic tanks is conducted as a maintenance routine operation by the City Corporation. When their septic tank is full (often noticed due to an excess of odor or the overflow of wastewater from manhole covers), customers come to the City Corporation and fill a form requiring the desludging operation. As many people request to empty their septic tank and to further improve this service, which seems to be functioning rather satisfactorily, a customer service will be created to manage demands in the near future.

For sludge collection, three trucks are at the disposal of the Thimphu City Corporation: one vacuum tanker (6 m³ capacity) and two cesspool trucks (3 m³ capacity). Maintenance of these vehicles seem to be an issue, as it has been mentioned that the trucks had often to go to the repair shop with apparently one maintenance issue occurring every two weeks. This is obviously a significant obstacle for the management of the service (on the day of the visit, one truck was away for repair).

Figure 35: Septic tank before desludging operation in Thimphu (visible wastewater overflow)

Figure 36: Desludging operation

Figure 37: Improper equipment (shoes) during desludging operation

Figure 38: Discharge of collected sludge in a sewer manhole

Figure 39: Potential danger with traffic after discharge operations

For a cesspool truck, two or three trips are usually needed to empty the septic tank of individual households (bungalow type), and five or six trips for buildings. On average, about fifty trips are conducted each month. For our team, following the desludging operation of one building proved to be an instructive experience. If the number of operators present for this work was quite sufficient (three operators in addition to the driver), their equipment was less satisfying. Despite wearing a uniform, operators did not wear work shoes, gloves or other safety equipments (only one operator was wearing a mask). Although three trips were made, desludging operations went quite smoothly. However, it is regrettable that the desludging service compulsory with the sewer user charge paid monthly (without extra charge if done once a year) is only limited to three trips. For the observed building, three trips were not enough to empty the septic tank and, as the building owner was not willing to pay for an extra trip, the tank was left partly filled. Furthermore, what remained in the tank was the most solid portion of sludge, which is also the most contaminated one. By training operators, pumping technique could improve and sludge could be collected more effectively. After collection, sludge was discharged in a manhole of the sewer network located nearby the visited building. This operation did not cause any issue. Nevertheless, for safety reason with road traffic, one operator could stay on-site during the duration of the discharge operations, as the manhole cover remained open and one pipe used for sludge dumping also was left on the street.

All these findings were important information that will help for the organization of septage management in the three towns of the Small Town Programme.

3. RECOMMENDATIONS

3.1 SEPTIC TANKS IMPROVEMENT

3.1.1 GENERAL RECOMMENDATIONS TO IMPROVE SEPTIC TANK STRUCTURE AND TREATMENT EFFICIENCY

For future building constructions, the capacity of the septic tanks designed for 5 to 50 users needs to increase. This would give more time for sludge to settle in the tank, thus preventing overflow when a high quantity of water is flushed away. This increase of capacity would also reduce the frequency of desludging operations and the load on the cesspool truck.

Treatment efficiency could be improved by increasing the number of compartments inside the septic tanks, and by ensuring that the approved standard design is not modified during construction. Depending of the number of users, the standard size of the septic tanks should be determined by regulation (to be created). This legal system would facilitate enforcement, including the use of financial penalty or the obligation to reconstruct the septic tank (information campaigns will be needed before strict enforcement) if the implemented tank is different that was has been approved by the district authorities.

Treatment efficiency could also be improved by adding a soak pit to the septic tanks. It is highly recommended to make this as a compulsory measure in areas where the level of water table is high or where a well can be found at a relatively close distance, and, more generally, for all future constructions.

3.1.2 WATER USAGE WITH TOILETS

To ensure that septic tanks are not overloaded with an unnecessary quantity of water – which can disturb the settling process of sludge in septic tanks with inadequate capacity – it would be beneficial to educate householders on the usage of water (where goes what and for what result, and awareness on how wastewater is treated and why), in order to avoid toilets to be used for the disposal of non-related water. This could be done through communication campaigns (posters, publication in newspaper, radio messages, workshops, etc.)

To reduce the quantity of water flushed into the septic tanks, it is recommendable to reduce the quantity of water stored in cistern flush toilets, for example by putting bottles in the cistern of existing toilets, and by modifying the design of future cisterns. In addition, it would

be beneficial to slightly elevate the level of squat toilets to prevent water from flowing into the toilet when using water for other purposes, such as cleaning.

3.1.3 SLUDGE MANAGEMENT

To improve health protection and reduce water related diseases, it is crucial to organize and manage septage management. When sludge accumulates too much in septic tanks, it lowers wastewater treatment efficiency and can partly be discharged with the effluent, while untreated wastewater can overflow from manhole covers. Both have negative impacts on the surrounding environment, and water contamination can occur, for example, if leaking water pipes are in contact with infiltrating wastewater in areas where there is overflow from septic tanks or where wastewater is discharged without treatment.

3.1.3.1 SLUDGE COLLECTION AND TRANSPORT

Figure 40: Cesspool truck recently acquired for desludging operations in Tsimasham/Tsimalakha

To manage sludge in an environmentally safe manner, regular sludge collection, transport and treatment need to be organized. To collect and transport sludge, Tsimasham/Tsimalakha towns have recently acquired a cesspool truck, which has not been utilized yet but is ready for use. Except in Phuentsholing, this is the only vehicle available to collect and transport sludge in the Chhukha district (Gedu has no cesspool truck at disposal). Few options for sludge collection and disposal have been discussed with local authorities. This consultation considered the use of the existing cesspool truck to cover both Tshimasham/Tsimalakha and Gedu. However, we would not recommend this option, as the transport from Tshimasham/Tsimalakha to Gedu would consume too much time, be expensive and uncertain due to road conditions, for instance, during the monsoon season. It is preferable to acquire a new cesspool truck for Gedu or reassign the truck for certain months. In addition, to improve the service quality and enable regular desludging, another

vehicle in both Tshimasham/Tsimalakha and Gedu might be needed, depending on sludge collection frequency to cover all the towns, the number of trips needed to empty each tank, and the total volume of sludge to treat, dispose or reuse.

Gedu and Tsimasham show comparable conditions: high coverage of septic tanks, which can sometimes be difficult to access. Pumping issues can also occur if the elevation level between the access point of the cesspool truck and the septic tank is too different (probably not higher than 6 meters). For this situation, sludge will need to be removed manually with a manual desludging hand pump (to acquire).

Tsimalakha shows a different profile with many buildings not connected to a septic tank. This mainly concerns settlements that are considered illegal, but not only. For example, some households were sometimes built without any wastewater treatment system, such as the few houses located near the Chhukha Higher Secondary School. In the upper part of the town, the BPC colony is supposed to be connected to septic tanks, but most of them are not functioning (connecting issues). These problems need to be solved before considering septage management. To improve the situation at the BPC colony and limit the negative impact for the households located downstream, it has been mentioned during the debriefing meeting, held at the Chhukha district on 23 August 2011, that the Chkuha district authorities would call a meeting with leaders of BPC, to ask them to repair the broken connections and improve the general sanitary conditions in their colony.

Finally, another issue related to sludge collection concerns the opening of manhole covers, which are generally sealed. Manhole covers should not be sealed after desludging operations to facilitate septic tank maintenance inspection (for example, to assess when septic tanks are full before they overflow) and shorten the time of sludge collection. The access to the septic tanks should also be eased wherever possible.

3.1.3.2 Sludge Treatment: Methods and Disposal Options

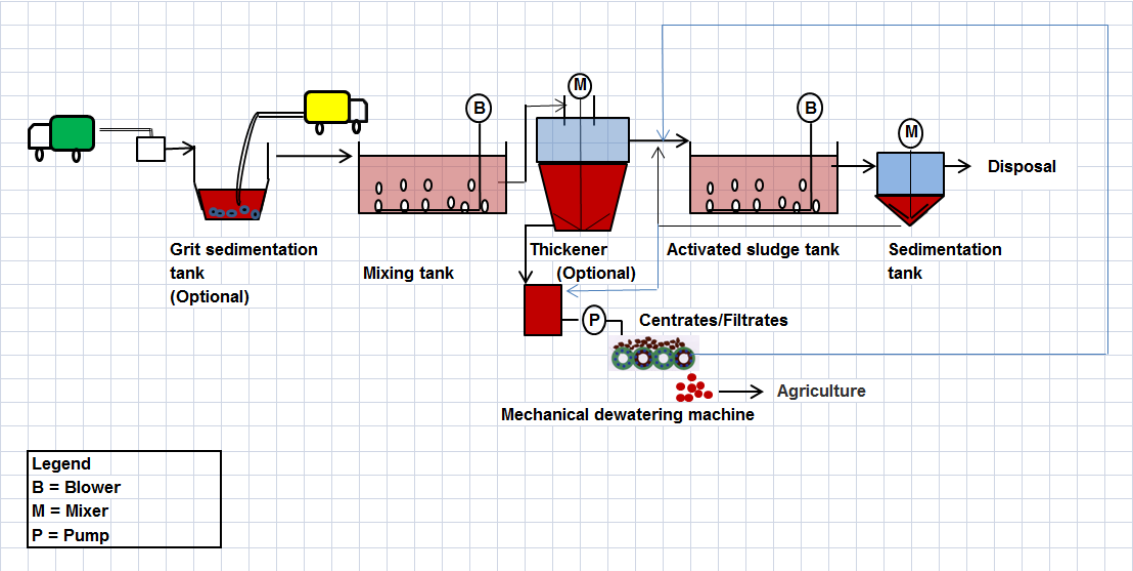
The options for sludge disposal slightly differ between Tshimasham/Tsimalakha and Gedu.
In Tshimasham/Tsimalakha, three options can be considered:

1. To construct a new sludge treatment plant. This option offers high performance of treatment and can reduce BOD level to 10 mg/L. However, this option is also the one that requires the highest investment/capital cost, including design and construction.

Municipal staff for O&M would also need to be recruited and trained. To implement such facility, land would be needed. A possible location has been found below Tsimasham called the 'Old Dog Pond Site', already accessible by road and having enough space for receiving such facility; space that can even be enlarged if needed.

Figure 41: Potential sludge disposal site in Tsimasham ('Old Dog Pond Site')

The following diagram shows the proposed treatment process for the sludge treatment plant:



2. To construct a site for sludge compost, including sludge dewatering and drying processes. This involves the construction of two sludge drying beds (each one to be used alternately with the other, when full) installed inside an open-air building with roof and concrete floor. During the dewatering process, the excess water can be drained from the concrete floor and brought to a septic tank for anaerobic treatment and discharged to a soak pit for final ground filtration. If there is no septic tank available, the

excess water can also be discharged into the soil under the condition of not having any settlement nearby, especially downstream. After the dewatering process, the same site can be used for sludge drying, after having mixed manually sludge with rice straws or other organic materials. Sludge compost could be used as a fertilizer for farming activities.

This is an option that received favorable opinions during the meeting with local shop keepers and building owners. If not totally used, sludge compost can also be disposed by landfilling.

3. To construct a site for sludge disposal. This is the easiest and cheapest sludge disposal method. However, as this method includes ground filtration, settlements must not be at close location. This method involves the digging of holes where sludge will be dumped. To reduce pathogens to a level that does not pose health hazards, calcium oxide needs to be added after each dumping operation. Through this process, a smell of ammonia is likely to be noticed.

In Gedu, the same options can be considered. In addition, other options for sludge reuse or disposal are available with the sewage treatment plant and the Alikha incinerator. These are:

4. To bring the collected sludge to the sewage treatment plant which includes a dewatering machine and a sludge drying bed. Sludge can be composted in a similar way than explained in 2 and reuse as a fertilizer or, if not possible, disposed by landfilling.

5. To bring sludge to the Alikha incinerator for disposal. Although this option is feasible, it has two constraints: a) to allow good combustion, sludge needs to be dewatered and dried before inicineration; b) the Alikha incinerator is already overloaded with garbage coming from the colony of the Tala hydropower plant and the town of Gedu.

As the sewage treatment plant in Gedu would need some maintenance and repair in order to function properly, the option 3 can be used as a temporary measure until the plant is ready for operation. A favorable location for the disposal site was identified downstream to the plant where no settlement is constructed yet. However, the construction of a new road indicated that new settlements might be built in this area. Therefore, if this disposal site option is considered, further consultation will be required to confirm if this area is appropriate for sludge disposal or if it is necessary to identify another site further away from the town.

Figure 42: Potential sludge disposal site in Gedu (to be confirmed)

3.1.3.3 SEPTAGE MANAGEMENT: SERVICE ORGANIZATION

The ultimate goal of septage management is to set up a system that enables a regular emptying of septic tanks (sludge collection) before these get full. This system aims to prevent any intervention (e.g. phone call) from building owners or the persons in charge of the septic tanks. To organize such a system, it will be necessary to identify, as precisely as possible through sanitation mapping, the volume of sludge to be collected. Therefore, some time will be required, also to select and train the operators. At least two operators would be needed to conduct daily desludging operations with the cesspool truck. For safety reasons, it is recommendable to provide them with protective equipments, including a uniform that covers arms and legs, gloves, long shoes, and a mask. It is also advisable to ensure that these equipments are regularly cleaned and not brought home. Operators should be provided the opportunity and the facilities to have a wash and change clothes at the end of their duty.

For sludge collection and transport, a financing system will also need to be set up to ensure the sustainability of the business and favor a possible opportunity for the involvement of the private sector. This system should prevent users from paying for each visit of the cesspool truck to guarantee that the emptying of septic tanks does not get penalized by individual financing issues. However, until this system gets properly organized, sludge collection and transport can be done through an on-call service, in which people who urgently need to have their septic tank emptied can call and get this operation done. During this period and to promote the importance and quality of service, it would be positive and educational to conduct desludging operations without charging the population (especially as the consultation with communities showed their worry about the quality of service than can be provided, even if they regularly pay for it).

The financing of the charge for septage management needs to be discussed among local authorities. This could be collected from the water bill, if water supply is charged and if water meters are installed; through the local tax system or through a charge taking into account the number of users. Prior to decide the amount of the charge to be collected, it is important to thoroughly calculate all costs associated with daily operations, maintenance and future investment that will ensure the sustainability of the service. To identify the volume of sludge to collect and the frequency of desludging operations, the number of users for each septic tank will need to be precisely assessed as well as the water consumption/capita/day.

3.2 Sewerage System

3.2.1 Revival of the Sewage Treatment Plant in Gedu and Consideration for Future Expansion

A series of measures can be considered by MoWHS and the District to revive the sewage treatment plant in Gedu if the ownership is transferred from the college. However, the most urgent measure to take is to assess precisely why wastewater is not reaching the plant, what are the problems and what needs to be done to solve them. This assessment is critical as wastewater is probably stagnating or infiltrating the soil somewhere between the college and the sewage treatment plant; areas where concentrate many houses and businesses. Infiltrating wastewater poses a serious threat of contamination for the water supply network if it comes in contact with leaking pipes, whereas stagnating wastewater is also a threat for health, especially for children if there are nearby such area. Until the sewer network gets repaired, it is urgent to ensure that all wastewater from households and institutions gets collected and treated. For that purpose, the acquisition of a cesspool truck would be needed.

Different options are conceivable for the sewage treatment plant. Among the available options, one would be to revive/repair this facility and provide a few improvements (see hereafter for the detailed measures). Another option would be to increase the plant treatment capacity in order to cover the whole town. Consultation with local communities during the meeting with building owners and shop keepers held in Gedu (20 August 2011) indicated that people are willing to be connected (and also pay for it), thus extending the sewered area to the whole town. According to them, this would prevent future maintenance issues with septic tanks and be better in the long-term perspective. Increasing sewer coverage in Gedu is an idea that also caught the attention of MoWHS during this mission's debriefing meeting in Thimphu (26 August 2011), by contrast with what has been expressed

during the last meeting with the Chhukha district authorities (23 August 2011).

To increase the actual sewage treatment plant capacity, different options can be envisaged; such as disassembling the existing plant and construct a new one that would have the capacity to treat all the wastewater from the town, or build an additional plant next to the existing one. The location of the actual plant would provide enough space to enable the two options. However, before further considering the increase of sewer coverage or the best way to increase sanitation coverage – including a combination of on-site and off-site sanitation systems – it is necessary to gather precise data/information for the creation of a master plan that would enable such planning as well as technology selection. Among the information required, data on population, population density, area to be covered, water consumption/capita/day, influent water quality, a map including the topography and the location of buildings (1:2,500 scale), etc., need to be obtained in addition to a town developing plan which will show how and where the town and associated infrastructures will develop.

Along with this preparation, it is necessary to clearly establish who will have the responsibility for the maintenance of sewerage facilities, and create a body for operation and maintenance. The capacity to properly operate and maintain the sewerage system, for example as plumbing issues have been observed in many areas, might be a challenge. One of the important issues to address will be the training of the staff in charge of operation and maintenance. Another challenge will be the financing of the construction cost, including the cost for connection to the sewer network by individuals and institutions. Sewer user charges would also need to be discussed among local authorities and set up for cost recovery and future investments.

A third option would be not to repair the sewer network and to use the sewage treatment plant only for sludge treatment, as the treatment process is similar. Nevertheless, this option would imply the acquisition of a cesspool truck and the implementation of a wastewater treatment system (such as the septic tank) for the buildings that have been disconnected from the sewerage system.

The following measures are propositions for repairs and improvements for reviving and improving this facility.

1. Addition of a flow equalization tank: wastewater treatment is more efficient under

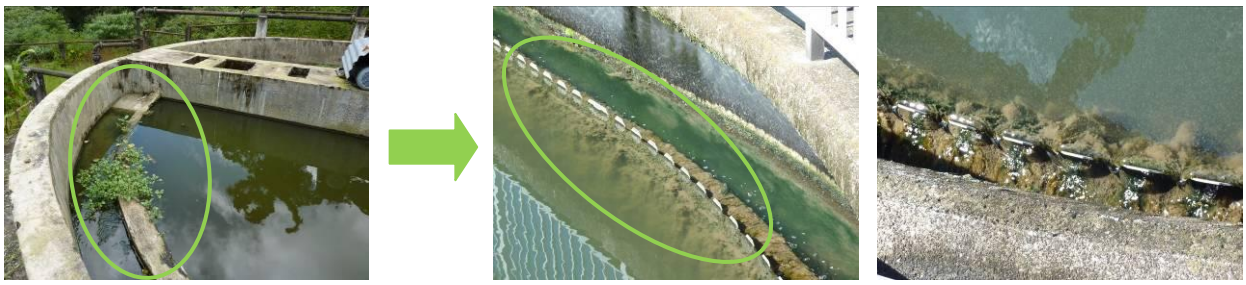
uniform flow conditions. Depending on the time of the day, wastewater volume differs. To ensure a regular flow of wastewater and a stable treatment even during flow peaks, it would be beneficial to install a flow equalization tank prior to the preliminary stage of treatment. This tank equipped with a pump would be used for temporary storage. When the volume of wastewater reaches a certain level in the tank, wastewater will be lifted by the pump and sent to the plant for treatment.

2. Screen improvement: it would be beneficial to improve the screens at the preliminary stage of treatment to improve the removal of large objects and to optimize solid removal. This would prevent damage further in the plant and improve the efficiency of the treatment process.

3. Oxidation ditch improvement and repair: to allow the rotor of the final oxidation ditch to be sufficiently in contact with wastewater, it will be necessary to either lower the rotor or raise the outlet pipe. The cracks visible in the structure of the same oxidation ditch will also need to be repaired.
   For the aeration process, the system would improve if an air diffuser device was added inside the two oxidation ditches.

4. Sedimentation tank structure improvement: To allow a uniform flow removal from the surface and avoid a too short detention time, the weir channel around the periphery of the tank should be at equal level. Further improvement could be obtained by modifying the design of the outlet weir and adding notches, holes, or slits along its length. The outlet zone should be designed to prevent short-circuiting of water and to allow only a top few centimeters of water to flow out from the sedimentation tank.

Figure 43: Appropriate outlet zone for uniform flow removal in the sedimentation tank



5. Improvement of dewatering process: dewatering process could be eased by mixing

sludge to a coagulant inside a tank to be added between the sedimentation tank and the dewatering machine. Finally, one of the pipes of the dewatering machine was leaking at the time of the visit and needs to be replaced.

3.2.2 Consideration for Sewer System Implementation in Tsimasham/Tsimalakha

As well as in Gedu, shop keepers and building owners in Tsimasham/Tsimalakha expressed their interest in being connected to the sewerage system in the future. This idea mainly comes from the facts that they are afraid of experiencing problems with their septic tank; problems that they would not know how to solve. They are also afraid that the cesspool truck will not come on time to collect the sludge accumulated in their septic tank. Therefore, rather than paying for a service that is unsecured, they would prefer to pay for a system that would be more sustainable/trouble less for them in the long-term.

Nonetheless, before envisaging the feasibility of such project, other options can be considered to increase sanitation coverage as well as quality conditions with on-site sanitation systems and proper sludge management.

3.3 Implementation of Public Toilet Facilities

Shop keepers from Tsimasham clearly showed interest in the construction of public toilet facilities to lower the load on their toilets and septic tanks from the numerous travelers who stop for a toilet break. The construction of such facilities could be financed through local tax. As for operation and maintenance, communities agreed that a fee collected for each usage would be needed and that, in the meantime, all shop keepers should restrict the access of their toilet if public toilet facilities are available.

3.4 Improvement of the Drainage System

To avoid the accumulation or inappropriate passage of grey water nearby houses, it is important to check all open drains and repair/improve the system where needed. Regular cleaning is also crucial to ensure that garbage does not block the drains.

3.5 Management Strategies for Untreated Wastewater Discharge

For the buildings that are not connected to any wastewater treatment system, or connected to a faulty system, it is urgent to take measures to prevent wastewater from being discharged untreated. This especially concerns the houses located nearby the Chhukha Higher Secondary School and the BPC colony in Tsimalakha. An option would be to collect toilet waste in a tank directly connected to the buildings. This tank could be emptied regularly by the cesspool truck.

Another option would be to speed up the relocation of the temporary settlements, some of which are considered illegal, to new development areas with houses connected to a proper wastewater treatment system. For the BPC colony, the Chhukha district authorities emitted the desire to call a meeting with the BPC authorities to describe the actual problems and ask them to repair the broken septic tanks of the colony.

To prevent water contamination through leaking pipes, it is also advisable to promote the repair of water supply pipes.

4 Next Steps

To promote sanitation improvement, the next steps will be to:

- Gather information, data from further assessment (e.g. population, density, water consumption/capita/day, water quality, town city/road plans highlighting future developments, etc.), and maps at appropriate scale (1:2,500) from each town for the preparation of a master plan to frame future sanitation improvements, including the development of sanitation infrastructure

- Conduct sanitation and hygiene education and awareness-raising activities among communities

- Provide training to operators and staff involved in management of sanitation facilities, including new staff for septage management and O&M of future sanitation facilities

- Define clear responsibilities for management of sanitation facilities and create related bodies where needed

- Review and develop sanitation-related institutional framework, including legal and regulatory arrangements for septic tanks and other sanitation facilities (sludge/wastewater treatment plants)

- Develop sanitation education in academia to increase the number of available specialists

- Formalization of Sanitary Committee and finalization of their TOR

- Raise education and awareness on Sanitary Committee TOR, ECOP Guidelines and Waste Management Act etc.

More specifically, this will imply to:

- Further develop the programme interventions to reflect the findings of this report with a focus on the improvement of sanitation and behavior change

- Undertake the baseline process

- Review legal and institutional arrangements

- Share the findings with MoWHS in terms of supporting their role in addressing the Gedu sewage treatment plant and actions

- Consult with district authorities in terms of the sludge disposal site and establishing the service

- Consultation with other stakeholders, such as Bhutan Power Corporation (BPC) and Druk Green Power Corporation (DGPC) management to sort issues related to sanitation in their compounds and include them in periodic district sanitation consultations

Annex A

Sustainable Sanitation and Hygiene for All in Small Towns

TOR for JSC 2nd Technical Visit

17th- 26th August 2011

Introduction

SNV and DUDES under the Ministry of Works and Human Settlement (MoWHS) are working in partnership to develop a Sustainable Sanitation and Hygiene for All (SSH4A) in Small Towns programme in Bhutan under a two year framework agreement. The goal of the programme is to enhance access to improved sanitation and improved hygiene practices for all the three small towns in the Chukka District. DUDES will be the collaborating agency, and Chhukha Dzongkhag and Municipal Corporations of the three towns under Chhukha Dzongkhag will be the implementing agency.

The programme will have the following components;

- Sustainable sanitation and hygiene behavior change communication
- WASH governance for planning, enhancing and regulating
- Strengthening sanitation supply chain development and faecal sludge management.
- Knowledge brokering and process facilitation for expertise on specific treatment options.
- Analysing, disseminating, and learning (knowledge management).

As part of the development of this programme a joint initial assessment was undertaken by DUDES, SNV and JSC of the three towns Tsimasham, Tsimalakha and Gedu Towns from the 8-17th May 11. The subsequent report made recommendations which will be followed up during a stakeholder meeting and subsequent second technical input by JSC.

Objective: Provide technical advice in follow-up to the initial joint sanitation assessment of the selected small towns with a focus on septage waste management and institutional arrangements.

The second assessment will have a specific focus on agreed key activities and recommendations as listed hereafter.

At the same time a stakeholder meeting is planned for the 18th August 11 for the Chukka Districts 3 urban settlements of– Tsimasham, Tsimalakha and Gedu Towns. The objective of the stakeholder meeting is to:

- Introduce the programme framework
- Present and discuss the report findings
- Prioritise recommendations and agree on priorities
- Agree on key roles and responsibilities
- Develop shared expectations
- Develop a Work Plan
- Begin preparations for a baseline and sanitation mapping process to commence in September 2011.

Key activities

- Contribute to the stakeholder workshop in collaboration with SNV, MoWHS and the Chhukha district in terms of developing a list of priorities and prioritized areas in towns for sanitation improvement and prepare a Work Plan, including sanitation targets and a schedule for implementation.

- Assess how to organize septage management, including the financing, regulation and selection of sites for treatment and the feasibility of involving the private sector.

- Understand in further detail the actual legal and institutional structure for sanitation.

- Provide technical advice to the team in terms of the planning of sanitation mapping to be undertaken as part of the baseline process in September 2011.

Specific recommendations to follow up

Recommendation 6. Implementation of septage management

To improve wastewater treatment efficiency of septic tanks, and prevent untreated wastewater from overflowing when tanks are overloaded, regular and systematic desludging operations need to be implemented. Better septage management can be considered as an important first step of sanitation improvement for small towns, with substantial impact on the

treatment efficiency of septic tanks. The organized system should be compulsory and eliminate any intervention from septic tank owners (avoid on-call service).

The frequency of emptying operations should be determined depending on the size of the septic tanks and the number of users (probably once or twice a year, or more often). This should be preliminary assessed through sanitation mapping and consultation with the public. As previously mentioned in the finding 7, a new cesspool truck has been ordered by the Chhukha district and was due to be delivered at the end of May. Depending on the capacity of this truck, it may be necessary to increase the number of such vehicles for desludging operations. The acquisition of more cesspool trucks would solve the problem of overflow from septic tanks with small capacity.

A financing mechanism should also be implemented to prevent users from paying for each visit of the cesspool truck (thus ensuring regular desludging), and enable the involvement of the private sector. This would require the understanding of the public and, therefore, the implementation of communication campaigns to explain why a financial contribution is needed.

Recommendation 7. Consideration for disposal sites and construction of sludge treatment facilities

As sludge from septic tanks needs to be collected on a regular basis, it is essential to consider and implement disposal/composting sites and treatment facilities. Different options for collection, transport, treatment and disposal or recycle as compost are conceivable depending on land availability, the acceptance of the local population (for example on the possibility of using sludge compost), and the funds available (i.e. priority given for the construction of sludge treatment facilities). These options are:

- Sludge can be treated through a sludge treatment plant (to be constructed). After treatment and drying operation, dried sludge can be used for landfill, farming or combusted for example at the Alikha incinerator in Gedu.

- Sludge can also be dewatered and used as a fertilizer after compost. This would necessitate the acquisition of dewatering machines, the construction of buildings with roof and concrete floor, the provision of land, and the acceptance and needs from the local population to use sludge as a fertilizer. If not fully utilized, part of the dewatered sludge or compost could be brought to the Alikha incinerator for disposal.

Consultation with the local population will need to be first carried out to determine what would be the most suitable way to manage sludge and if compost sludge is adequate for agriculture.

Recommendations 13. Charge for sludge collection and treatment

To allow regular sludge collection and transport, a financing mechanism will need to be set up. Such mechanism is to be discussed and decided between the central government, the district authorities and the municipalities. Different systems can be considered depending on whether sanitation will be paid by each household through a charge or financed through the tax collection system, and how much the government of Bhutan will subsidize for sanitation improvement. What follows is only to consider as options.

As well as the sewer charge paid by the populations living in an area covered by the sewerage system, a compulsory charge included in the water bill (as it is done in Manila, Philippines) – which could be called 'environmental charge' – could be paid by all septic tank users living in an area targeted for sludge collection and treatment. If water meters are not widely used, another possibility would be to collect this charge through other existing local taxes.

To facilitate this new charge collection, it will be important to communicate with the public and makes everyone understand that, in order to promote good sanitation practices that will enable a safe and healthy environment with ultimately high economic return, governments/districts/people need to invest in and pay for sanitation.

The collected charge is intended to cover sludge collection and transport to the treatment facility or disposal/recycling site. The private sector could here be invited to play a role and conduct sludge collection and transport under the management of a body of professionals (for regulatory management) from the municipality. As mentioned earlier, it is recommendable to construct one or more sludge treatment facilities and consider different options after sludge treatment: disposal or recycle as compost (if acceptable for local communities). As done in other countries, the funding for the acquisition and the construction of such facilities could be covered through local taxes or budget from the central government, as for the implementation of the sewerage system. Operation and maintenance could be covered by local taxes.

Recommendation 20. Legal, regulatory and institutional development

The legal and institutional system for sanitation in Bhutan was not fully assessed during this first mission. Although more clarity in this matter is required, ideally, a sound institutional framework for wastewater/night soil/sludge management is needed to maintain a healthy living environment and conserve water environment. This includes the following:

- Establishment of a legal system to define the responsibility and duties of central government department, district, municipalities, the private sector and individuals for wastewater/night soil/sludge management.

- Establishment of a legal system with regulations and standards for wastewater/night soil/sludge management including the introduction of appropriate sanitary equipment/wastewater treatment technologies and standards of structure/performance/O&M for the equipment/technologies (including regulation and enforcement in relation to the construction, sitting and designs of septic tanks.)

- Establishment of a legal system to regulate the stakeholders who intend to join businesses related to wastewater/night soil/sludge management, in order to enable participation of the private sector.

- Establishment of a training system for capacity development dedicated to municipal officers in charge of or related to wastewater/night soil/sludge management, to ensure the effective application of laws, regulations and standards.
- Specification of the role and implication of non-government organizations/ community-based organizations for sanitation and hygiene awareness-raising activities and the mobilization of local communities.

Annex B

Sustainable Sanitation and Hygiene for All – Small Towns

The goal of this pilot phase is enhanced access to improved environmentally safe sanitation and improved hygiene practices for 9,500 people in 3 small towns in Chukka District by mid-2013.

The specific objectives of the project are:

1. Improve hygiene behaviour and create demand for regular emptying, improved construction and maintenance of on-site sanitation facilities of households, institutions, businesses and in public places.
2. Develop financially viable and environmentally safe solutions for sanitation services attending a variety of consumer needs among households, institutions, businesses as well as in public places.
3. Strengthen municipal level WASH governance, regulation and ensure both public and private stakeholders are in compliance
4. Improve local faecal sludge disposal, treatment, disposal and reuse options that are environmentally safe, socially acceptable, aligned with GNH goals and financially sustainable.
5. Improving learning, documentation and sharing of best practices

The project aims at town-wide sanitation coverage, improving faecal sludge management and hygiene practices for the three small towns of Gedu, Tshimisham and Tshimalakha in Chhukha District over a two year period. The Ministry of Works and Human Settlement (MoWHS) is the key client at the national level, and Chhukha Dzongkhag and the relevant sectoral agencies responsible for the three towns under Chhukha Dzongkhag will be the implementing partners.

Key Components are the strengthening of professional and institutional capacity in:

- Sanitation demand creation and hygiene behavior change
- On site sanitation services and business development
- Improving WASH governance, regulation and compliance
- Faecal sludge treatment, disposal and re-use


WASH governance, regulation and compliance
Sanitation demand creation and hygiene behaviour change
On-site sanitation services and business development
Sustainable sanitation & hygiene for all
Faecal sludge treatment, disposal and re-use