WWCH 2017 PROBLEM DESCRIPTION

Problem Title	
Current onsite sanitation system in the urban areas of Bhutan is not adequate for preventing public health risk and environmental pollution	
Contact Information	
Name	**Ugyen Dorji**
Country	**Bhutan**

1. Basic information

Bhutan is a small landlocked kingdom in South East Asia located entirely within the Himalaya mountain range bordering with China in the north and India in the east, west and south. It is located between latitudes 26°N and 29°N, and longitudes 88°E and 93°E covering a total area of 38,394 square kilometres. In 2016, the total population in Bhutan has been estimated to be around 800,000 with the capital city Thimphu with the largest population of slightly over 100,000. The total population living in the urban areas is expected to be about 60% by 2020. The land consists mostly of steep and high mountains crisscrossed by a network of swift rivers, which form deep valleys before draining into the Indian plains. Elevation rises from 200 m in the southern foothills to more than 7,000 m in the mountain peaks. This great geographical diversity combined with equally diverse climate conditions contributes to Bhutan's outstanding range of biodiversity and ecosystems.

Bhutan adopted constitutional monarchy in 2008. Bhutan's economy is based on agriculture, forestry, tourism and the hydroelectric power export to India. Bhutan has a very unique development philosophy called Gross National Happiness (GNH), an index that measures the collective happiness in a nation instead of widely used gross domestic product. GNH is a currently based on four pillars: economic self-reliance, environmental conservation, cultural preservation and promotion, and good governance. Bhutan has rich water resources and the high flowing rivers is the main source of hydropower energy most of which are exported to India. Bhutan’s constitution mandates to preserve 60% forest cover at all times. Bhutan has a long-term strategy of controlled tourism to for ensuring the long-term sustainability of the industry and its contribution to the economy.

3. Problem description

The urban population in Bhutan is growing rapidly driven by the better economic opportunities offered compared to the rural settlements. This puts an increased stress on the existing water and wastewater infrastructures which are often already inadequate. Rapid urbanisation not only increases water demand but also wastewater produced therefore needing appropriate wastewater treatment and management policies as part of the sustainable development. Bhutan is therefore struggling to provide adequate public wastewater management infrastructure (collection and centralised treatment system) to all the urban areas as it require huge capital investment. Currently only 10 out of 61 towns have built public wastewater management infrastructure although with still low coverage. In the three largest cities of Thimphu, Phuentsholing and Gelephu, municipal wastewater is treated using waste stabilisation ponds (WSP) which requires large land area and hence not appropriate for Bhutan with limited flat land. Six other smaller towns have recently built municipal wastewater collection network with expensive prefabricated wastewater treatment

technology imported from Denmark. Another two smaller towns have municipal wastewater collection system along with communal septic tanks and soak pit systems.
All other towns including the unsewered areas of the 10 towns therefore depend on the onsite sanitation system composed of septic tank and soaks pit system that treats only black water (from toilets) while grey water (from bath rooms and kitchen) is simply discharged to the environment. Given the high investment costs for public wastewater management system, it is now apparent that, most urban settlements will have to rely on the individual onsite sanitation system for many years or decades to come. However, there are several issues with the current onsite sanitation system because of which it is not serving the purpose it is intended. The conventional onsite sanitation of septic tank – soak pit system practised in all the urban areas is not adequate in Bhutan anymore under the changing urban settings and stricter environmental regulations because of several reasons:

- Septic tanks are used only as a primary treatment system for wastewater and hence their effluent quality is still too poor to be directly discharged to the environment
- The current onsite sanitation system releases methane, a highly potent greenhouse gas that significantly contributes towards greenhouse gas emission.
- Most existing onsite sanitation systems (septic tank - soak-pit) are normally poorly constructed generally following all size fit all guidelines without expert judgement.
- Poor operation and maintenance resulting in frequent overflow of untreated wastewater to the drains, natural gullies and streams
- Overloading of the old septic tank-soak pit system due to change in the land use and the population density
- Plot sizes in urban areas are small and inadequate for onsite sanitation system and
- Soil conditions in urban spaces are generally compacted to allow parking and other development and hence they are not suitable for land infiltration using soak pit.

All the above factors are responsible for the failure of the conventional onsite sanitation system in the urban settings. This is evident from the low quality of drain water that were recently sampled and analysed within the unsewered areas of Thimphu recently by CST. The low drain water quality could mainly be contributed from the direct discharge of wastewater from the kitchens and bathrooms and also from the discharge the septic tank effluent directly into the drains from some properties. The discharged raw wastewater eventually reaches streams and river system which could have a significant environmental impact on the water bodies downstream. The drinking water quality issue in Bhutan is also evident from the health statistics where diarrhoea (mainly related to water borne infections) still formed the highest morbidity in 2015. This therefore calls for the need to replace the conventional septic tank - soak pit system with more appropriate and affordable onsite treatment technologies for ensuring public health and environmental pollution. Natural treatment system such as WSP and constructed wetlands are not suitable for Bhutan as flat land is limited in many towns. Appropriate onsite treatment system must take into consideration the simplicity, effectiveness and affordability of the technology not simply adopted the technology available elsewhere in the other countries.