

## WWCH 2017 PROBLEM DESCRIPTION

Problem Title	
Water scarcity issues in the small hilly villages of Gonpasingma, Kherigonpa and Gonpung under Pemagatshel district in Bhutan	
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### 1. Basic information

Bhutan 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. 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. Administratively, Bhutan is divided into 20 districts with each districts further divided into Gewogs (sub-divisions) which in turn is further divided into villages. Pemagatshel in one of the districts located in the southeast region of Bhutan covering an area of 1027 sq.km with rugged terrain and scattered settlements. As per National Statistical Bureau (2016), the projected population of Pemagatshel district in 2015 is 12,375. The driest month is December with 6mm of rain. In June, the precipitation reaches its peak with an average of 468mm. There is a difference of 462mm of precipitation between the driest and wettest months. The variation in annual temperature is around 13°C. July is the warmest month of the year with an average temperature of 20.5°C. At 7.5°C on average, January is the coldest month of the year. The climate is warm and temperate with average annual temperature of 15°C. The cultivable arable land is 45% of the total land area with negligible wetland farming activities. About 53% of the total area is under forest cover, comprising mainly of coniferous and broadleaf species. Gypsum mining is one of the major activities in this district. Although the annual per capita water flow in Bhutan is 94,500 m<sup>3</sup>, the highest in the region however, in Pemagatshel district, the villages of Gonpasingma, Kherigonpa and Gonpung suffer from water scarcity during the dry winter season.

### 3. Problem description

According to assessment on drinking water resources conducted by Public Health Engineering Division in 2012, drying up of drinking water resources in Pemagatshel district has been reported as one of the serious issues. In particular, the villages of Gonpasingma, Kherigonpa and Gonpung, have fewer water sources that can provide sustainable drinking water to meet the increasing needs of the growing village population. The existing water resources are getting dried up each year. Every winter,

the villages face acute drinking water shortages when small rain-fed source almost dries up. When water resources gets dry, villagers try water rationing, but it means nothing when the sources are dry. Due to water constraints, it has triggered water-related disputes in the villages in the last few years. While the many disputes could be solved in the village level, however, some disputes are fought bitterly in the district court. A few cases been resorted to High Court and the matters drag on.

The root of the water shortages such as drying up of resources needs to look into mainly replenishment of underground water bodies. These villages lie on the boundary of the two different water catchments and on the margin of water line from where water cannot be piped on natural gravitation. In many parts of Bhutan, major rivers and tributaries flow in the valley bottoms while most communities lie on the hills upstream and therefore mostly depend on smaller streams, springs and lakes for their fresh water supplies. While the increased village population and improved living standard could contribute towards increased water usage however, drying of water sources itself is major concern. As with any mountainous areas, the perennial property of the streams and rivers is undoubtedly related to the ability of the catchment to store rain water during monsoon seasons. Forest and vegetation cover therefore plays a vital role in providing a perennial stream water source for village supplies. Clearing these forests to expand the increasing agriculture activities in the villages (as almost all rural economy in Bhutan are agro based) loses the watershed of the catchment and is therefore one of the major factors responsible for drying up these streams as the catchment has much lower capacity to store water. In such rainfall, water remains at the surface, does not infiltrate into the soil and into the underground water bodies. This body of investigation indicates watersheds and water bodies are getting dried without replenishment of the water aquifer. Climate change is another big problem for many parts of Bhutan as the rainfall pattern has significantly changed over the years.

In presence of rough terrains and landscapes, the challenge for the villagers is pumping water out of the ground like in the plains, is a constraint. First, it is not certain whether there are underground water bodies in the terrain as there are no recorded studies. Second, even if there is presence of water bodies, the cost of pumping the underground water is going to be very expensive and it is not cost effective for the villagers to invest in such water pumping activities due to the challenging terrain. Even simple storage of overflows from streams and harvesting rainwater may not be the sustainable and permanent solution given the long dry periods which may stretch more than 6 months. This will require lots of storage spaces not likely feasible as these areas are located mostly in the steep terrains.

Currently, Bhutan lacks a comprehensive national study or report on the extent, causes and solutions to the growing water scarcity in Bhutan, in particularly some of the rural communities. There are instances where people leave their farms due to water scarcity and some villagers expressed fear for the village's survival as water is an essential commodity. Therefore there is a need for a comprehensive water management plans

in the villages such as in the Pemagatshel district including technological solutions to solve the seasonal water scarcity issues.