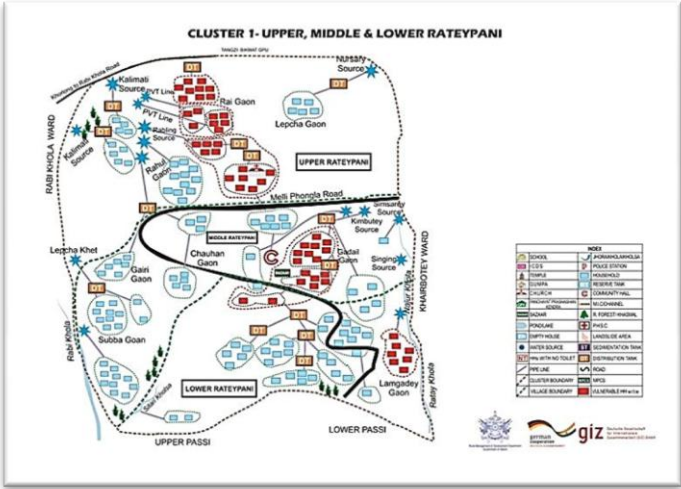


VILLAGE WATER SECURITY PLAN

LUNGCHOK KAMERAY GPU MELLI GVK, SOUTH SIKKIM



October 2014



Abbreviations and Acronyms

| | |
|--------|---|
| BFE | Bare Foot Engineer |
| CBOs | Community Based Organizations |
| Dept. | Department |
| DT | Distribution Tank |
| GIZ | Deutsche Gesellschaft fuer Internationale Zusammenarbeit (German Technical Cooperation) |
| GPK | Gram Prashashan Kendra |
| GPU | Gram Panchayat Unit |
| Govt. | Government |
| Ha | Hectare |
| HHs | Households |
| ICDS | Integrated Child Development Services |
| IEC | Information, Education and Communication |
| lpcd | Litres per capita per day |
| MPCS | Multi-Purpose Cooperative Society |
| NRDWP | National Rural Drinking Water Project |
| NREGA | National Rural Employment Guarantee Act |
| PES | Payment for Ecosystem Services |
| PHSC | Primary Health Sub-Centre |
| PMGSY | Pradhan Mantri Gram Sadak Yojana |
| PRA | Participatory Rural Appraisal |
| Pvt. | Private |
| RMDD | Rural Management and Development Department |
| RT | Reserve Tank |
| RWSS | Rural Water Supply Scheme |
| ST | Sedimentation Tank |
| Temp. | Temperature |
| VWSC | Village Water and Sanitation Committee |
| VWSP | Village Water Security Plan |
| w.r.t. | with respects to |

Contents

1. Introduction

Water remains one of the major local, strategic, and geopolitical issues today across the world in the face of changing and unpredictable climatic conditions with greater and conflicting needs of rising population and resource use. The Sikkim Himalaya is abundant in water resources, yet many parts suffer from acute water scarcity now often intensified by climate change and its triggering factors resulting in “too much or too little water”.

Sikkim situated from latitude 27°03'47" to 28°07'34"N and from longitude 88°03'40" to 88°57'19"E has the total geographical area of 7096 km². It is strategically located and shares international borders with the countries of Bhutan, China and Nepal. Annual rainfall in the state varies from 1270 mm in lower elevations (300-1500 m) at South Sikkim to 5000 mm in temperate to sub-alpine zones. The primary sources of water in the rural areas of Sikkim Himalaya are springs, streams and small rivers through the surface and sub-surface water flows originating mostly from the unconfined aquifers. Springs occur where sloping ground and impenetrable rocks intersect with the ground water table. Several forms of springs such as *Dhara/Pandhera* (pool/fountain), *Kuwa* (shallow well) and *Simsaar* (marshy area) are the main sources of water. As per the State Socio-Economic Household Census 2005, nearly 65,000 (80%) of the 80,000 rural households of the State depend on these springs as a source of drinking water.

The introduction of piped water supply and services to communities from distance has shifted the focus from conservation of local springs and water resources making them dependent, often with daily struggle due to improper/inefficient (sometimes unreliable) and inequitable distribution of piped water, owing to unsystematic pipe networking and storage tanks. The downstream consumers suffer the most in the loop. There is a dire need of willingness to pay for water use services and conservation efforts of the spring from the villagers.

Over the years many of these springs are drying up in the dry belts of Sikkim especially in the southern part owing to several factors. As a consequence there is a shortage of drinking water in the villages. Local level institutions on water management and conservation of natural resources are lacking. These areas are dry belts and face severe domestic water shortage, and thus conservation of seasonal water sources/natural springs by using traditional/ecological/scientific technologies are immediate interventions needed.

Therefore, GIZ (German Technical Cooperation) in consultation with the State Rural Management and Development Department conceptualized a study to prepare a comprehensive Village Water Security Plan at GPU level. The main objectives of the study were to identify the current issues related to drinking water, dependency for drinking water to local springs, to assess the Gravity-Based water supply systems, assess the current water requirement, the state of water governance in the rural areas and sanitation status in the GPU. The Village Water Security Plan would serve as guideline for the implementation of the future water supply schemes including Gravity-based water supply schemes, water management, rooftop water harvesting structures, protection of water supply network in the landslides prone area, community mobilization and so on. This plan would be highly useful in addressing the water related problems in the villages of LungchokKameray Gram Panchayat unit..

2. Methodology

During August 2014 GIZ-RMDD team conducted detailed PRA (Participatory Rural Appraisal) consultation at LungchokKamarey GPK for the entire GPU. Participatory consultation using PRA tools, field surveys, formal and informal interviews with the Gram Panchayat members, concerned

AE (Assistant Engineer)/JE (Junior Engineer), local water users, Bare Foot Engineers (BFE) and Village plumbers/water fitters. Extensive field surveys were organized for identification of springs, catchment areas of springs, household sample survey on drinking water supply and sanitation. PRA and focused group discussion were the main tools used in collecting the secondary information. The background information was utilized to carry out this study. The surveys were basically designed to obtain primary information using participatory tools such as structured interviews and resource mapping followed by field validation. By using structured and semi-structured field surveys in LungchokKameray GPU under Melli Gram Vikas Kendra in South Sikkim it also looks at the, current water requirement of the households along with the climate change impacts on the springs and the adaptive/best practices on spring management adopted by the communities. It also tries to explore whether consumers are willing to pay (PES) for spring conservation and use.

3. PRA - LungchokKameray GPU

According to the climate vulnerability studies carried out by IISc Bangalore, the LungchokKamarey Gram Panachayt Unit (GPU is identified as high climate vulnerability GPU in Sikkim). This GPU is located at 27°5'48" N, 88° 23' 36" E and 27°8'20" N, 88° 24' 16" under the jurisdiction of Melli Gram Vikas Kendra (GVK), South Sikkim. The GPU consists of 6 Gram Panchayat Wards (GPW) viz Mugram, LungchokRolu, Lungchok, Kameray, Belbotay and Tharpu and shares the boundary with SumbukKartikey GPU and TurukRamabung GPU of Melli GVK. This GPU has forest cover only in lower belt below the human settlement (which is a probable cause of scarcity in the GPU).

3.1. Demographic Profile

Table 1. Demographic profile of LungchokKameray GPU

| Panchayat Ward | Household | Population | Male population | Female Population | Schedule Tribe Household | Schedule Caste Household | MBC Household | OBC Household |
|----------------------|------------|-------------|-----------------|-------------------|--------------------------|--------------------------|---------------|---------------|
| Mungram | 60 | 305 | 145 | 160 | 17 | 0 | 39 | 4 |
| Lungchok-Rolu | 64 | 279 | 138 | 141 | 16 | 0 | 48 | 0 |
| Lungchok | 76 | 390 | 191 | 199 | 5 | 1 | 70 | 0 |
| Kameray | 64 | 320 | 165 | 155 | 1 | 7 | 54 | 2 |
| Belbotay | 54 | 258 | 126 | 132 | 2 | 0 | 24 | 28 |
| Tharpu | 63 | 293 | 152 | 141 | 3 | 5 | 37 | 18 |
| Total for GPU | 381 | 1845 | 917 | 928 | 44 | 13 | 272 | 52 |

3.1.1. Observation:

The LungchokKameray GPU has 1845 population in 381 household. The average family size in a household is 4.8, which are lower than the average state household family size. Similarly, the sex ratio of LungchokKameray is 101 female out of 100 male which is comparatively much better than state sex ratio 89 female out of 100 male. Population distribution in the entire village is similar except Lungchok ward have higher population due to rural marketing center. The Mungram Village and the LungchokRolu Village have highest numbers of tribal community in the GPU. The population of schedule caste community distributed mostly in Kameray and Thorpu village and it is in negligible figure. The Gram panchayat Unit is mostly dominated by Most Backward Classes communities.

3.2. Historical Information

Table 2. Historical information of LungchokKameray GPU

| Years | Observation |
|--------------|--|
| 1990- 2000 | ❖ Paddy used to grown in Belbotey, Kameray, Tharpu |
| | ❖ Ginger, Maize, Orange was the most economical beneficial crops used to grown in Lungchok and Lungchokrolu |
| | ❖ Similarly potato, peas and cabbage are the main crops grown in Mugram |
| | ❖ Fetching water from springs, rainfed farming, no harvesting tank |
| | ❖ Less household only 30 HH in Mungram, No roads in LungchokRolu and Mungram ❖ Devithanay and Bharteypuni are the water source in Mugram and LungchokRolu |
| 2000- 2010 | ❖ Orange was the main source of income in Lungchok and LungchokRolu |
| | ❖ Till 2004 people from LungchokRolu and Lungchok ward used to fetch water from Chipchipey source |
| | ❖ Paddy used to grown only in the lower belt in Kameray, Belbotey and Tharpu |
| 2010 and Now | ❖ Now orange orchards total disappear from LungchokRolu and Lungchok ward |
| | ❖ In 2011 Water supply to Lower Mugram from Devithan source was constructed |
| | ❖ In 2008 Roof water harvesting tank in Mugram and LungchokRolu was constructed |
| | ❖ Now Middle Lungchok and Lungchokrolu - timely distribution system in lean season |
| | ❖ High Intensity rainfall decreased over a year. Consequences of this, seasonal spring which emerges post monsoon has very low discharge and some are not emerging also. |
| | ❖ In lower belt paddy plantation time shifted from May -June to June- July because of late monsoon |

3.2.1. Observation:

LungchokKameray GPU have diversified landuse pattern. While it was clearly revealed that the upper part of GPU had water scarcity in the past as well- the community used to fetch water from the springs located in the lower part of Mungram village. Horticulture practices are common in upland and paddy farming in the lower part of the GPU. Habitation exists up to the ridge resulting in deforestation in the hill top. Dense forest cover available in the lower part of the GPU supports the soil moisture conservation only in that belt(with no habitation). In the upper part of the GPU, the community used to fetch water from the existing source but there was no water supply system in the past and the spring water was sufficient for the population 20 years back. The major changes that were observed in the last twenty years is the decline of orange farming from Lungchok and LungchokRolu village and the water distribution system became time based in the middle part of GPU. In the upper part of GPU, the adaptation measures can be roof water harvesting system to ensure water scarcity during the lean season. In the lower part of the GPU, it was observed that the sowing time of paddy was shifted from May-June to June-July due to delay in monsoon. Decline in orange productivity from the two villages resulted in loss of income of the community.

3.3. Educational and Sanitation Status

Table 3. Educational and sanitation status in the GPU

| Gram Panchayat Ward | Population | Household | Below Primary and illiterate | Junior High School | Secondary & Sr Secondary | Graduation, MA and above | No toilet | Kutchha Toilet | Pucca Toilet |
|---------------------|------------|-----------|------------------------------|--------------------|--------------------------|--------------------------|-----------|----------------|--------------|
| Mungram | 305 | 60 | 78% | 7% | 15% | 0% | 0% | 7% | 93% |
| LunchokRolu | 279 | 64 | 60% | 15% | 22% | 3% | 0% | 5% | 95% |
| Lunchok | 390 | 76 | 76% | 8% | 13% | 2% | 0% | 6% | 94% |
| Kamarey | 320 | 64 | 82% | 9% | 8% | 1% | 0% | 17% | 83% |
| Belbotay | 258 | 54 | 75% | 10% | 11% | 3% | 0% | 5% | 95% |
| Tharpu | 293 | 63 | 69% | 11% | 16% | 4% | 0% | 8% | 92% |

Note:

3.3.1. Observation

The education and sanitation in the GPU are interlinked to each other. Higher the number of educated people in the society, lesser is the sanitation problem and vice versa. This was clearly seen in LungchokKamarey GPU where the sanitation status was excellent. The school going children have the major in the population of the GPU. The School students and teachers are the best resource persons for awareness raising on sanitation in the GPU.

3.4. Environmental circumstances (Weather Parameters)

Table 4. Rainfall and temperature variation over a year

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Rainfall | 0 | 1 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 1 | 1 | 0 |
| Temperature | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 |

Intensity

| | | | |
|----------|-------------------|-------------|----------------------|
| Rainfall | No rainfall (0) | Temperature | High temperature (3) |
| | Drizzle (1 and 2) | | Cold Temperature (1) |
| | Good rainfall (3) | | Cool temperature (2) |

Observation:

It was observed that the LungchokKamarey GPU receives high rainfall only during July and August and there is no/little rainfall during December to April. In February sometimes the area receives very less rainfall that doesn't make much difference in spring water and farming. April is the peak lean season since, there is no rainfall and temperature also became very high, resulting into exponential increase in water demand. The three months i.e. during March to May there is no rainfall and the temperature remains very high. These three months becomes more critical compared to any other months in terms of drought and water demand. In this season because of the long dry winter most of the cultivable field in the area remains barren. Mechanism has to developed to address the water scarcity issue in the LungchokKamarey GPU

Water sources for drinking

| Status of Drinking Water in LungchokKameray GPU | | | | | | | | | | | | | | | | |
|--|----------------------------|----------------------|-----------------------------|-----|-----|-----|-----|-----|-----|------|-----|------|-----|-----|-----|------------|
| Sl. No | Name of Water Source | Household Dependency | Dependent village (s) | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sept | Oct | Nov | Dec | Land owner |
| Cluster 1- Mungram ward | | | | | | | | | | | | | | | | |
| 1 | Chipchihey Source | 30 | LungchokRolu and Mungram | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | Govt. |
| 2 | DevithaneyDhara | 33 | Mungram | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | Govt. |
| Cluster 2- LungchokRolu and Lungchok ward | | | | | | | | | | | | | | | | |
| 3 | PremjungJhora | 94 | Lungchok-Rolu, Lungchok | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | Govt. |
| 4 | TukKhola | 29 | Lungchok, Kameray | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | Govt. |
| 5 | RoluKhola | 60 | Lungchok, Kameray, Belbotey | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | Govt. |
| 6 | Pahireni Source | 15 | Lungchok | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | Govt. |
| Cluster 3- Kameray, Belbotey, Tharpu ward | | | | | | | | | | | | | | | | |
| 7 | Majua Source | 44 | kameray, Belbotey | 2 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | Govt. |
| 8 | MallagiriDhara | 2 | Kameray | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | Private |
| 9 | LampateyJhora (Sano Khola) | 67 | Belbotey, Tharpu | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | Govt. |
| 10 | Devithaney Source | 1 | Belbotay | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | Private |
| 11 | NareyDhara | 7 | Tharpu | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | Private |
| 12 | AmaleyDhara | 6 | Tharpu | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | Private |
| 13 | DevithanDhara | 4 | Tharpu | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | Private |
| 14 | MandirDhara | 7 | Tharpu | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | Private |
| 15 | R.B. Dhara | 8 | Tharpu | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | Private |

Intensity

| | | | | | |
|----------|--------------------------------------|----------|--|----------|--------------------------------------|
| 1 | Low discharge/ less then requirement | 2 | Springs water met demands/ no scarcity | 3 | High Discharge/ Excess and over flow |
|----------|--------------------------------------|----------|--|----------|--------------------------------------|

Observation:

Water resources distribution of LungchokKameray GPU is controlled by the geographical condition of the region. The villages in the upper part of the GPU have less water resources and more household dependent. Whereas lower part of the village has more water resources mostly concentrated in the private land. The Mungram is the most water deficit village because of no water resource for gravity flow. In Mugram two sources are located in the lower part of the village, so the gravity flow to the uphill household is not possible. Roof water harvesting is the common adaptive measures in this village. Since the Mugram village is located in the hill top, compare to other foothill villages it will received higher rainfall, so the roof top rain water harvesting system is much successful in this region. From December to May there will be acute water scarcity. Roof water harvesting system has to scale up on this region for the water security in a professional manner.

Lungchok and LungchokRolu ward have water scarcity but it is not like Mungram. All the feeder sources to these villages are perennial sources but located in other village. The sources have very high discharge in the monsoon season but there will be water scarcity during lean season. February to May is the lean season in this area described by the community. TukKhola source is located in adjacent village have 29 household are dependent from this area. The water from this source is distributed to many villages of other GPU too. Leaking temporary poly pipe in several places resulting too less water available in the village and the maintenance became time consuming and expensive. PremzungJhora have highest coverage in Lungchok and LungchokRolu villages. The distribution system has to be repaired and involvement of community was felt necessary in all water distribution system. RoluKhola covers lower parts of Lungchok village and other village below this area.

Kamerayand Belbotey have water scarcity because of poor management and distribution system but not because of water scarcity. Their main source is Mazwa and Pairini source which is located adjacent to these villages. The sources had Govt pipeline in the past which was damaged by the landslides. So the most of the household have private line from these sources and some are depend upon private source located in their private land. The strategy has to developed to utilized the private source as common source and link it to the main distribution system to maximum utilization of resource.

Classification of GPU based on the water user

Cluster 1: Mungram Ward

Mungram ward is located geographically in the hill top. The most of the local sources are seasonal and are located in the foot hill. The habitation above the hills have to manage drinking water either fetching water uphill's from the springs at foothills or by storing monsoon rainfall in the roof top. Mungram do not have any common source with other villages.

Cluster 2: LungchokRolu Ward and Lungchok Ward

Both LungchokRolu and Lungchok Ward have several common sources and the villages are adjacent to each other. These two wards have common problem with respect to water, common distribution system in most of the cases, so to describe their problem in the micro level they have been put together in one water user group.

Cluster 3: Kameray Ward, Belbotey Ward and Thorpu Ward

These three wards in the lower part of the LungchokKamarey GPU share same water sources for drinking and agriculture practices are similar in these villages. The water scarcity is not much as compare to other villages in cluster 1 and 2.

Threats to Water Resources

| Threats to water resources of LungchokKameray GPU | | | | | | | | | | | |
|---|-------|--------------------|------------|---------------|-------------------|----------------------------|---------------------|---------------------|--------------|------|-----|
| | Index | Increase in Demand | Landslides | Deforestation | Road construction | Rise in annual temperature | Low annual rainfall | Tunnel construction | Total Points | Rank | % |
| Index | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | | |
| Increase in Demand | 2 | | 1 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 10% |
| Landslides | 3 | 1 | | 3 | 4 | 5 | 6 | 2 | 1 | 4 | 5% |
| Deforestation | 4 | 3 | 3 | | 4 | 3 | 6 | 3 | 4 | 2 | 19% |
| Road construction | 5 | 4 | 4 | 4 | | 5 | 6 | 4 | 4 | 2 | 19% |
| Rise in annual temperature | 6 | 5 | 5 | 3 | 5 | | 6 | 5 | 4 | 2 | 19% |
| Low annual rainfall | 7 | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | 1 | 29% |
| Tunnel construction | 8 | 1 | 2 | 3 | 4 | 5 | 6 | | 0 | 5 | 0% |

Intensity:

| | |
|--|---------------|
| | Low Threat |
| | Medium Threat |
| | High Threat |

Observation:

Depletion of water sources mainly due changing climate or landslides in the source catchment area or by any natural means in the hilly region. Some time we can see that developmental activities like construction of roads also may affect the existing water sources if it is ignored during the planning process. According to the community the biggest threats to their water resources is the low annual rainfall in their region and followed by road construction from the catchment of the sources, rise in annual temperature and deforestation was kept in second threat. For the protection of the water sources in this area, there is need of environmental protection measures like afforestation and eco-friendly developmental works, soil moisture conservation works in the upper catchment of the area. All this measures will give result in the long term, the community participation for this works seems to be challenging

Water Distribution System

| Current Water Distribution System | | | | | | | |
|--|-------------------------------------|--------------------------------|---|---|-------------------------------------|---------------------------------------|-----------|
| Cluster/village | No. of HHs having Private poly pipe | No. of HHs having Govt. supply | No. of HHs having both private and Govt. supply | No. of HHs not having direct water supply | Main water source in the dry season | No of water storage/ harvesting tanks | |
| | | | | | | Individual/ Private | Community |
| Cluster 1 (Mungram Ward) | | | | | | | |
| Mungram | 35 | 4 | 1 | 10 | DevithaneyDhara, BharteyJhora | 71 | 2 |
| Cluster 2 (LungchokRolu and Lungchok Ward) | | | | | | | |
| Lungchok | 13 | 67 | 0 | 3 | PremjungJhora | 32 | 4 |
| Lungchok-Rolu | 0 | 56 | 5 | 3 | Chipchipey, PremjungJhora | 46 | 0 |
| Cluster 3 (Kameray, Belbotay and Tharpu ward) | | | | | | | |
| Kameray | 44 | 13 | 0 | 0 | Majua, Sano Khola, TukKhola | 17 | 0 |
| Belbotay | 7 | 54 | 2 | 0 | Sano Khola | 10 | 2 |
| Tharpu | 0 | 60 | 54 | 6 | Sano Khola, Majua | 50 | 3 |

Intensity

| | |
|--|------------------|
| | Least vulnerable |
| | Moderate |
| | High vulnerable |

Observation:

The water distribution system of LungchokKameray GPU is highly depends upon gravity flow based water distribution system. The villages which are not having their own water sources also depend upon the water sources available in other village but distribution system is gravity flow. Very few people are using rain water. Extensive use of rain water harvesting system is mostly available in Mungram village. The roof top rain water harvesting system have very positive impact on the lives of Mungram's villager. TheGovt water supply scheme has positive impact in those areas where local sources are available. The government rural water supply scheme mostly focus on those village who do not have their own water sources but can be possible to get it from other village(s) like in LungchokRolu, Lungchok ,Belbotey and Tharpu ward. Kameray and Belbotey ward have Govt water supply system but the main pipeline was damaged by landslides so the community has more private pipelines of their own.Rain water harvesting systems have high potential in the region, community based water supply system in a timely manner is suggestedfor water security.

Water storage facilities

| Water Storage/Distribution/Harvesting Tanks | | | | | | | | | |
|---|--------------------------|-------------------|-------------------|------------|---------|--|--|--|---|
| Village /Cluster | Funding Dept/ Agency | Total No of Tanks | Capacity (liters) | Functional | Defunct | Reasons | Average volume of Tank (in liters) | Average numbers of water scarcity days | Total number of days that existing tank with full of water can serve to a family of 5 person @ 70 LPCD is: |
| Cluster 1 | | | | | | | | | |
| Mungram | Soil | 49 | 20,000 | 48 | 1 | Leakage | 24,147 | 180 days | 68 days |
| | RWSS | 23 | 34,000 | 18 | 5 | Damaged by road construction | | | |
| | NGO | 2 | 30,000; 40,000 | 2 | 0 | | | | |
| Cluster 2 | | | | | | | | | |
| Lungchok | Dept. of Horticulture | 22 | 20,000 | 10 | 12 | Leakage | 16738 | 120 days | 48 days |
| | MG NREGA | 10 | 10,000- 20,000 | 10 | 0 | 5 tanks under construction | | | |
| | RWSS | 3 | 34,000 | 2 | 1 | Leakage; pipe damaged by road construction | | | |
| Lungchok- Rolu | World vision | 1 | | 1 | 0 | | | | |
| | Dept. of Horticulture | 15 | 20,000 | 13 | 2 | Leakage | | | |
| | MG NREGA | 9 | 10,000- 20,000 | 6 | 3 | Leakage | | | |
| Cluster 3 | | | | | | | | | |
| Kameray | Horticulture Dept. | 8 | 10,000 | 2 | 6 | Leakage | 12, 942 | 116 days | 36 days |
| | RMDD | 2 | 5,000- 10,000 | 2 | 0 | | | | |
| Belbotay | Horticulture Dept. | 6 | 10,000 | 6 | 0 | | | | |
| | RMDD | 2 | 34,000 | 2 | 0 | | | | |
| | MG NREGA | 2 | 10,000 | 2 | 0 | | | | |
| Tharpu | Horticulture Dept. | 10 | 20,000 | 6 | 4 | Leakage | | | |
| | MG NREGA | 15 | 10,000 | 15 | 0 | | | | |

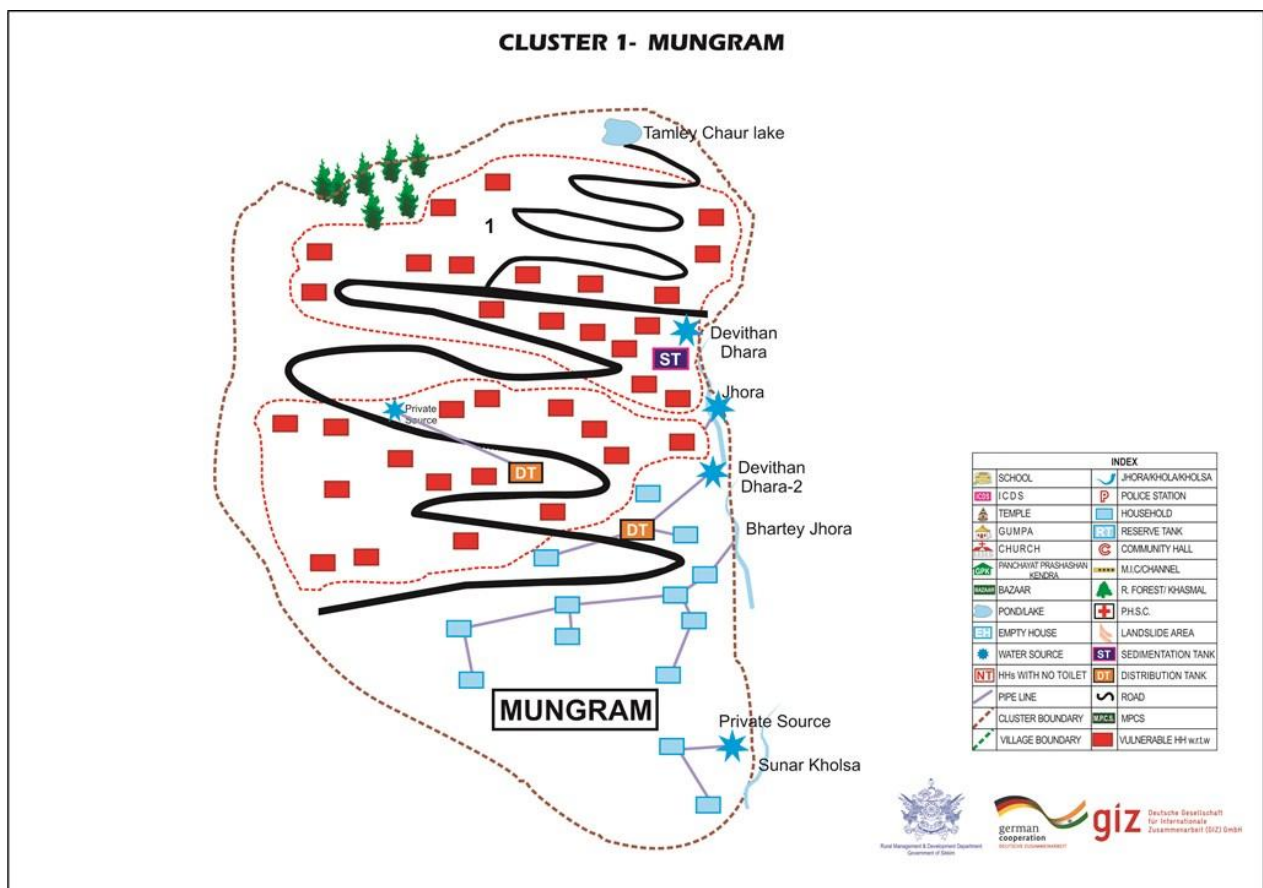
Observation:

The water scarcity in the village can be understood easily based on available water storage options at the household level in the village. Higher storage tank is built in the high water scarcity area and the numbers of tanks is also very high this shows that the storage medium is the options for adaptive

measures within the community. In LungchokKameray GPU, community already realized the need of storage medium to store the monsoon rain to be used in the dry season. Availability of water storage medium (tanks) inversely depends upon the availability of drinking water from the source. Lesser the availability of water sources higher the number of tanks available in the village. it is always advisable to promote the idea which is acceptable by the community. Several tanks are defunct because of leakage; it can be made functional by repairing with the small investment. The Mugram village has water scarcity for around 180 days and the average available water storage tank can store water that can serve only for 68 days. So there us a need of construction of additional storage tank in this village based on annual rainfall they received.

PRA Maps for water security

Cluster 1: Mugram Ward



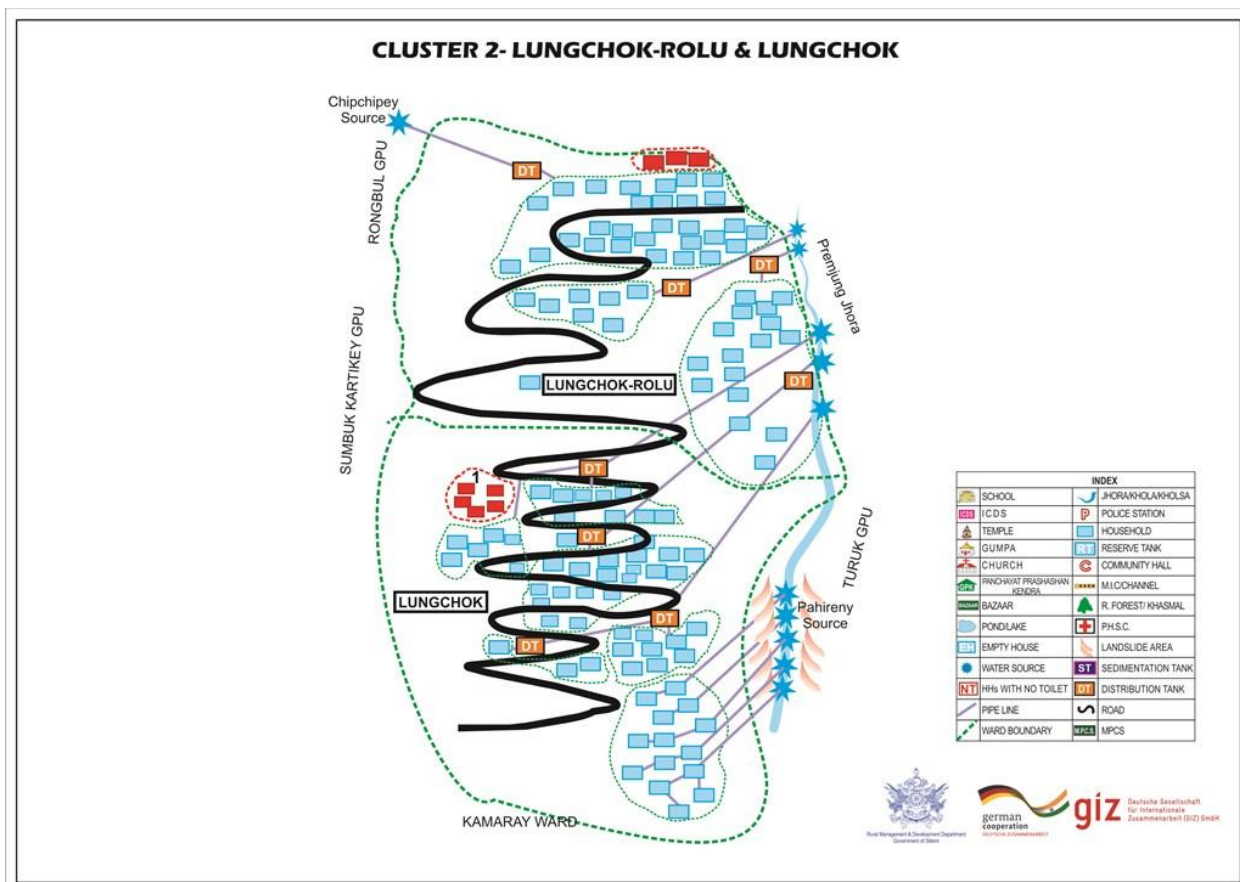
Observation:

The Mungram ward have 60 household located in the ridge line of LungchokKameray GPU. The area is mostly dominated by the Sharpa communities. Being in the higher elevation the Mugram receive comparatively higher rainfall then other gram panchayat ward of this GPU. The Mungram have high water scarcity due to lack of water sources of their own. Geographically the village is located in the higher range and all the water sources located below the hills. The gravity flow from the existing source is not possible. In the past there was one lake called “TamleyPokhari” used to exist in the top

of the village, the lake was concretized and suddenly the lake became dry. After the human intervention in the lake the local sources dried up. Now the community used to harvest roof top rainwater for their drinking purposes. More than 50% Mungram villagers depends upon the monsoon rain for the drinking purposes through the year. The government has supported harvesting tank of different volumes supported by many departments but the dry season remain almost for 6 month and the volume of tank may not be sufficient address the scarcity.

The village has 27 household whose life totally depends upon roof top rainwater harvesting tanks. 20 household do not have water supply in their home and they have to do head load from the springs located below their house. 13 household have government pipeline and 7 household have private pipe line they are comparatively in safer zone within the village. The treatment/filtration of roof top rain water used for drinking felt urgent requirement in the area.

Cluster 1: LungchokRolu and Lungchok Ward

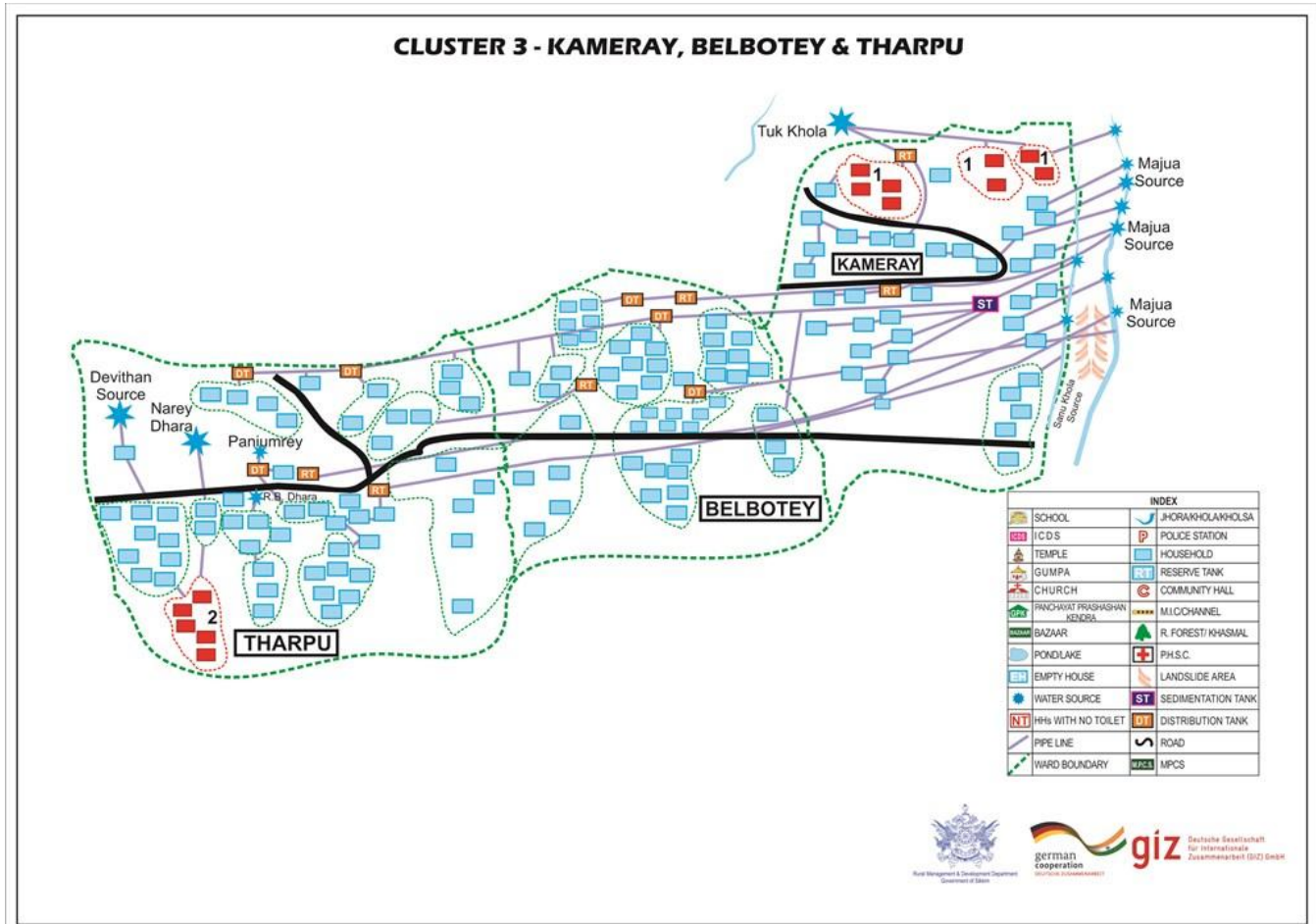


Observation:

LungchokRolu and Lungchok villages are located in the middle part of the GPU. The Chipchipay source is the only source in the LungchokRolu ward have the largest water users extend till Lungchok ward. The water from this source is also taken by other villages like Rong bull, SumbukKartikey GPU. The Premzongjhora a water source flows towards Lungchok and Kamaray ward is the perennial source and have the largest coverage in the GPU. The water from this source is also taken by the community of TurukRamabung GPU. The LungchokRolu have more water problem then Lungchok ward since the only source Chipchipay have limited discharge for the water users from many village. The lower parts of Lungchok ward community used to get water from Pairini source that most of time

get disturbed due to landslides. The PremzongJhora have good amount of water but proper water management is the key issues to be address. The solution could be community based water management and distribution system with additional community storage tank has to be constructed.

Cluster 1: Kameray, Belbotey and Thorpu Village



Observation:

The three villages in the lower part of LungchokKameray GPU mostly take water from Majua Source. The landslides between Majua source and kameray village is the main cause of disturbance in the water supply in the village. GI pipe was damaged by the landslides and the dependent community have drawn private poly pipe from the Majua source. The increasing number of private poly pipeline resulting conflicts among the villagers and lead to water scarcity especially to the economically vulnerable groups. For equal distribution and proper management of water in this cluster focus on community based water supply scheme is suggested. The Tharpu village has several private source of their own; combining these private sources in a proper network will benefits the larger groups of people. Large reservoirs with the regulatory system are suggested in all the water sources in village for equal-distribution of water that will minimize the conflicts.

Suggested measures

| Measures | Where | Why | Priority |
|----------|-------|-----|----------|
|----------|-------|-----|----------|

| | | | |
|---|---|--|-----------|
| Roof top water harvesting system with proper filtration techniques | All household in all village | Plenty of rainfall, around 40000 liters rain wastage in runoff. | Very High |
| Strictly monitoring of ongoing RWSS works | LungchokRolu, Lungchok, Kameray, | Implementation of the project was not done so appropriately | Very High |
| Construction of large volume reservoir with multiple channelization system at the source to store monsoon discharge for the community | In all water sources | Every year lakhs of liters of water goes overflow from the springs by surface runoff. Do not have adequate infrastructure to store excess water in the source. | High |
| Cluster wise water distribution system in a timely manner | From main storage tank to distribution and to household | Minimize the problem of water scarcity. Minimize the conflicts. | High |
| Repairing of existing water supply and distribution system | In all the village | Leakage of pipe, tanks in several places was observed | High |
| Implementation of DharaVikas for source sustainability | In the catchment of all the sources | Due to environmental changes discharge of source is diminishing | High |
| Protection of water supply pipeline in the landslides prone area by adopting proper measures | From Majua source to Kameray, Belbotey, Thorpu village | Every year in monsoon season the landslides in Pairini damaged water supply pipeline from Majua source to lower part of GPU causing high threat for water security | Moderate |
| Formation of water user group in the village level for proper management and operation | In most of the village. | Increasing in private pipeline connection in the village resulting conflicts among the community, distribution system is not balanced | Moderate |
| Harvest roof top rain water in dugout pond with tarpaulin for irrigation | In all the household | In rural area a household can have multiple roofs. Water from the roof of cowshed, kitchen ect can be harvest for irrigation | Low |

| Options for water security | | Mungram | LungchokRolu | Lungchok | Kameray | Belbotey | Tharpu |
|--|---------------------------------------|---------|--------------|----------|---------|----------|--------|
| Roof top rain water harvesting with filtration | | Green | Green | Green | Green | Green | Green |
| Strictly monitoring of ongoing RWSS works | | White | Red | Red | Red | Red | White |
| Construction of large volume reservoir to store excess discharge in monsoon | | Yellow | Yellow | Yellow | Yellow | White | White |
| Repairing of existing water supply network | | White | Yellow | Yellow | Green | Green | Green |
| Protection of water supply pipeline in landslides zone | | White | White | White | Red | Red | Red |
| Source sustainability through DharaVikas | | Red | Red | Red | Red | Red | Red |
| Time based water supply system | | Green | Green | Green | Green | Green | Green |
| Networking/ Linking of water sources located in private land into public water supply system | | White | White | White | White | Green | Green |
| Index | | | | | | | |
| Red | Immediate intervention | | | | | | |
| Yellow | Moderate priority | | | | | | |
| Green | Highly recommended and high potential | | | | | | |

Potential of Rain Water Harvesting System

| | |
|---|-----------------------------|
| Average annual rainfall in LungchokKameray | 1200 mm |
| Average area of roof of a rural house | 12 feet X 25 feet 28 SqM |
| Volume of water harvest from a roof in a year | 34 CUM 34000 liters |
| Average size of the family | 5 persons |
| Total water requirement in a day @ 70 LPCD | 350 liters |
| Numbers of days that the roof top rain water can support | 97 days |
| Average Numbers of water scarcity days in a year | 120 days |
| Average amount of water consume by a household based on current senario (4-6 gagri in a day \approx 80 liters/Day) which is 4 times lesser then the state prescribed amount | |



Survey of existing water tank (Public)

| Sl. No | Location | GPS Coordinates | | | Water Source | Target village(s) | No. of HHs connected | Type of Tank at source | Size of Tank | Status of Tank | Size of Pipe | Observation | Suggested Measures |
|--------|----------------------------|-----------------|-----------|---------|---------------------|-------------------|----------------------|------------------------|--------------|----------------|--------------|--|---|
| | | Latitude | Longitude | Alt (m) | | | | | | | | | |
| 1 | Mungram (TamleyChaur Lake) | 27°08'21" | 88°24'17" | 2022 | Lake water/rainfall | | 0 | Water harvesting | 60mx20m | Dry | | Water in the lake and springs downstream dried ot due to cementation/conversion of lake to water harvesting tank | Official direction to dismantle and remove the concrete structure which could facilitate the percolation of rainwater |
| 2 | Mungram RF | 27°08'47" | 88°24'02" | 1767 | Chichipecy source | Lungchok-Rolu | 26 | Distribution tank | 10'x5'x5' | Functional | 80 mm | No sedimentation tank at the source | |

| | | | | | | | | | | | | | |
|---|-------------------|-----------|----------------|------|----------------------------------|--|----|----------------------|-----------|--------------------------|----------|---|--|
| 3 | Mungram | 27°08'15" | 88°24'02" " | 1743 | Devithan eyDhara | Mungr am | 0 | Intake tank | 15'x8'x4' | Leaking | NA | No sedimentation/storage tank at the source; people upstream fetch the water (headload) | |
| 4 | Lungchok- Rolu | 27°08'06" | 88°23'40" " | 1703 | Devithan eyDhara | Lungch ok-Rolu | 12 | Distribution tank | 12'x8'x5' | Functional | | | |
| 5 | Lungchok- Rolu | 27°08'00" | 88°23'05" " | 1666 | Chichipey source | Gurung gaon, Lungch ok-Rolu | 26 | Distribution tank | 12'x8'x5' | Functional (not used) | 20 mm | New water supply tank is to be constructed above at 1677m | Clusterwise distribution of water from tank for equitable distribution |
| 6 | Suntaley | 27°07'54" | 88°23'19" " | 1494 | Chipchipey Kalikhop Source | Lungch ok-Rolu | 10 | Distribution tank | | Functional | | Proposed 10 HHs to get new connection from this tank | |
| 7 | Lungchok- Rolu | 27°07'46" | 88°23'40" " | 1421 | Premjung Source | Lungch ongRol u, Lungch ok | 92 | Distribution tank | | Functional | | | |
| 8 | Suntaley | 27°07'57" | 88°22'43" " | 1265 | TukKhola | Kamera y | 14 | Intake tank | | Functional | | Location of source/tank is inaccessible, pipelines laid on difficult terrain | |

Survey of Main Water Source

| S I. N o | Name of Source | GPS Coordinates | | | Perennial/ Seasonal (if seasonal, indicate months) | Locat ion | Depen dent Village | No. of HHs depe ndent | Catch ment Type (nam e) | Type of tank at source (Intake/sedimentation /distribution tank) (Yes/No) | Disch arge level (lpm) | Size of Tank | Status of Tank/ water source | Si ze of Pi pe | Suggested Measures |
|-------------------|--------------------------|-----------------|---------------|---------------------|--|---------------|----------------------------|--------------------------------|-------------------------------------|--|---------------------------------|--------------------|--|----------------------------|---|
| | | Latit ude | Longi tude | Altit ude (m) | | | | | | | | | | | |
| 1 | Chipchipey source (1) | 27°08'47" | 88°24'02" | 1767 | Perennial | Mungram RF | Upper Lungchok | 26 | Mungram RF | Distribution | 8-10 lpm | 10'x5'x5' | Overflow in monsoon | 80 mm | Review the incomplete water supply scheme |
| 2 | Devithaney Dhara | 27°08'17" | 88°24'02" | 1753 | Perennial | Mungram | Mungram | 15 | Mungram RF | Intake | 300-400 lpm | 15'x8'x4' | Overflow in monsoon | NA | Construction of proper intake tank and big storage tank for storing surplus monsoon water |
| 3 | Devithaney Dhara (Lower) | 27°07'53" | 88°23'43" | 1499 | Perennial | Lungchok-Rolu | Lepcha gaon, Lungchok-Rolu | 5 | Mungram RF | NA | 150 lpm | NA | Overflow in monsoon | NA | |

| | | | | | | | | | | | | | | | |
|---|------------------------------|-----------|-----------|------|------------|---------------|----------------------------|----|------------|--------------|---------|----|---------------------|----|--|
| 4 | Premjung Jhora (LepchaDhara) | 27°07'59" | 88°23'58" | 1512 | Perrennial | Lungchok-Rolu | Lepcha gaon, Lungchok-Rolu | 10 | Mungram RF | Distribution | | | Overflow in monsoon | NA | Individual pipelines to HHs should be replaced with large reservoir/distribution tanks |
| 5 | KolampeyKhola | 27°07'47" | 88°22'42" | 1235 | | Suntaley | None | NA | | | 150 lpm | NA | | | |

