Rural Water Supply and Sanitation Project in Western Nepal Phase II

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CLIMATE CHANGE ADAPTATION AND DISASTER RISK REDUCTION IN THE WORK OF RWSSP-WN

RWSSP-WN BRIEF 13-2018

INTRODUCTION

As per Finland's Development Policy 2016[1], all development activities supported by Finland are geared to climate change adaptation (CCA), mitigation and preparedness. Strengthening the capacity of societies to be better prepared for natural disasters and survive crises is mainstreamed into Finland's development cooperation.

As per the Nepal Country Strategy by the Ministry for Foreign Affairs of Finland (2016)[2], disaster risk reduction (DRR) in mainstreamed in all the programmes and activities supported by the Government of Finland in Nepal. The Strategy underlines that DRR and CCA are important in the construction and operation of water supply schemes, and that every water supply scheme should have a water safety plan (WSP) in use.

This Brief explores how RWSSP-WN II answers to the CCA and DRR objectives of Finland's development policy and SDGs and how this shows in the everyday work of RWSSP-WN II.

Climate Change Adaptation plays an important role in the realization of the **Sustainable Development Goals** (SDGs)[3].

SDG 13 calls for urgent action to combat climate change and its impacts.

The indicator 13.b.1 under SDG 13 measures (…) specialized support, and amount of support, including finance, technology and capacity building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.

Note: the progress figures in this Brief refer to the situation as of July 2018.

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CCA AND DRR IN STEP-BY-STEP APPROACH

In RWSSP-WN II, scheme implementation follows a Step-by-Step approach. Step-By-Step guides the Water Users and Sanitation Committees (WUSC) through the scheme planning, implementation and post-construction phases. It ensures feasibility of scheme design and participation of all the scheme users throughout the process. WUSC is the centre of Step-by-Step: WUSC members' capacity is developed through gradual learning-by-doing backed up by training events and scheduled monitoring visits.

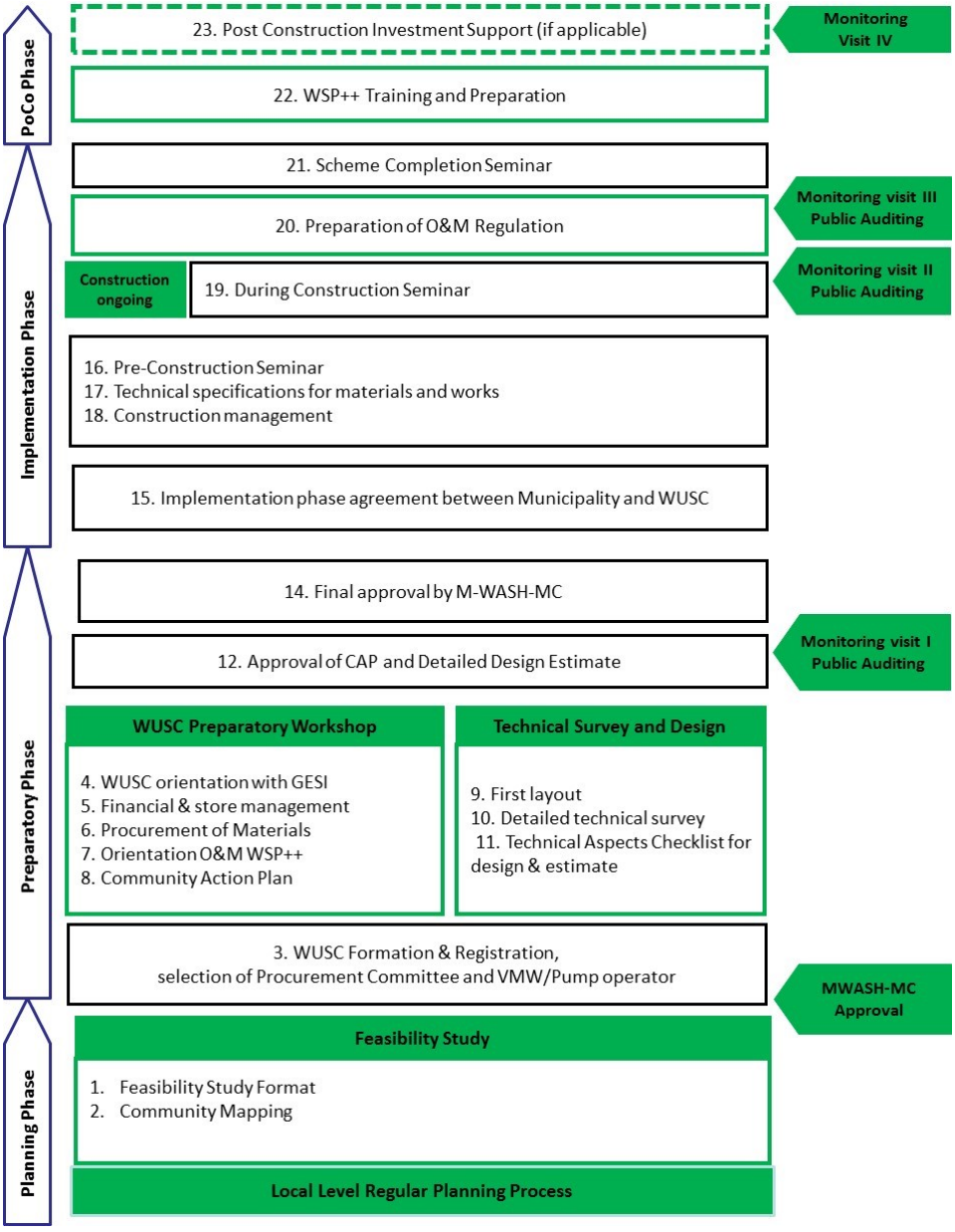
CCA and DRR are embedded in Step-by-Step. They are first time considered in the **Planning Phase Feasibility Study** that investigates if the potential water source delivers enough water throughout the year, if the water is free from contaminants, if source protection is needed, and if any hazards risk the scheme functionality. These are examples of factors that define whether the scheme is considered feasible and can enter the **Preparatory Phase**.

If the scheme is considered feasible, next step is the WUSC formation after which WUSCs receive **orientation to operation and maintenance (O&M) and Water Safety Plan ++ (WSP++)** as part of the **WUSC Preparatory Workshop**. In this one-day orientation, WUSCs familiarize with themes such as climate change, natural hazards, water safety and spring shed management in a practical way. This helps WUSCs to identify potential risks and come up with solutions. After the orientation, necessary improvements are made in the scheme design before starting its implementation.

In FY05 only, the Project organized 73 O&M and WSP++ orientations that reached 1,163 beneficiaries in rural WUSCs.

WUSCs prepare two interlinked plans: **O&M Regulation and WSP++**. O&M regulation serves as O&M policy that considers both short and long-term maintenance needs. It describes scheme institutional arrangements such as WUSC composition and frequency of meetings, water tariff collection and maintenance worker responsibilities. It is prepared by WUSC and approved in a mass meeting by the scheme users latest in the Scheme Completion Seminar.

When the scheme has already been in use for several months, the users will receive **WSP++ training** to further improve sustainability. This is given to WSP++ team that is selected among the scheme users. WSP++ training helps to recognize flaws and gaps in the water source protection and O&M practices, and to find ways to improve these. In the two-days training, the whole scheme and catchment area are carefully investigated to identify any risks to be addressed.



CCA and DRR are mainstreamed in RWSSP-WN II Step-by-Step working modality.

Based on the system analysis, WSP++ team prepares a comprehensive maintenance plan including immediate control measures, short term plan for regular O&M works and a long-term plan for bigger upgrading works. WSP++ considers also financial sustainability helping WUSC to set the water tariff on a sustainable level. After the training, the WSP++ team has the responsibility to continuously implement, review and update the Plan.

If the WSP++ implementation requires further investment to ensure scheme functionality, WUSC can apply for **Post-Construction Phase investment support**. Post-construction support is allocated for small works such as source protection, recharge structures and filtering systems to improve scheme sustainability.

By the end of FY05, the Project had provided post-construction support to 385 schemes with 156,571 beneficiaries out of which 382 schemes had received WSP++ training and 78 had received post-construction investment support.

Source yield measurement is crucial to determine whether the source delivers enough water for the target population throughout the year. Regular source yield measurement and recording is beneficial also after the scheme completion: knowing the spring behaviour helps to optimize water use and react in case of declining trend.

Scheme monitoring and public auditing play an important role in the Step-by-Step modality. Each gravity and lift scheme go through at least three monitorings and public audits. In the half-day public audit meeting, the community can discuss any challenges and find solutions together with the Municipality and Project staff.

CCA and DRR issues are discussed in every monitoring visit: first monitoring pays special attention to the water source including water quantity, availability and quality as well as source protection needs. The monitoring team investigates whether there are risk factors that require further attention in the scheme technical design.

The second monitoring ensures that the scheme is constructed as per design and gives advice for improvements. The third monitoring ensures that all the required works have been completed as per design, VMW has been trained, O&M Regulation has been prepared and the scheme is financially cleared.

Monitoring and public audits play an important role in the Step-by-Step approach. CCA and DRR are discussed in the public meetings where all scheme users have an opportunity to share their concerns. Necessary actions are taken in the scheme implementation as per the findings.

RWSSP-WN II *strengthens the institutional capacity of government bodies to plan, coordinate, support and monitor WUSC and other community groups in the implementation, operation and maintenance of domestic water, sanitation and hygiene programmes in a self-sustainable manner.* Since the state restructuring process of Nepal, municipalities have the responsibility to plan, coordinate and manage water supply in their corresponding areas. Municipality staff must have adequate knowledge of CCA and DRR so that they can support others. Therefore, the Project trains also municipality staff.

In FY05 only, 440 municipality staff members were trained in CCA and DRR in the Project working municipalities.

SPRING SHEAD APPROACH TO PROTECT AND REVIVE DECLINING SPRINGS

Spring source depletion is a real challenge in the Nepalese mountains. In 2014, RWSSP-WN II inititated a study to compare source yields of 2,387 water sources and changes in climate in between years 2002 and 2013 in Tanahun district. During the study period, temperature had had an increasing trend, the average rainfall had decreased significantly from 2,748 mm between 1970 and 2010 to 2,298 mm between 2002 and 2013, and the average spring yields had decreased from 0.204 l/s in 2004 to 0.16 l/s in 2014 in the study area. (RWSSP-WN Brief 5-2016 and report by Dr. Binod Shakya 2015).[4]

Depletion of sources seriously hinders the sustainability of water supply interventions. RWSSP-WN II has its own **Spring-shed approach** for a systematic spring revival. The approach is embedded in the Step-by-Step: the spring yield is assessed first time during the Planning Phase and only schemes that deliver enough water throughout the year are accepted. Recharge technologies can be included in the scheme design from the beginning or later as part of the post-construction investment support. There are various nature-based solutions including recharge ponds, recharge pits, check dams and plantation that can help to increase spring yields and to improve water quality.

There are many uncertainties in implementing spring revival technologies. The correct spring recharge area must be defined, the number and volume of technologies selected, and proper capture of rain and surface runoff ensured. The challenging topography and geo-hydrological variations in Nepal mean that the water can flow to the spring from a long distance and even from the opposite side of the mountain than where the spring is located.

Recharge pond

In RWSSP-WN II Spring shed approach the optimal recharge area is defined based on an analysis of the rock bedding plane, dip direction, spring type and topography using Google Earth software as a planning tool (see Brief 9-2016)[5].

It is important to know the actual spring yields before the intervention so that the technologies could be designed accordingly. Yet, the success of the intervention can be studied only later on. In practice, it would be good to record spring yields regularly at least for two years (2 dry seasons) to know the required recharge volume. After the intervention, at least 2 monsoon seasons shall pass after which the impact can be analysed. Precipitation must be measured on site before and after to know the actual impact of the spring revival intervention. The source yield can be measured using a simple bucket and stopwatch method and precipitation data can be collected with a rain gauge device.

Plantation over scheme intake

By date, 80 RWSSP-WN II water supply schemes include recharge structures in their design: 29 schemes include recharge ponds, 34 schemes recharge pits, 15 schemes check-dam structures and 25 schemes plantation. The total number of recharge ponds constructed is 62.

Despite of the significant number of structures, the Project has found it challenging to study the impact of the interventions. No regular source yield data was collected for a long enough period before the interventions and it has been difficult to record reliable source yield data also afterwards. The Project can neither collect *on-site* precipitation data over several years. WUSCs' experiences have varied from no impact to positive changes in spring yields.

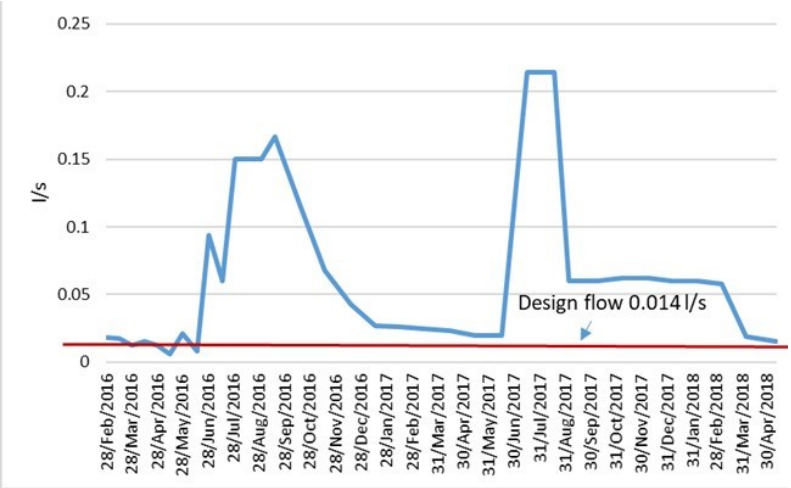
CASE STUDY— RECHARGE INTERVENTION IN BHURUNG THUNG, SYANGJA

Bhurung Thung Point Source Improvement water supply scheme (PSI) in Chapakot municipality, Syangja district, is a protected spring that serves 27 people from 5 households. The scheme has a design quantity of 45 litres per capita per day (l/c/d). Before the spring revival intervention in June 2016, the source yield data had been collected since February for less than four months during which the scheme had suffered from water deficit. After one year of regular source yield data collection, it was observed that the scheme had delivered surplus water all year except in April—June 2016 when it had suffered from an average daily deficit of 0.4 m^3. This means that the source would have required approximately 23 m^3 extra to deliver 45 l/c/d also through the dry months. Nevertheless, if the source delivered its total volume evenly, the daily quantity between February 2016 and 2017 would have been 190 l/c/d. The surplus which is lost as overflow in the rainy months largely exceeds the deficit of the dry months.

In June 2016, four dam structures and three recharge pits were implemented to improve source yields in the defined recharge zone of Bhurung Thung PSI. Both the dams and the pits were dug one after another on a hill slope by a drainage channel that directs surface runoff to the pits.

When Bhurung Thung PSI was revisited 22.5.2018, source yield data was available for almost three dry seasons (May-June 2018 is lacking). After constructing the check dams and the recharge pits in June 2016, the source yield had not dropped under the critical line 0.014 l/s required to serve the design quantity. A local key person Mr. Keshar Thapa who had been involved in the implementation of the recharge structures, estimated that the pits had improved the source yields. According to Mr. Thapa, before constructing the structures, there were years when the source dried completely and that had not happened after the intervention. These are all positive news but without locally collected precipitation data, an objective analysis of the impact cannot be conducted.

A monitoring visit to the site in May 2018 showed that after a heavy rain, the first pit with the highest elevation (2,1 m x 1,2 m x 0.70 m) had captured approx. 30 cm of water, the second pit (2.30 m x 1.4 m x 0.70 m) approx. 10 cm of water and the lowest pit was empty. All dam structures were dry. Below the pits, there is a 20 m^3 recharge pond meant to feed to another spring source. After the rain, also the pond was found dry. Based on the observation it seems that surface runoff plays a large role in the functionality of the recharge structures. Those pits that could capture surface runoff had stored water – those that captured only rainfall were dry.



Bhurung Thung PSI source yield data (l/s)

Recharge pit after the rain in Bhurung Thung PSI recharge zone

All rain and surface runoff water had filtrated through the pond in a couple of hours after the rain.

CONCLUSIONS

CCA and DRR are mainstreamed in RWSSP-WN II through the Step-by-Step approach. The Project has an objective to ensure access to safe and functional water supply services which is not possible without adequate risk management and adaptation measures. O&M and WSP++ trainings give WUSCs basic practical knowledge of CCA and DRR, and help them to improve scheme design where necessary. WSP++ training and preparation ensures that schemes are operated in a socially, financially and technically sustainable way. Spring-shed interventions are included in the scheme design where applicable or later as part of the post-construction support. Post-construction support can also address such as source protection to improve scheme sustainability. As a result of the activities, the communities become less vulnerable to the impacts of climate change and disaster risks, will become less dependent on external help and more capable to maintain their infrastructure in long-term.

RWSSP-WN II spring-shed approach has been applied to selected schemes since 2016. There are many uncertainties in implementing spring revival technologies: the structures must capture enough water to compensate the deficit, they must hold water long enough not to lose it in the overflow and systematic data collection must be practiced to follow up of the functionality of the intervention. At the same time, every spring is unique in a unique topographic and hydrogeological setting: what works in one place does not automatically work elsewhere.

Even if recharge structures would not solve the whole water deficit issue they might still have a positive effect on the seasonal volume of the spring discharge. Plantation and protection of existing vegetation is important as good vegetation cover increases water infiltration and reduces surface runoff and the chance of landslides. Vegetation can also improve water quality as it holds mud and silt from entering into the source. Springs have proven to have a declining trend in Nepal and therefore multiple solutions such as storing source overflow and using multiple sources must be considered to ensure reliable and sufficient water quantity throughout the year.

RWSSP-WN II is currently studying the impact of WSP++ implementation comparing functionality, operation and maintenance of schemes with and without WSP++. The results will be published in the Brief series later this year.

REFERENCES

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Rural Water Supply and Sanitation Project in Western Nepal Phase II is a bilateral development cooperation project funded by the governments of Nepal and Finland, and implemented through local governments and users' groups under the Department of Local Infrastructure, Ministry of Federal Affairs and General Administration. RWSSP-WN II works in 14 districts in two Provinces of Western and Mid-Western development regions in Nepal, thorough municipality-based programmes.

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