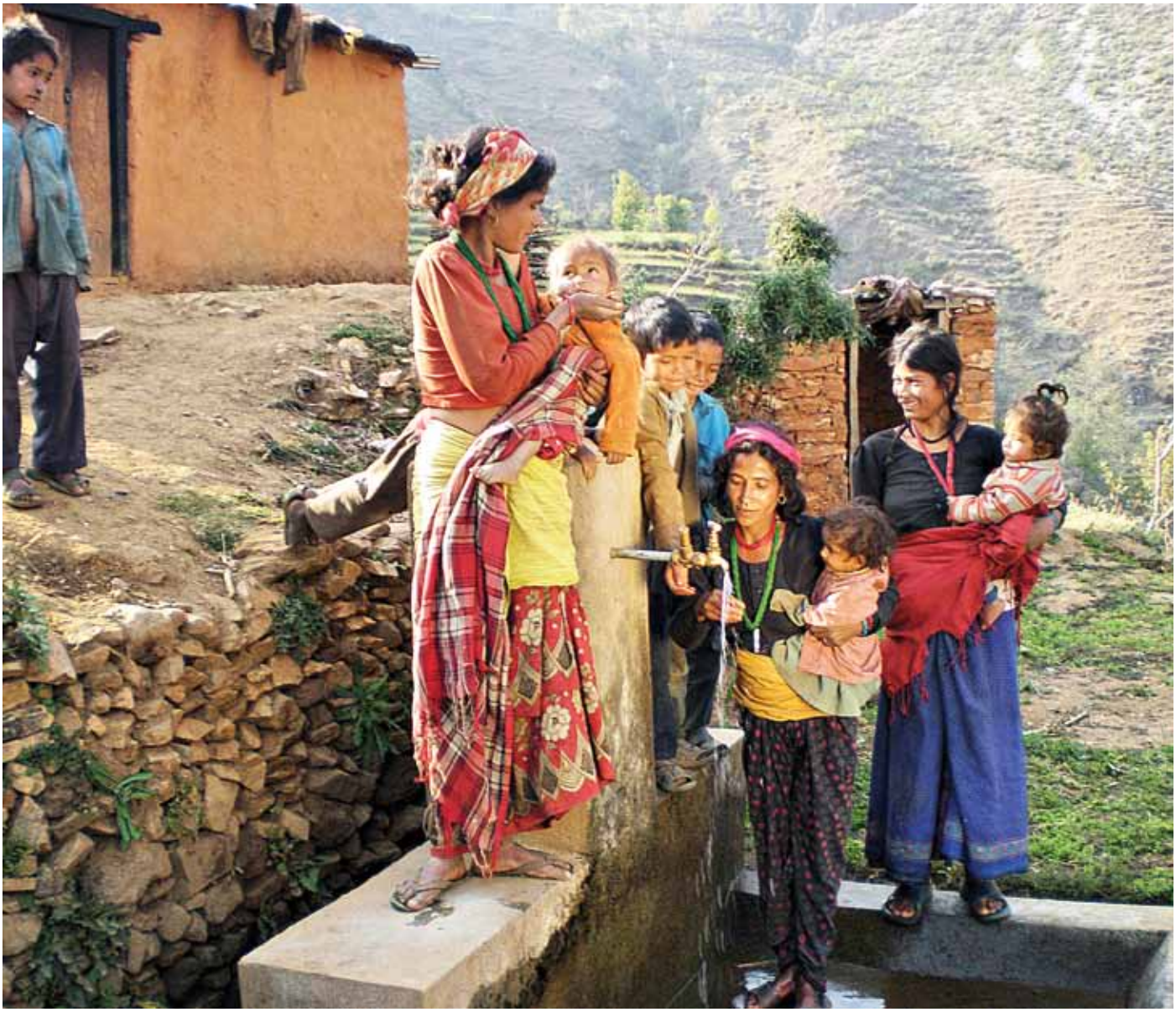

THE EFFECTIVENESS AND OUTCOMES OF APPROACHES TO FUNCTIONALITY OF DRINKING WATER AND SANITATION SCHEMES

Water and Infrastructure Series 2013/1

HELVETAS Swiss Intercooperation | NEPAL

This paper discusses factors affecting functionality of community managed drinking water and sanitation schemes and highlights HELVETAS Swiss Intercooperation Nepal's approaches and their effectiveness in maintaining the functionality. We expect the paper to be a good medium to share our long experience and learning in the drinking water and sanitation sector since 1976 in the country.

We would like to thank all the contributors to this publication and offer special thanks to the author, Yogesh Pant. We would also like to express our sincere thanks to Han Heijnen for reviewing the paper and providing intellectual inputs.

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HELVETAS Swiss Intercooperation is a Swiss association devoted to development and cooperation. It works towards the elimination of the causes of marginalization and promotes solidarity with the poor in the south and the east. Its mission is to actively contribute to the improvement of the living conditions of the economically and socially disadvantaged people in Asia, Africa, and Latin America. Currently, it runs programmes of co-operation in 30 countries including Nepal.

Through publications, it contributes to the generation of knowledge and the process of learning through sharing on development and co-operation. For more details or comments, please contact:

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Cover Photo: A community tap in a drinking water and sanitation scheme supported by Water Resources Management Programme in Dailekh district

THE EFFECTIVENESS AND OUTCOMES OF APPROACHES TO FUNCTIONALITY OF DRINKING WATER AND SANITATION SCHEMES

Findings of a study on the functionality of drinking water and sanitation schemes supported by HELVETAS Swiss Intercooperation Nepal: 2001 - 2005

By Yogesh Pant

Acronyms

DDC	District Development Committee
D-WASH-CC	District Water Sanitation and Hygiene Coordination Committee
DWSS	Department of Water Supply and Sewerage
MUS	Multiple Use System
NGO	Non Governmental Organization
NMIP	National Management Information Project
UC	User Committee
VDC	Village Development Committee
V-WASH-CC	Village Water Sanitation and Hygiene Coordination Committee
WARM-P	Water Resources Management Programme
WASH	Water Sanitation and Hygiene
W-WASH-CC	Ward Water Sanitation and Hygiene Coordination Committee

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Executive Summary

The General Assembly of the United Nations has declared access to drinking water and sanitation as a fundamental human right and the Government of Nepal has committed itself to provide drinking water and sanitation to all its citizens by the year 2017. To fulfil this commitment poses multifaceted challenges in a developing country such as Nepal. The current coverage of drinking water and sanitation in the country is 85% and 62% respectively. In addition to constructing new drinking water and sanitation schemes, existing facilities need to be rehabilitated to provide quality service to local communities.

The Water Resources Management Programme (WARM-P) uses a well-defined approach based on the following factors, which affect the proper functioning of community managed drinking water and sanitation schemes in rural Nepal. These factors include:

- local ownership, and skilled maintenance workers
- management capacity of User Committees (UCs)
- operation and maintenance funds
- tools and spare parts for operation and maintenance
- scheme design
- construction materials and workmanship
- water source and the productive use of water

WARM-P conducted a study in November – December 2011 on the functional status of 98 drinking water and sanitation schemes that included 92 gravity flow systems and 6 Rainwater Harvesting systems constructed with its support during 2001-2005. Among the schemes studied, 34 were located in Syangja, Kaski, Parbat, and Tanahu districts in the Western region, 19 in Dailekh and Jajarkot districts in the Mid-Western Region, and 45 in Doti, Achham, and Dadeldhura districts in the Far-Western region of the country.

The study assessed the overall status of the drinking water schemes taking into account both the operational status of water services and structural conditions as a whole. The study revealed that out of the total 92 gravity flow schemes surveyed, 23% were categorised as functioning well, 48% needed minor repair, 22% needed major repair, 5% needed rehabilitation, 1% needed reconstruction, and the remaining 1% were not in good enough condition to be rehabilitated. Even though the first four categorised water systems were functioning, some were in need of basic repair. The gravity flow schemes falling under the last two categories were the only ones that were not functioning.

Although Rainwater Harvesting systems were not classified in these categories, all of them were functioning well with the exception of a few jars that were not being used for need of repair. In conclusion, 98 per cent of the schemes — both the gravity flow schemes and the Rainwater Harvesting systems constructed with WARM-P's support — are functioning and providing people with water in their courtyards.

In the schemes surveyed, communities were aware of basic hygiene and good sanitation practices and 64.5% had toilets, which is higher than the national average of 62%. On average, schemes constructed with WARM-P's support are functioning better than schemes implemented by other agencies. The Department of Water Supply and Sewerage conducted a study in 2011 on the functional status of 37,541 drinking water schemes

constructed with support from different agencies in the country. The study revealed that only 17.9% of these schemes were functioning well; 38.9% needed minor repair, 11.8% needed major repair, 21% needed rehabilitation, 9.1% needed reconstruction, and 1.6% were not in good enough condition to be rehabilitated. A direct comparison may not be justified here as the study may have included schemes older than in WARM-P's study, resulting in a higher percentage of schemes that were no longer functioning.

Despite being in working condition and having good physical structures, many WARM-P schemes are in need of different types of repair, indicating that in the long term there could be problems with how these systems continue to function. The study reveals that the institutional mechanism responsible for taking proper care of the operation, repairs, and maintenance of the facilities remains poor.

There are UCs, Operation and Maintenance fund and trained service providers in almost all the schemes. However, more than 40% of the UCs have not been holding meetings in the last year. In addition, about two thirds of the schemes have not been using their Operation and Maintenance fund for the required purpose, and about one third of trained service providers are passive or not functioning. These key factors indicate a need for a review of the schemes constructed. These institutional shortcomings need particular attention and approaches need to be reviewed to reactivate mechanisms, especially after construction.

The Department of Water Supply and Sewerage has tried to address operation and maintenance issues and emphasized the need for post-construction support at district level. In the future, the government should provide this type of long-term service, and hand the scheme over to both the community and the district government.

The need for different types of repairs seems to stem from the programme's approach to support only community or public tap stands shared by many households. The study revealed that users were reluctant to use and properly maintain community tap stands and would rather connect separate pipes from the tap to bring water directly to their houses.

The programme needs to review this approach and support both private tap stands and community tap stands based on a feasibility study and an assessment of users' demands. This will result in a proper system of payment based on water usage. It would be fair for people with a household connection to pay more per month (and possibly at the time of initial connection) than lower income households who take (less) water from a public tap stand. WARM-P has piloted the concept of household connections in some rural areas of the country however; the results of this have not yet been assessed.

It is essential to establish local institutional mechanisms to monitor drinking water and sanitation schemes. With its legal mandate and capacity, a District Development Committee (DDC) is the most appropriate body for establishing this institutional mechanism. The government will have to strengthen further the capacity and capability of local bodies for this purpose.

Finally, the sustainability of a WASH system depends on the awareness of the community using it. If WASH is introduced as part of the 'Life Skills' curriculum at the end of primary school, this will increase awareness in locals from childhood.

1 Introduction

Since the General Assembly of the United Nations declared access to drinking water and sanitation as fundamental human rights,[1] many member states including Nepal ratified the declaration and others are in the process. Ensuring this right of the people has multifaceted challenges in developing countries. Together with construction of new drinking water and sanitation schemes to cover additional people deprived of the facilities, it requires maintaining functionality of the existing schemes for ensuring they serve the designed populations for the design period and possibly beyond. Rather than counting the number of newly constructed drinking water facilities and constructing new drinking water and sanitation schemes to benefit additional communities, those that are still functioning properly and are still serving local communities need to be counted.

In most developing countries, national aggregated data on the coverage of drinking water and sanitation facilities is generally based on the number of people reported to have used the schemes immediately after construction is complete. The data does not look at how drinking water schemes are functioning at present. As a result, chances are high that the coverage data is sometimes unrealistically high and does not represent the real situation on the ground.

The government of Nepal is committed to provide drinking water and sanitation to all its citizens by 2017. Based on the census conducted in 2011 by the Central Bureau of Statistics Nepal, coverage of basic water supply and that of sanitation in the country are estimated to be 85 per cent and 62 per cent respectively. The actual functional coverage is still far lower. About 43% of drinking water schemes counted as 'coverage of drinking water' are not fully functional (Water Supply & Sanitation Division / Ministry of Physical Planning and Works: 2011). This indicates that existing schemes need to be properly maintained and assets need to be managed well to make drinking water schemes sustainable. The focus needs to shift towards local capacity and funding, whilst experts who have worked with non-governmental organizations (NGOs) will have to strengthen the capacity of the national government, the government at district level, and civil society organizations.

Water Resources Management Programme (WARM-P) is a programme of HELVETAS Swiss Intercooperation, a Swiss NGO that supports the effective management of water resources at community level in remote, rural areas of Nepal. HELVETAS Swiss Intercooperation has been a development partner of Nepal since 1956. It began its support to the drinking water and sanitation sector in 1976. WARM-P evolved in the year 2001 from the experiences and learning of its predecessor programmes i.e. Community Water Supply and Sanitation Programme (1976-1994) and Self Reliant Drinking Water and Sanitation Support Programme (1994-2000). The programme supports Village Development Committees (VDCs), the lowest administrative units in the country, to prepare their Water Use Master Plan, implement

[1] On **28 July 2010** the United Nations General Assembly through **Resolution A/RES/64/292** declared safe and clean drinking water and sanitation a human right, essential to the full enjoyment of life and all other human rights.

drinking water and sanitation schemes prioritized in the plan, and grooms service providers to sustain schemes constructed with its support. Sanitation is an integral part of drinking water schemes and all households who use the service have also been given support to construct toilets. By 2012, WARM-P supported to prepare 92 Water Use Master Plans and construct 346 drinking water and sanitation schemes managed by local communities in remote, rural areas of Nepal. These initiatives have benefitted more than 125,000 users (WARM-P: 2001-2012).

This paper discusses factors with regards how schemes function and the approaches taken by the programme. It presents the effectiveness and outcomes of approaches by looking at a study on the functionality of drinking water and sanitation schemes constructed with WARM-P's support during 2001-2005.

2 Functionality Factors

A well-functioning drinking water and sanitation scheme has sound structural conditions, and is dependent on these various structures and their capacity to work as an integrated system. The role of local people and institutions in operating the system are also crucial for a drinking water and sanitation scheme to function well.

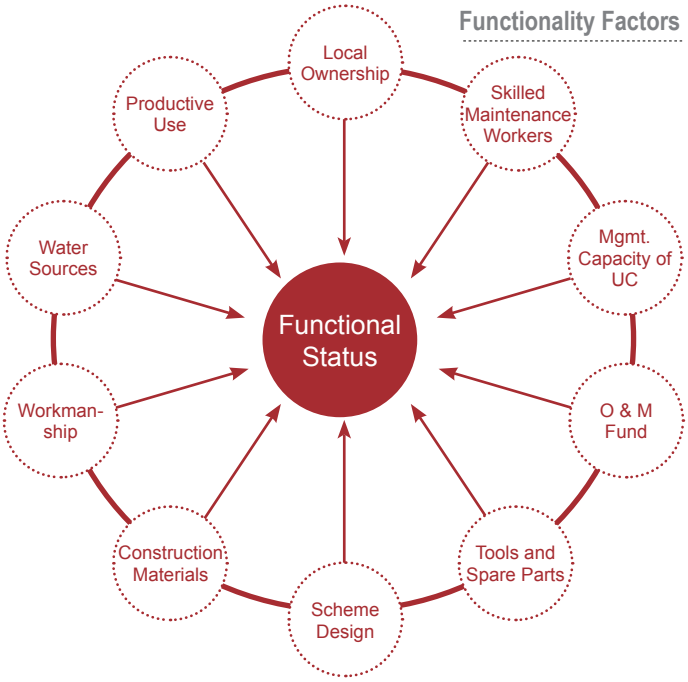
Many factors affect a drinking water and sanitation scheme such as type, size, and location. This paper only discusses key generic factors that are particular to community managed drinking water and sanitation schemes in rural areas of Nepal. Figure 1 presents the key generic factors and their relationship to how well schemes function.

2.1 Local Ownership: If users have a sense of entitlement to equitably use a drinking water facility and to share the responsibility to effectively operate, repair, and maintain it throughout its lifespan, they feel a sense of ownership towards it. Ownership, thus, does not only mean just the right to use the scheme but also to have a deep sense of responsibility to maintain it. Users must be involved from the start in planning, financing, constructing, managing, operating, and maintaining their drinking water facility to develop this strong sense of ownership.

2.2 Skilled Maintenance Workers: Skilled maintenance workers must be available as they are a key component for drinking water and sanitation schemes to function well for both the efficient operation and the timely repairs and maintenance of the schemes.

A drinking water scheme has a variety of structures in between the source and points of use. Any damage or malfunction may not necessarily stop water flowing from taps and users may not immediately notice the damage. However, small damages may affect

FIGURE 1
Functionality Factors



the overall facility from functioning well in the long run. If minor repairs are unattended to the situation may lead to major repairs later or to the need to replace the entire water system. In order to avoid this situation, every water scheme requires skilled maintenance workers to monitor the entire structure from the source to distribution points. If maintenance workers are involved from the start of the development of the water safety plan, and if they regularly walk along the path of the installed system, flaws can be detected and repaired on time.

2.3 Management Capacity of User Committees (UCs): UCs have the right and the responsibility to oversee the planning, networking, advocacy, construction, operation, repairs, and maintenance of their drinking water schemes. However, they must also have the capacity to secure legal identity of their schemes and must be able to network with and approach potential resource organizations to ensure that their facility remains sustainable.

This will enable the UCs to acquire funds for larger repairs and maintenance when needed, and keep the water scheme functioning long-term. The quality of a drinking water facility depends on the capacity of UCs to be able to carry out the above activities effectively.

Key elements that determine the management capacity of UCs include issues of gender / the presence of women in the UCs, and rotating leadership over the years so that younger community members can also hold positions of responsibility.

2.4 Operation and Maintenance Fund: A drinking water and sanitation scheme must have access to an Operation and Maintenance fund to pay maintenance workers and to replace small fittings and parts i.e. taps, valves, washers etc. A maintenance fund established at the scheme level may not be enough to undertake major repairs such as reconstruction or replacement of larger structures i.e. the reservoir tank, intake main pipeline etc. In such cases, UCs should approach the VDC, DDC and other agencies, which have allocated budgets for this type of repair.

The maintenance fund is used for financing direct operational support and for regular maintenance and repairs of different scale. It does not aim to cover indirect operational costs or recover the capital expenditure.

2.5 Tools and Spare Parts for Operation and Maintenance: Without access to tools and spare parts, maintenance workers will not be able to do their job. Tools and spare parts must be kept in stock for regularly maintaining and repairing drinking water facilities. Not only must these tools be easily accessible, maintenance workers must also know where to purchase them. It is important to note that in remote areas of Nepal, local markets have poor access to manufacturers, dealers, or suppliers of tools.

2.6 Scheme Design: The scheme design is the blueprint for how a water scheme operates and how it looks like. It provides the framework on which the scheme stands and operates throughout its life span and outlines the type, location, and size of various structures from source to distribution points. The scheme design also takes into consideration local demand, structure, hydraulic requirements, and factors that will have direct or indirect impact on the life of the proposed water facility. Preferably, all targeted users and other stakeholders should have knowledge about the scheme design. A hoarding board displaying the summary of the scheme design and other related information can be put on site for this purpose.

The scheme design has vital impact not only on the structural framework of a facility but also on the socio economic and cultural practices of the people who use it. Efficiency of a design is subject to its acceptability by the people it targets to serve.

2.7 Construction Materials and Works: The quality (strength and durability) of construction materials and works done determines how well the water scheme functions in the long-term.

2.8 Workmanship: Artisans / skilled workers who work to create a water facility must have the necessary knowledge, skills, expertise, and creativity to carry out construction work. The quality of the entire water facility thus depends on good workmanship.

2.9 Water Source: If there is no water source, a drinking water facility cannot be built. If a source starts drying up, functionality of the scheme deteriorates or the scheme even stops serving the purpose for which it was constructed.

In addition, it is crucial that the water source is reliable for the long-term, and is safe to drink. Once established, the source needs to be protected and conserved. Decisions made in this regard require a participatory process ensuring equitable sharing of water by all concerned people. Lastly, it is important to acquire a legal document or record of the water source that is accessible to all stakeholders for review.

2.10 Productive Use of Water: Water is primarily used for drinking, cooking, hygiene, laundry, and sanitation. Fully productive drinking water schemes that have the capacity to supply water for additional productive purposes such as cattle, biogas production, and vegetable gardening tend to function better because users have an interest to maintain the facility well for these additional purposes.

3 WARM-P Approaches to Functionality

WARM-P uses an approach that balances a mix of both hardware and software supports in its entire implementation process. Hardware support comes in the form of standard construction materials and technology and software support focuses mainly on enhancing the capacity of UCs to better plan, implement, and take proper care of their schemes. WARM-P has adopted a step-wise process with clearly defined activities and events that have a long-term impact on how the overall water and sanitation scheme functions. The 20 steps of the implementation process create synergy between hard and soft support. WARM-P's approach ensures that the entire implementation process is effectively monitored and reviewed with two mandatory follow-ups within two years after construction.

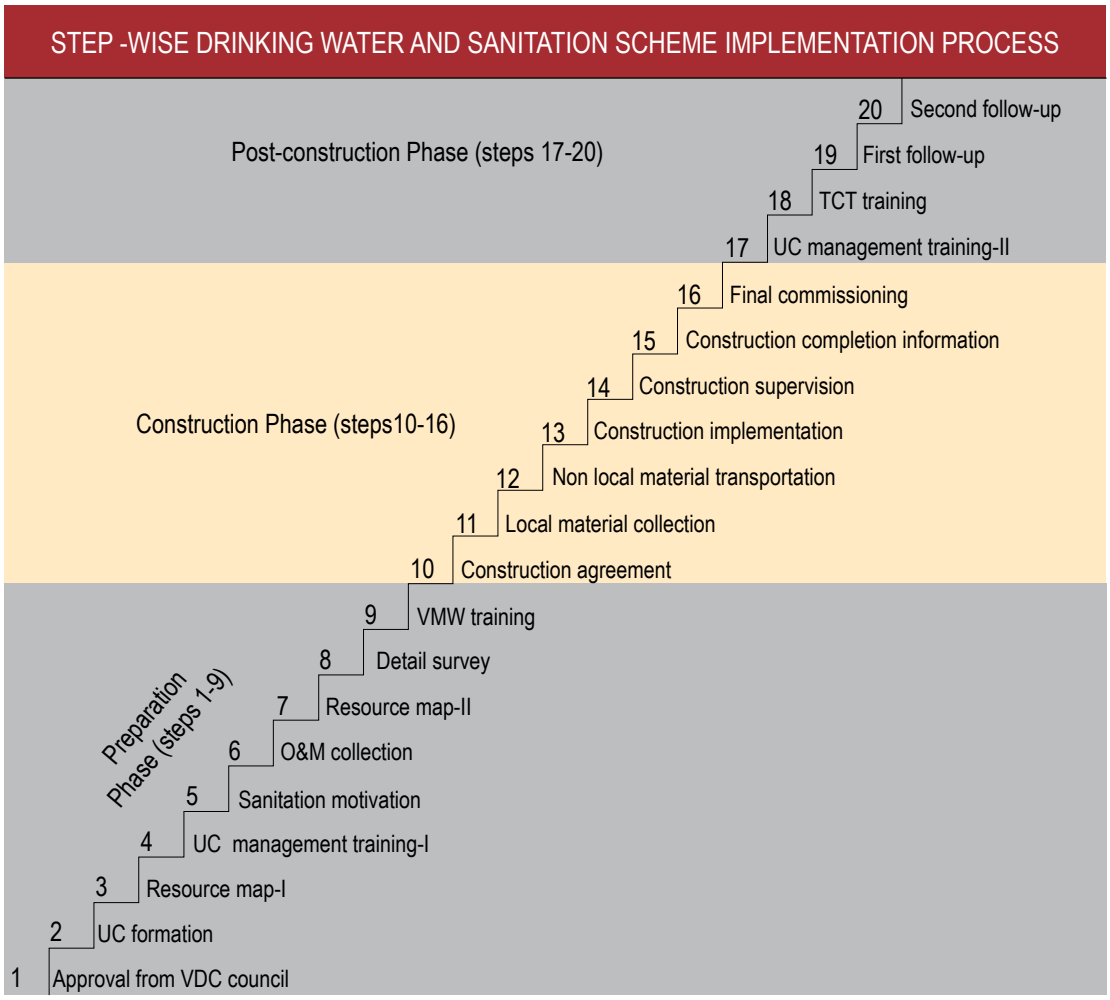
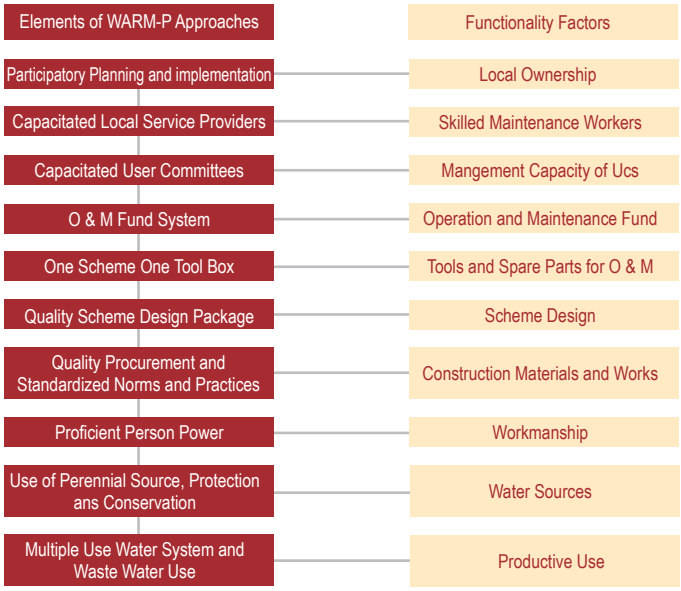


FIGURE 2 Elements of WARM-P Approaches and Functionality Factors



3.1 Elements of WARM-P Approach Influencing Functionality

3.1.1 Participatory Planning and Implementation

A Water Use Master Plan is a 17- step planning process that uses Participatory Rural Appraisal tools to ensure that people from all social strata participate in planning, negotiating, and decision-making activities. The plan provides access to information, builds consensus, empowers disadvantaged groups, and attempts to integrate water resource management at VDC level. The process involves assessing the current water situation and planning the future use of available water resources of the whole VDC. In each VDC where a Water Use Master Plan is prepared, a Village Water, Sanitation and Hygiene Coordination Committee(V-WASH-CC) and several Ward Water, Sanitation

A view of social mapping at Nepa VDC, Dailekh

and Hygiene Coordination Committees (W-WASH-CC) are elected by the community, that proportionally represent the different groups in the whole VDC.

Members of V-WASH-CC take a lead role in preparing the Water Use Master Plan; they coordinate with sectoral agencies at local level, mobilize people, organize various meetings, and manage resources contributed by WARM-P and other organizations. The VDC owns and leads the process to prepare and implement the Water Use Master Plan.

Using a participatory approach, gender balanced UCs are formed that represent all caste and ethnic groups in the area. The UCs are responsible for supporting the scheme's implementation process. The concerned VDC then approves the scheme and the community contribute their time, labour, and local construction materials to implement it. This approach enhances the feeling of ownership by local people and government authorities, ensures a sense of entitlement to use equitably the scheme, and instils a feeling of responsibility to effectively operate and maintain it.

In recent years, public auditing has been made mandatory in WARM-P's implementation process ensuring transparency and accountability of the entire implementation process and enhancing ownership of the schemes at local level. Public auditing practices supported by WARM-P contain the following three components:

Public Hearing:
This is conducted at the preparation phase and is used to disseminate all information regarding budget estimates related to the scheme. The hearing informs the community about the implementation plan and their role and responsibility in the implementation process. It also acts as a forum to gain approval and, thereby, commitment from people to implement the scheme and complete it within the planned time. A hoarding board containing all the information is then displayed permanently in respective scheme sites.

A public audit event in Dailekh district

Service providers at work: construction of Rainwater Jar

Public Review

This is conducted during the implementation phase of the scheme. It is a type of mid-term review and generally occurs during the middle of the construction phase. Ongoing works and progress are reviewed, the roles and responsibilities of committees are assessed, and corrective actions are taken, if required, to ensure completion of the scheme within the planned time and as per the programme's standards.

Public Audit

This is conducted after the scheme has been completed. All the members of the targeted community assess the quality of the completed work, and review whether the scheme met the set norms and standards and serves the targeted households. The community compare the completed scheme with its original design, estimate, and plan, and report any discrepancies. They discuss financial aspects of the scheme in terms of total cost, cash, and material subsidy provided by the programme and contributions made by the community. Expenditures and accounts are approved and settled if the community finds them to be satisfactory. At this point, the actual costs discussed and approved by the community are put on the hoarding board for public display.

3.1.2 Capacitated Local Service Providers

Local people are provided with various social and technical training so that they can become service providers and can effectively implement and sustainably use the schemes. For example, WARM-P conducts well-structured training programmes for maintenance workers to develop their skills so that they can monitor structures from the water source to distribution points and undertake minor repairs when and where needed.

It is also not practical or financially feasible in remote areas to hire service providers from far hence, WARM-P supports to train and develop service providers from within scheme areas. Types of service providers that the programme supports to develop are given below:

Village Maintenance Workers

Village Maintenance Workers are trained locals who construct, operate, and maintain the gravity flow water facilities and keep the entire system functioning. Various criteria are applied when selecting maintenance Workers, the most valid criteria being that they plan to stay in the community long-term.

Depending on size, each of the water facilities supported by WARM-P has at least one or two Village Maintenance Workers who are involved in developing the water safety plan and who take regular walks along the system to detect any flaws. Most of these workers are paid in cash or kind (food grains), or both, depending on the socio economic condition of the area they serve.

Tap-stand Caretakers

Each community tap stand has one local woman, who herself is a user, as a Tap-stand Caretaker. Tap-stand Caretakers are not paid for their services - their work is voluntary.

Local Latrine Builders

Local Latrine Builders not only provide their skills and labour to construct latrines but also have a key role in promoting awareness about sanitation and the benefits of using latrines. There is at least one Local Latrine Builder in each working VDC. Local Latrine Builders are paid for their services.

Rain Water Harvesting Mistri[2]

Much like the job of a Village Maintenance Worker in the gravity flow scheme, a Rain Water Harvesting Mistri is a person trained to construct and maintain a Rain Water Harvesting scheme. There are an average of two Rain Water Harvesting workers in each area with a Rain Water Harvesting scheme. Workers are paid for their services.

3.1.3 Capacitated UCs

WARM-P's approach involves forming a UC at local level that have the capacity to manage effectively drinking water and sanitation scheme constructed with its support. A UC normally comprises of seven to eleven representatives of local users. The community itself selects / elects its own representatives. The UC can renew or reform itself over the years so that younger community members can also engage in positions of responsibility. A UC plans and implements a scheme and operates, repairs, and maintains it after construction is completed.

UCs have been given a wider role and more responsibility. All members of the UCs are provided with two trainings — UC Management Training-I and UC Management Training-II — to enable them to effectively manage, construct, operate, repair, and maintain water and sanitation schemes on their own. UC Management Training-I provides knowledge and skills on management issues during pre-construction and construction phases of the scheme, and UC Management Training-II provides the same for post-construction phase.

Through this training, UCs are empowered to be able to register their facility with the District Water Resources Committee and are able to network with organizations who may be able to provide funds for larger repairs and maintenance when required. UCs are also trained to conduct public hearings, reviews, and audits to ensure transparency and accountability throughout the implementation process.

3.1.4 Operation and Maintenance Fund System

In accordance with WARM-P's approach, it is mandatory for every scheme to establish an Operation and Maintenance fund so that each water facility can function effectively. Though the key objective of having a fund in any scheme is the same, the process of acquiring funds varies from scheme to scheme. UCs are free to delineate the process according to the socio economic status of the users it represents. The fund is entirely managed by the UC, which prepares rules and regulations in consultation with targeted users. The UCs decide on the amount of money to be collected from every household and decide how the fund should be used.

WARM-P provides financial assistance therefore; funds do not need to be generated to recover the costs of a water facility. Funds created under WARM-P supported schemes are generally utilized for minor repairs and for paying village maintenance workers. It is generally better for UCs to save and generate funds to improve their facility, for example investing in pipeline extensions or water treatment plants, however fundraising remains to be a challenge.

3.1.5 One Scheme, One Tool Box

Tools and spare parts are not easily available in remote areas. At the same time, economically poor users may not be able to afford to purchase them. Given the situation, WARM-P has adopted the "One Scheme, One Tool Box" approach that provides one toolbox to each drinking water and sanitation scheme it supports. The toolbox is a trunk with 42 tools that are necessary for minor repairs and maintenance. The box is handed over to every UC and the chairperson is responsible for its proper care and utilization. The UC is able to replace broken or missing tools by utilizing the Operation and Maintenance Fund.

There is no provision for spare parts; however, surplus pipes and fittings acquired during construction phase do not have to be returned. These items are recorded and handed over to respective UCs for future use. Moreover, maintenance workers are told where and how to purchase spare parts. WARM-P has developed a pictorial booklet with specifications of different spare parts, fittings, and construction materials so that maintenance workers can easily identify what to purchase.

[2] "Mistri" is a Nepali word meaning a skilled worker

3.1.6 Quality Scheme Design Package

WARM-P has developed a hydraulic design software package — Pipeline Design Package for Rural Water Supply System — that follows guidelines provided by the Government of Nepal's Department of Water Supply and Sewerage.

The design package applies five parameters to assess the availability of water in a village, and to design schemes: quantity, reliability, continuity, accessibility, and quality. These parameters are also taken into consideration while designing a household toilet.

The WARM-P design package also takes into consideration issues regards non-discrimination, acceptability, affordability, use of local materials and knowledge, environment and ecology, and the productive use of available water, including wastewater.

3.1.7 Quality Procurement and Standardized Norms and Practices

WARM-P follows rules and guidelines during the procurement process that ensure construction materials are of good quality. Major construction materials are centrally procured in bulk from a competitive bidding process at the national level. Bidding documents and technical specifications of the materials to be procured are prepared. The tenders are called upon through public notice in national newspapers and the successful bidder is selected based on the quality of materials being offered, and the credibility and capacity to deliver the materials within the stipulated time. Only materials having international or national level standard certificates are procured.

Similarly, construction work follows standardized norms and practices set up by the government. A quantity design package based on the government's practices is used in determining the quantity of various materials and person-days needed in the construction process.

3.1.8 Proficient Person Power

WARM-P uses an approach that ensures a high level of workmanship during the entire implementation process. The programme implements all its activities through a professional team comprising of its own regular staff and consultants that have been recruited through a competitive process. The team has both social and technical expertise. All supported schemes are implemented under direct supervision of this team which regularly backstops the UCs in all matters related implementing the scheme. A social expert and a technical expert are assigned to each scheme during construction. These experts are stationed in the assigned scheme areas until construction is completed and the scheme is finally commissioned. Care is taken while hiring even semi-skilled and skilled workers locally. Local people are provided training so that they can be involved in construction and can enhance their skills and knowledge.

3.1.9 Use of Perennial Source, Protection, and Conservation

WARM-P's approach ensures reliability, continuity, and safety of water source(s) used in all drinking water schemes. The programme only uses water sources that are perennial in nature. Water sources are scientifically measured during the peak dry season to test their reliability. Sources are identified, measured, and planned for potential use during the participatory preparation process of the Water Use Master Plan. Every source has a barbed wire fence around it to protect it from contamination or damage caused by people or cattle. The water source is registered with the District Water Resources Committee, which gives users the legal right to own it.

Moreover, WARM-P also supports the conservation of water sources in its working areas. Conservation activities such as live and dead fencing, plantations, and water retention holes in larger areas around the water sources are carried out where feasible. Communities undergo awareness campaigns, orientations, and trainings while the scheme is being implemented so that they know how to conserve water sources. The objective behind such activities is to maintain existing water yields from sources or even increase them in the end.

3.1.10 Multiple Use Water System and Waste Water Use

Multiple Use System – often referred to as MUS, is an approach used by WARM-P that promotes the productive use of water so that users gain economic benefits in addition to having access to drinking water. MUS is usually developed in schemes that have an abundant source.

Physical structures are designed and constructed so that water can be brought to households to fulfil other needs such as irrigation and cattle rearing. MUS also includes measures that conserve and reuse water to ensure efficient use. The overall practice motivates users to take better care of their water facility.

WARM-P also supports the construction of small ponds, canals, drains, and pipes that collect and store wastewater so that it can be used for irrigation.

Productive use of water: a Multiple Use Water System (MUS) and a kitchen garden in Punma VDC, Jajarkot district

4 Study on Functionality of Drinking Water and Sanitation Schemes Supported By WARM-P (2001 – 2005)

WARM-P conducted a study on the status of 98 drinking water and sanitation schemes constructed with its support during 2001-2005 in November – December 2011. The study 'Post Completion Study of Drinking Water and Sanitation Schemes: With Special Focus on Overall Functionality' was carried out by a team comprising of Thakur P. Bhatta, the team Coordinator, and Guna B. Waiba Lama, the Research Associate, - both of whom are independent experts from outside the programme. Summary of objectives, rational, and key findings of the study are presented below.

4.1 Objectives and Rational

WARM-P's drinking water and sanitation schemes are designed for a minimum of 20 years and constructed following the norms, standards and a step-wise approach presented above. The programme has adopted various measures for ensuring sustainability of the schemes constructed. Nevertheless, it does not have a formal mechanism to monitor the functional status of the schemes in the long-term or beyond two years of construction.

The programme carries out two mandatory follow-ups to assess how drinking water and sanitation schemes are functioning. However, such follow-ups have a time constraint: they are carried out within a period of two years after construction. The first follow-up is conducted 6 months after a scheme has been constructed, while the second or the final follow-up is conducted after 18 to 24 months (WARM-P: 2010).

Except in cases of natural calamities – floods, landslides, etc., most structures are found to be intact and schemes functioning well up to this period. The programme and its local partner have remained in contact with the local community to offer, directly or indirectly, continued support to operation and maintenance activities up to this period. Hence, the future sustainability of the schemes and their use up to the designed period (20 years) cannot be concluded based on the findings of these follow-ups alone. A separate study was needed to look at the overall status of the older schemes.

The key objectives of the study were to identify the overall functional status of the schemes and how they function, assess the effectiveness and outcomes of the programme's approaches, and provide input for revising or redesigning subsequent plans and policies.

The study highlights valuable guidelines for more effective interventions not just for WARM-P but also for other agencies in the same sector. The study also assesses how effective the approaches were with respect to functionality and suggests further refining these approaches.

Very few studies of this kind have been conducted in Nepal. The study entitled 'Nationwide Coverage and Functionality of Water Supply and Sanitation in Nepal'[3] published by the Department of Water Supply and Sewerage in 2011 is probably the first and only study that has exclusively assessed functionality of some 38,000 drinking water schemes in the country. Key findings of this

[3] Nationwide Coverage and Functionality Status of Water Supply and Sanitation in Nepal, Final Report. National Management Information Project (NMIP), Department of Water Supply and Sewerage (DWSS), March 2011

study are referred to throughout this paper. Other studies and reports that discuss sustainability issues focus on limited areas or one particular project.

'Nepal Water for Health' conducted a Long Term Sustainability Study of 298 drinking water and sanitation projects it supported before 1998. The study found that out of the 6,278 water points visited, 80% were functioning (30% were functioning to the designed capacity and 30% required attention) while 20% were not functioning at all (NEWAH: 2005).

Rural Water and Sanitation Fund Development Board usually conducts sustainability assessments of its projects in different batches. In its final report (batch III), water systems were assessed in three categories: 3.3 percent were sustainable, 80.4 per cent were fairly sustainable, and the remaining 16.3% were unsustainable (RWSSFDB: 2008).

Another study entitled 'Research into financial and institutional structures to support the functionality and sustainability of rural hill water systems' conducted by Water Aid in 2010 reviewed the studies on sustainability conducted by different agencies working in water and sanitation sectors throughout the country. The study suggested ways that would significantly contribute to reforming a larger state policy to institutionalise drinking water systems and to ensure their sustainability in rural hill communities. (Water Aid: 2010).

A discussion paper entitled 'Long Term Sustainability Monitoring: WaterAid's Experiences in Nepal' presents a multi-criteria analysis based framework for monitoring sustainability. The paper discusses monitoring the sustainability status of each old project (more than 5 years post-completion) through multiple criteria, consisting of various technical, socio-environmental, financial, and institutional aspects (Water Aid: 2010).

Generally, agencies working in the sector have a tendency of reporting their achievements against the annual targets and highlighting the achievements in terms of the number of schemes completed and populations benefited. This way of reporting leads to inflating the coverage data as it simply reports the number of the people served by the schemes irrespective of their functional status. Leaving a few exceptions, most agencies do not look at the functional status of the schemes constructed with their support. This definitely undermines the opportunity to learn from the past, especially to understand what worked well and what did not, and use the lessons learnt into subsequent plans and policies. In addition, this method serves as an effective medium to share experiences and enhance cooperation among different agencies working in the sector.

4.2 Methodology

Both quantitative and qualitative methods were employed for the purpose of this study to validate information collected. The study process began with a review of relevant documents, especially assessments on the functionality of drinking water and sanitation schemes in the country. WARM-P's guidelines for follow-up and salient features of the schemes selected for the study were also well reviewed in the process.

The study has mainly employed quantitative survey methods to collect primary information at the scheme level. A Scheme Survey Questionnaire was prepared and tested for collecting the information and a one-day orientation was provided to the field enumerators on the questionnaire to gain clarity and uniformity on understanding the contents of the questionnaire. All schemes that fell under the study were surveyed using these questionnaires. Respondents of the survey included UC members and trained local persons such as Local Latrine Builders, Village Maintenance Workers, and Rainwater Harvesting Workers.

Of the total schemes covered by the survey, around 10 percent were selected for focused group discussions. Members of the UCs and trained local persons like Local Latrine Builders, Village Maintenance Workers and Rain Water Harvesting Mistris of the selected schemes participated in the focused group discussion. At the same time, discussions were held with other stakeholders at both the local and central level to attain their responses regards how the schemes supported by the programme were functioning. Separate

standard checklists were applied to both focused group discussions and discussions with the stakeholders.

Finally, the data collected from both qualitative and quantitative methods were processed and presented in different data tables, and were further analysed and interpreted following the study objectives.

4.3 Key Findings

The 98 schemes surveyed for the purpose of this study were located in 116 wards[4] within 35 VDCs in nine districts of the country. Of the schemes surveyed, 34 were located in Syangja, Kaski, Parbat, and Tanahu districts in the Western region; 19 in Dailekh and Jajarkot districts in the Mid-Western Region; and 45 schemes were located in Doti, Achham, and Dadeldhura districts in the Far-Western region. Type wise, 92 of the schemes were gravity flow piped systems and the remaining six were Rain Water Harvesting systems. When construction was completed, 5,703 households were served by these schemes but while at the time of the survey, the figure had reached 6,644. The overall increase of users over the years in all the schemes surveyed was 16.5%.

Various physical structures were inspected in detail for the study and assessed for their operational conditions, taking into account responses from UC members and Village Maintenance Workers involved in their operation and maintenance. Given the different nature of gravity flow piped schemes and Rain Water Harvesting schemes, the key findings related to them are separately presented below.

4.3.1 Functional Status of the Schemes: Gravity Flow Piped System

Status of Water Sources and Hydraulic Flow

The determining factor of how well a gravity flow water scheme functions is the continuity of the water source measured at the time the scheme is designed. Hence, the study looked at whether the sources had reduced overtime since the scheme was completed. Of 221 water sources tapped for 92 gravity flow schemes, 71% of sources were constant and 24% had decreased, while 5% of the sources had dried up completely.

Hydraulic flow is an important indicator of how well a scheme is functioning. A good physical structure alone cannot guarantee water to flow to taps in quantities for which a scheme was designed. Therefore, the condition of the hydraulic flow of different schemes was examined in various ways: water flow from source to Reservoir Tank, water flow in tap stands, and water supply service in terms of availability as expressed in hours per day.

The study found that 66% of the schemes had the same flow of water measured at the scheme's original design phase, whilst some even had slightly more. The remaining 34% percent had less.

The study found that out of the total 942 tap stands constructed in 92 gravity flow schemes, 78% of taps had full water flow as per the scheme design, 7% had less, and 15% had no water at all.

The study also revealed that water services were available in 86% of the schemes for a whole year, and in 14% of the schemes for 10 months or less. The study further revealed that 71% of the schemes were supplying water for over 8 hours a day, 19% for 4 to 8 hours a day, while 10% were supplying water for 3 hours or even less a day.

Condition of Physical Structures

The study examined the condition of physical structures such as intakes, reservoir tanks, break-pressure tanks, interruption chambers, collection and distribution chambers, fittings, and fencing. There were altogether 653 such structures in the 92 schemes studied. On average, about 72% of these structures were perfectly functioning and not needing repair; 18% were needing some minor repairs and 6% were needing major repairs, though functioning to some extent. Only about 4% of the physical structures in the schemes were not functioning and needing reconstruction and replacement.

[4] A ward is a settlement or cluster of settlements within a Village Development Committee.

FIGURE 3 Conditions of Major Physical Structures

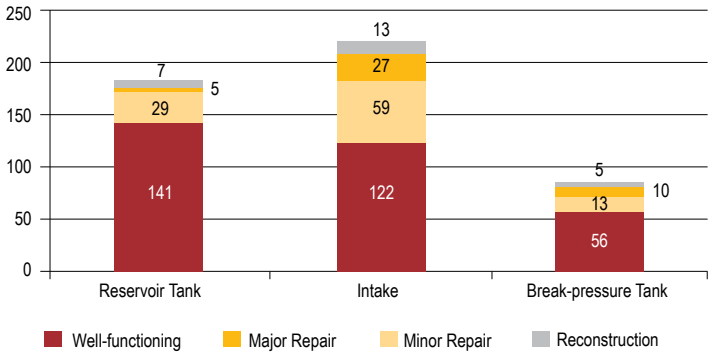


FIGURE 4 Conditions of 934 Tap-Stands

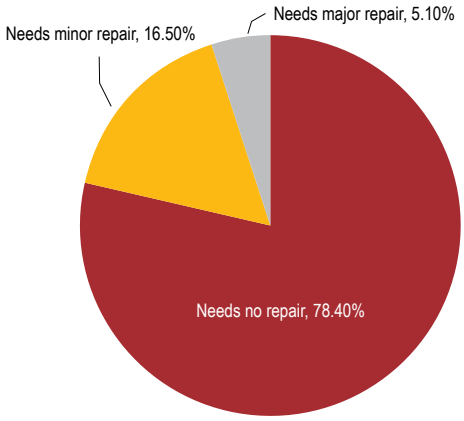


Figure 3 represents the physical conditions of three major structures namely intake, reservoir tanks, and break-pressure tanks. These represent the only major physical structures that are present in every scheme. As shown in Figure 3, the most problematic structure is the intake where 40 out of 221 (or 18.1%) need major repairs, followed by break-pressure tanks at 17.9%.

WARM-P supported the construction of community tap stands in its gravity flow scheme areas that were shared by five to six households on average. There were 942 taps in the 92 gravity flow schemes studied, 934 of which had platforms and stands, and eight of which were without stands. Only taps with platforms and stands were assessed for this study. Of the taps, 78% were in perfect condition while 17% needed minor repairs. The remaining 5% needed major repairs. However, although the tap stands were in good condition, some of them had less or no water due to other structural problems.

A community tap stand in Tolijaishi, Dailekh

A house with a RWH jar, a small RWH pond for kitchen gardening and a toilet

4.3.2 Functional Status of the Schemes: Rainwater Harvesting System

Rainwater Harvesting systems were assessed separately looking at the individual condition of jars, the gutter system, and their operational level and uses.

There were 313 Rainwater Harvesting jars: 280 of 6.5m^3 capacity and 33 of 2m^3 capacity benefiting 321 households in the six schemes surveyed for this study. The study found 76% of the jars were intact, 16% needed minor repairs, and only 8% needed major repairs. None of the jars installed needed reconstruction or replacement. Interestingly, irrespective of these repair conditions, 95% of the jars in total were being regularly used by their respective owners, while only 5% were not being used for need of repairs and maintenance.

Users reported that the rainwater collected in their jars partially met up their water needs for six to twelve months depending on the rainfall. Most users were using water stored in the jars during peak dry seasons. People also used nearby sources when available as much as possible and saved water in the jars to use during the dry season when other alternatives were not available at all. Of the total households covered by the Rainwater Harvesting schemes, 60% were using the rainwater collected in the jars only for drinking, 30% were using it for other purposes including drinking, while 10% were using the water for other purposes but not for drinking.

4.3.3 Institutional Mechanism

Schemes under WARM-P's support contain three key elements: i.) User Committee, ii.) Operation and Maintenance Fund, iii.) Trained Service Providers and Maintenance Tools. Assessments on how they contributed towards the schemes are presented below:

Users Committees (UCs)

One UC was formed in each of all the 98 schemes surveyed. Registration is a prerequisite for gaining legal status however, only about 29% of UCs formed were registered with the District Water Resources Committee. Registering helps a UC to get access to funds from both government and NGOs for repairs and maintenance. Any negligence in this regard can, adversely affect how the scheme functions in the long run.

All UCs had actively participated in implementing their schemes and had effectively managed the construction phase. However, after the construction phase, their activities had decreased. Only 24.5% of UCs had renewed or refreshed their membership over time, while the remaining UCs had continued with the same UC members that had formed at the beginning of the scheme's implementation. WARM-P encourages the renewal of UC members every two years to reinstate energy and enthusiasm towards the scheme and to give opportunity to other energetic members of the local community to join the team. However, the majority of UCs had not been following this provision.

Another key indicator is whether UCs have held meetings or not. Meetings serve as a platform where members discuss and decide matters related to the operation, repairs, and maintenance of their scheme and are crucial for keeping them functional. The study found that about 59% held their meeting in the last one year while the remaining 41% did not.

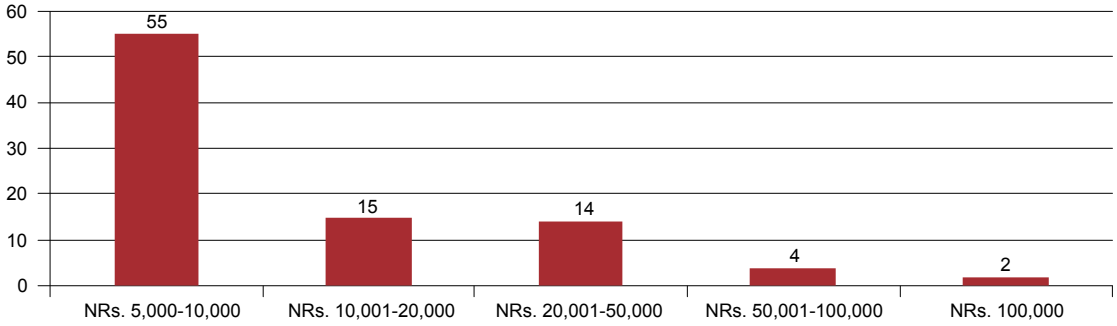
Collection and Utilization of Operation and Maintenance Fund

All UCs with gravity flow schemes had collected an Operation and Maintenance fund when construction had been completed. However, only 91 schemes had acquired a fund at the time of the survey. The study found that only 25 UCs were collecting the fund on a regular monthly basis; the remaining 66 collected funds only once, generally at the beginning of the scheme's implementation. The rate of regular collection ranged from Nepali Rupees (NRs) 5 to NRs 200 per household per month. The total amount of money held by the 91 UCs at the time of the survey was about NRs. 1,700,000, which was kept in a separate bank account and mobilized as a loan.

The amount of the fund collected per scheme ranged from NRs. 5,000 to above NRs. 100,000. Figure 5 shows the ranges of the funds collected with the number of schemes in each range. The schemes surveyed had a reasonable amount of funds for small repairs and maintenance. Nevertheless, the fact that UCs had not been regularly collecting their Operation and Maintenance fund poses a concern for how schemes function in the end.

The study reveals that 81 out of 92 schemes spent money over the years for repair and maintenance from both their own Operation and Maintenance fund and from support received from other agencies. The total amount spent for repairs and maintenance by these schemes was NRs approximately 2,200,000. Only 33 of these schemes had used their own Operation and Maintenance fund for repairs while the other 48 schemes had used funds from other sources such as Village and District Development Committees and other agencies. The total amount spent from the UCs' own Operation and Maintenance fund represented about NRs 400,000 or just 18% of their total expenditure.

FIGURE 5 Number of Schemes with Range of Operation and Maintenance Fund Collected



Trained Service Providers and Availability of Maintenance Tools

There were a total of 157 Village Maintenance Workers, 861 Tap-stand Caretakers, 116 Local Latrine Builders, and 47 Rainwater Harvesting Workers trained by the programme in the 98 scheme areas selected for this study. On average, about 67% of these trained service providers were active in their respective scheme areas – the highest at 72% being Local Latrine Builders and the lowest at 57% being Tap-stand Caretakers. The remaining 33% of trained service providers were inactive – either absent or passive at the time the scheme was surveyed.

WARM-P plans that the services of the Local Latrine Builders, Rainwater Harvesting Mistris and Village Maintenance Workers are paid and the Tap-stand Caretakers work voluntarily. In line with this plan, services of both the Local Latrine Builders and the Rainwater Harvesting Mistris were paid on the daily wage basis – they were paid for number of days they worked. Of the active Local Latrine Builders and Rainwater Harvesting Mistris, each earned about NRs. 25,000 on average per annum selling their services, which represents a good source of additional income for them. The study revealed that about 44% of the active Local Latrine Builders and 79% of the active Mistris were working outside their scheme areas. However, only about 41% of Village Maintenance Workers were getting remuneration in either cash or kind (e.g. food grains) amounting to NRs. 1,000 per month on average from their respective UCs. Others were working voluntarily.

WARM-P provided one maintenance toolbox for each of the 92 gravity flow schemes and 90% still had the toolbox with them at the time of the survey. About 10% of the tool boxes provided by the programme were either missing or not in usable condition.

A household toilet in the rural village

4.3.4 Sanitation and Hygiene

People in the surveyed schemes maintained good sanitation practices and were aware about hygiene issues. Toilet coverage in these areas were found to be better than the national average. Of the total 6,644 households covered by the 98 schemes studied, 64.5% were using toilets. The current sanitation coverage in the country – defined as access to safe excreta disposal facility — is 62%.

In the study area, 4,706 household toilets had been constructed in total; 2,505 with support from WARM-P, 606 with support from other agencies, and 1,595 funded by the users themselves. The study found 91% of them were functioning or in use.

Fewer households were using other sanitation measures e.g. garbage pits and constructing a *chang* — an elevated platform of wood or bamboo to dry kitchen utensils. Of the total households served by the schemes, 27.4% had constructed a *chang* and only 9.4% had garbage pits. About 40% of households were maintaining kitchen gardens using excess / wastewater from the drinking water schemes.

Very broad perception of the users was collected to gauge general impacts of drinking water and sanitation schemes in terms of changes in personal hygiene and trend of prevalence of diarrhoea. About 97% of the respondents felt good improvement in personal hygiene of people after construction of the schemes. Similarly, the respondents in 98% of the schemes surveyed were found feeling prevalence trend of diarrhoea decreased after construction of the drinking water and sanitation schemes with WARM-P support.

4.4 Overall Functional Status of the Schemes

Contrary to the previous section in this paper where the conditions of various aspects of the scheme were discussed separately in terms of structural and operational status, the following findings cover the functional status of water schemes in their totality.

The functional status of a scheme is classified into six categories as defined by the National Management Information Project / Department of Water Supply and Sewerage shown in Table 1 below.

TABLE 1 **Functional Categories of the Drinking Water Schemes**

Well-Functioning	Schemes that are functioning and do not need repairs
Need Minor Repair	Schemes that are functioning and need repairs that are within the capacity of users (with no external inputs required)
Need Major Repair	Scheme that are functioning but need major repairs (with external inputs for construction components and technical support)
Need Rehabilitation	Schemes that are functioning at their design level but are incapable of meeting present demand in quantity and / or quality
Need Reconstruction	Schemes that are defunct and need major technical and financial inputs from external sources as well as sizeable contributions from users before they can function again
Non Refunctionable	Scheme that cannot be made operational again with rehabilitation or reconstruction owing to a variety of reasons (e.g. dried out sources)

Source: Adapted from NMIP/DWSS, 2011[5]

TABLE 2 **Functional Status of Gravity Flow Drinking Water Schemes**

Functional Status	No. of Schemes	%
Well-functioning	21	23
Need Minor Repair	44	48
Need Major Repair	20	22
Need Rehabilitation	5	5
Need Reconstruction	1	1
Non Refunctionable	1	1
Total	**92**	**100**

Among the 98 schemes surveyed, the study included only the 92 gravity flow piped drinking water schemes for such functional status categorization and excluded the 6 Rainwater Harvesting schemes for their different mode of implementation and technology and installation at household level.

Out of 92 gravity flow schemes surveyed, 23% fell in the well-functioning category, 48% needed minor repair, 22% needed major repair, 5% needed rehabilitation, 1% needed reconstruction, and the remaining 1% was non refunctionable or not fit for reoperation. The functional categories of the 92 gravity flow schemes that were surveyed are presented in detail in Table 2 above.

The notable point here is that the schemes falling under the first four categories are the ones that are functioning at their designed level, though some of them need minor repairs. Schemes falling under the last two categories are the only ones that are not functioning. Although Rainwater Harvesting schemes were not classified under the given functional categories, most were functioning with the exception of a few jars that were not being used or were not operational.

Of the schemes constructed with support from WARM-P, 98% are thus functioning, serving the people well, and providing them with water in their courtyards. An overwhelming 93.5% of the respondents affirmed that the schemes had significantly reduced their time spent fetching water and they were able to utilize their time for various other productive purposes such as educating their children and other social activities.

[5] Nationwide Coverage and Functionality Status of Water Supply and Sanitation in Nepal, Final Report. National Management Information Project (NMIP), Department of Water Supply and Sewerage (DWSS), March 2011

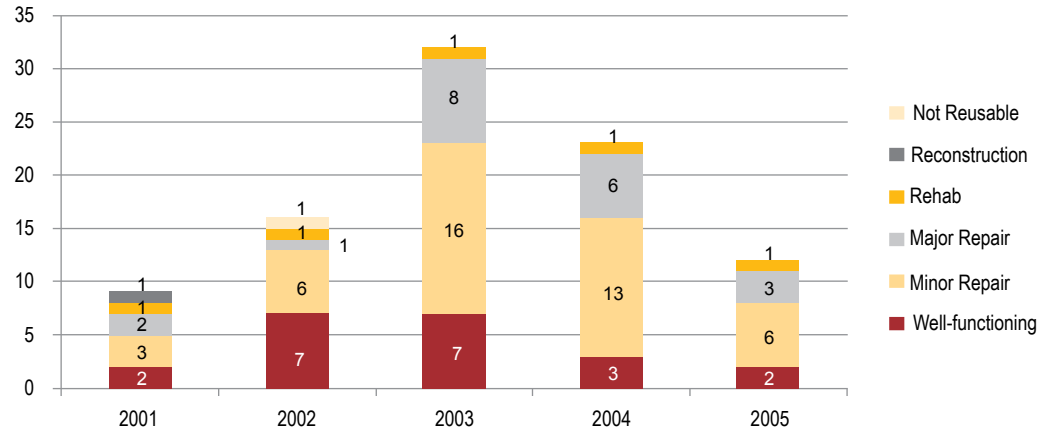
5 Effectiveness of WARM-P's Approach

WARM-P's approach has been effective with 98% of the schemes that were constructed during 2001-2005, functioning well. Some schemes were in need of a range of repairs, and only 2% were not functioning. The study was conducted towards the end of 2011 when more than 50% of the schemes were running in the 8th year of their designated lifespan (20 years). The number of gravity flow schemes completed each year between 2001 and 2005 along with their functional status is presented in Figure 6.

On average, schemes constructed with WARM-P's support functioned better than schemes implemented by other agencies. NMIP / DWSS conducted a study in 2011 on the status of 37,541 drinking water schemes constructed throughout the country with support from different agencies[6]. The study revealed that only 17.9% of these schemes were functioning well, 38.9% needed minor repair, 11.8% needed major repair, 21% needed rehabilitation, 9.1% needed reconstruction, and 1.6% of the schemes were not in condition to be rehabilitated or reconstructed. If the schemes in the first four categories are to be interpreted as ones that are functioning, the total percent of schemes functioning is 89.3%, while WARM-P supported schemes stand at 98%.

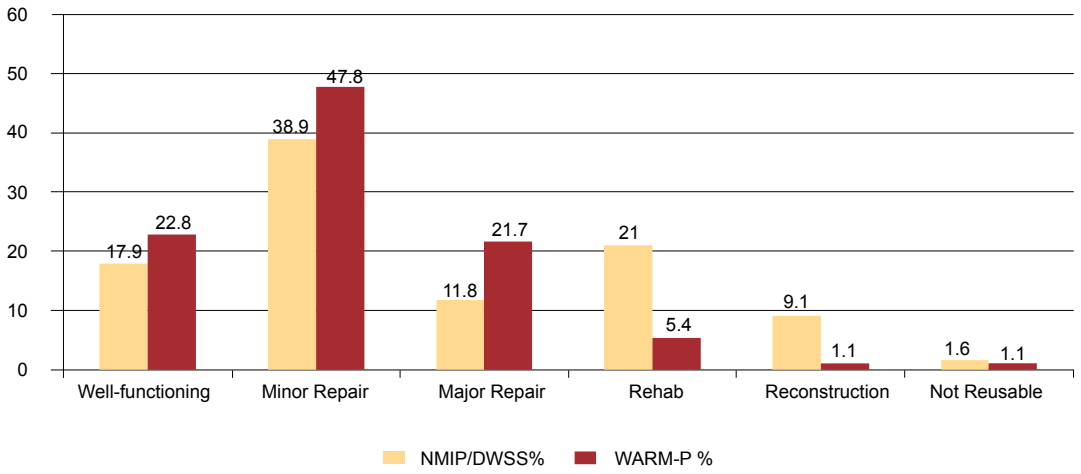
Out of the schemes that are functioning, the percentage of those needing rehabilitation against WARM-P supported schemes is significantly higher: 21 needed rehabilitation in schemes assessed by NMIP / DWSS compared to 5 in ones supported by WARM-P. Nevertheless, a direct comparison here may not be justified as the NMIP / DWSS study may have also included schemes that predate ones included in WARM-P's study resulting in a higher percent of schemes that are not functioning. The functional status of the total

FIGURE 6 Construction Completion Year and Functional Status of 92 Gravity Flow Schemes



[6] Ibid

FIGURE 7 Functional Status of Schemes: Comparison between NMIP and WARM-P Data



37,541 schemes in the country assessed in NMIP's report and that of the 92 schemes supported by WARM-P during 2001-2005 are presented above in Figure 7.

WARM-P's approach has received appreciation and interest from government and NGOs within the country and abroad who have tried to replicate the Water Use Master Plan in particular. Acknowledging the importance of the Water Use Master Plan, the Government of Nepal has formed a task force under the Ministry of Federal Affairs and Local Development to explore the possibility of replicating it in about 4,000 VDCs in the country.

The main difference with WARM-P's approach from that of the other agencies is that the focus is on 'planned and agreed use' of water resources and the aspect of applying a holistic approach to managing drinking water schemes. WARM-P insists on the preparation of a Water Use Master Plan as an entry point for all its interventions in the sector. Inclusive participatory practices and the preparation of Water Use Master Plans substantially contribute to resolving disputes related to using water sources — which are common in rural areas — and sets priorities in terms of implementing and using available water sources.

The study also revealed that physical structures in almost all the schemes were in good condition proving that technical input provided by the programme is of professional quality. This was made possible by the following factors: using perennial water sources, having a quality scheme design package, procuring quality materials, and having standardized norms and practices. The practice of deputing technical and social staff in each scheme during the construction phase has also contributed to ensure that physical structures are of good quality.

Other approaches include building the capacity of local service providers, empowering UCs, establishing an Operation and Maintenance fund, and ensuring that maintenance tools are available. However, these institutional mechanisms at the local level were not as active in the post construction phase as they were in the preparation and construction phases. This could adversely affect how a scheme functions in the long run.

The study also revealed that about half of the schemes needed minor repairs, which indicates a comparatively poor performance of the institutional mechanisms that are supposed to take care of operation, repairs, and maintenance.

Furthermore, 40% of the UCs had not been holding meetings at least once in the last one year, and about two thirds of the schemes had not spent their Operation and Maintenance fund for the purpose for which it was collected. In addition, about one third of the trained service providers have been classified as passive or not functioning. These factors further aggravate the need to carry out various types of repairs in the schemes constructed. If repairs are not immediately addressed, it poses a risk that the schemes may not last up to their designated lifespan.

In conclusion, the institutional mechanism with which a scheme functions needs to be reviewed and further refined in the light of all these shortcomings. Since UCs represent the key actors, specific measures need to be explored to enhance further their activities, especially during the post construction phase. The way the Operation and Maintenance fund system operates and how trained service providers perform will consequentially improve if UCs increase their activities.

The study also revealed that users were reluctant to use and properly maintain community taps and that they would rather connect separate pipes from a community tap to bring water directly to their respective houses. This could be the reason why the need for different types of repairs arises in a water scheme. The programme needs to review the situation and support both private and community taps based on a feasibility study and assess whether users are willing to pay for the service.

6 Conclusion and Way Forward

1. WARM-P's approaches were created in 2001 out of HELVETAS Swiss Intercooperation's experiences and lessons learnt after 25 years of being in the drinking water and sanitation sector in Nepal. The approaches have been constantly reviewed and updated over the years according to the changing context, needs, and priorities. Overall, the approaches have been effective and have been proved by the findings of the functionality study the programme conducted by independent experts in the sector.

2. The study revealed that 98% of the schemes were functional and still providing people water after five to ten years after construction. Since the schemes have a strong physical foundation and structure, they have the potential to function up to their designated lifespan of 20 years if users properly manage and maintain them.

3. WARM-P's approach in general and the Water Use Master Plan in particular has been appreciated by both the government and national and international NGOs. Many have already replicated the Water Use Master Plan in their respective working areas. This has set the ground for increasing future collaboration between WARM-P and other agencies at both national and international level.

4. The proper functioning of drinking water and sanitation schemes is determined by both the quality of physical structures and the effectiveness of the institutional mechanism to properly operate, repair, and maintain the schemes. Almost all schemes supported by WARM-P were in good condition and have the potential to benefit more communities in the future.

5. Despite maintaining strong physical structure, many schemes are in need of different types of repair. The programme needs to review its approaches on how to establish institutional mechanisms related to operation and maintenance and ensure that they remain active throughout the designated lifespan of each scheme. The Department of Water Supply and Sewerage's operational directives have tried to address these issues. Directives in this regard emphasize the need for post-construction support to be available at district level. Since these are long-term issues, the government has to be the designated agency to provide this support. In future, schemes may need to be handed over to the community along with the district government.

6. Three components make up the institutional mechanism: the UC, the Operation and Maintenance fund, and skilled service providers. UCs control or mobilize the remaining components, therefore measures to activate further the UCs are crucial to keep the entire mechanism active and functioning for the long-term. UCs can be more effective by taking the following measures:
   - making sure that membership is renewed or that the UCs reform every two years;
   - building their capacity by strengthening linkages with local bodies and other resource organizations;

[7] The Federation of Drinking Water and Sanitation Users Nepal (FEDWASUN) is a people based umbrella organization of drinking water and sanitation user's groups in Nepal. It has district chapters in 52 out of 75 districts in the country. (http://www.fedwasun.org/page.php?page=1)

- becoming members of the Federation of Drinking Water and Sanitation Users Nepal (FEDWASUN)[7] and other networks in the sector, and
- increasing their income by better mobilizing the Operation and Maintenance fund.
- In addition, trained service providers could have refresher trainings and utilize their skills in other programmes and organizations so that they are encouraged to stay within their scheme areas. Lastly, in recent years there has been an increase in remittances being sent to villages by migrant workers. Efforts could be made to channel this money in the future towards operating and maintaining drinking water and sanitation schemes in the country.

7. People are increasingly interested in having household water connections that would require a proper system of payment based on the amount of water used. The challenge for the future is how to provide an efficient, equitable, and sustainable service that will also serve lower income households adequately. It would be fair for people with a household connection to pay more per month (and possibly at the time of initial connection) than lower income households who take (less) water from a public tap. WARM-P has piloted the concept of household connections in some rural areas of the country. However, the results have yet to be assessed.

8. It is essential to establish an institutional mechanism at the local level to monitor how drinking water and sanitation schemes function. Regular monitoring ensures that repairs are made on time. In order to monitor schemes effectively, each scheme should undergo the process of preparing and implementing a water safety plan, as prescribed in Nepal's Drinking Water Quality Ordinance.

9. The purpose of monitoring is not only to know the status of schemes but also to initiate activities to correct practices that are not functioning effectively. Local and national government bodies can play a stronger role in monitoring, regulating, and training activities in this regard. For example, given its legal mandate and capacity, the District Development Committee (DDC) can mobilize technical support under its District Technical Office and has the authority to mobilize all sectoral agencies working in the district. Led by the DDC, this mechanism should have representation of all the other sectoral agencies and stakeholders in the district. Monitoring through the DDC should be a regular activity rather than a casual one, and conducted in every completed scheme at regular intervals of three to five years. The monitoring process should enable an assessment of all repairs that need to be made, clearly categorize them as ones to be managed by the respective UCs, ones that need funds from the concerned VDC, and ones that need funds from the DDC or other resource organizations. To achieve this, the government will have to strengthen further the capacity and capability of its local bodies.

10. Finally, the sustainability of the WASH system is subject to awareness levels of the community that uses it. Hence, the WASH system should be integrated into the school curriculum under the subject 'Life Skills' at the end of primary school. This will be an important contribution to increase people's awareness right from their childhood.

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