International Journal Of Engineering Research And Development
e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 19, Issue 4 (Jul.-Aug. 2023), PP. 31-37

Study Of Status Of Water Supply Schemes Funded By Rural Water Supply And Sanitation Project- Western Nepal In Parbat District.

Rabindra Tiwari*, Sushma Pandey*, Ramesh Banstola**
*Engineer, Government of Nepal
**Associate Professor, Department of Civil and Geomatics Engineering, Pashchimanchal Campus, Institute of Engineering, Tribhuvan University, Nepal

ABSTRACT:
This study discusses the deterioration and maintenance challenges of rural water supply and sanitation systems. These systems degrade over time due to various factors, leading to increased operational costs and decreased water quality. Proper maintenance involving beneficiaries is crucial to preserve these systems. The study's core objective was to evaluate the status and functionality of different water supply schemes funded by RWSSP-WN and implemented by DDC Parbat in the initial RWSSP-WN phase. This aimed to pinpoint operational and maintenance issues and propose policy enhancements for rural water supply system maintenance. The study evaluated water supply schemes in Nepal funded by a donor agency and found limited interaction between beneficiaries and water users committees (WUCs) responsible for maintenance. Beneficiaries' income levels and reliance on agriculture were noted. While WUCs collect funds for minor repairs, major issues require external support. Key findings highlight limited beneficiary and water users committee interaction regarding operation and maintenance. The population's reliance on agriculture and low to medium income among business and job holders was evident. While WUCs handle minor maintenance through collected water tariffs, major structural and pipeline defects require external assistance. The research concludes that effective WUCs are essential for system functionality, emphasizing proper member selection, transparency, training, and support. Technical skills, operation manuals, and strong monitoring mechanisms are crucial for sustainable rural water supply systems.

KEYWORDS: *Rural Water Supply, Sanitation System, water users committee, sustainability, RWSSP-WN, DDC Parbat, Water Tariffs, Beneficiary interaction*

Date of Submission: 19-08-2023 Date of Acceptance: 04-09-2023

I. INTRODUCTION

Water is life and sanitation as way of living. It is therefore, safe drinking water and hygiene & sanitation are considered as one of the important pillars of human development. Access to safe water and sanitation facilities are imprinted human rights of citizen.Access to safe water and sanitation plays a vital role in the overall socio-economic development of any community or country. The people of Nepali have traditionally considered flowing water to be ‘pure’ and ‘safe’. However, modern systematic and planned development of public water supply and sanitation system only started with the First Five-Year Plan 1956–1961. Since then, it has always been one of the State’s priority areas. In more recent times, non-State actors have also supported drinking water and sanitation programmes in Nepal. Today, government plans have also given importance to attainment of targets for water supply and sanitation in the Millennium Development Goals (MDGs) with the help of the donor community, the government formulates policy, implements projects and monitors overall progress.

Water supply and sanitation sector has been taken as one of the core component in priority order of the government of Nepal upon declaration of Water Supply and Sanitation Decade by the United Nations in 1981. The National Census, 2011 data estimate that the coverage of water supply in the country to have gone up to 85.4% and that of sanitation to 61.8% of population. The existing coverage compares with the MDGs targets for 2015 of 73% water and 53% for sanitation. The information indicates that at present, 794,083 households do not have adequate water service and 2,069,812 households lack adequate sanitation facilities. The national target is for universal access to water and sanitation by 2017*(The national sanitatation and hygine plane 2011.)*

The Water Resources Act 1992 and its regulation 1993, Local Self-Governance Act 1998 and its regulation 1999, Environmental Protection Act 1997 and its regulation 1998 and National Sanitation and hygiene Master Plan 2011 have been enunciated for speedier progress in the sector. The National Water Supply

and Sanitation Strategy (WSS Strategy: 2004) spells out that plans prepared in the district and village level forms the basis for planning purpose and allocation of budget accordingly. The DDCs are made leading role and responsible for planning, implementation, coordination and monitoring and evaluation of the rural water supply and sanitation plans in their respective districts.

Rural water supply and sanitation project in western region RWSSP-WN in Nepal funded jointly by the government of Finland and Nepal through sharing the cost with District Development Committees(DDC),Village Development Committees (VDC), Communities and users working in western region since 2008. RWSSP-WN aligned with Nepalese national priorities supporting the national target of providing access to water and sanitation to all by 2017. This project is the priroties-1 project for the government of Nepal. The overall objective is improved health and fulfillment of equal right to water and sanitation for the inhabitant's project area. The purpose is the poorest and excluded household right to access safe and sustainable domestic water, good health and hygiene ensured through a decentralized governance system.

II. MATERIALS AND METHODS

In this study extensive work has been performed for the review of published and unpublished materials regarding various water supply schemes funded by RWSSP-WN in Parbat district such as newspapers, journals, articles, research papers, annual reports, broachers, project diaries from RWSSP-WN project, WSSDO, DWSS and previous thesis related to study area of water supply systems.

A. Research Design

This research was carried out on the basis of primary data, secondary data and information's from the checklist. Field observation using a checklist are carried out in water supply scheme focusing on physical condition of the schemes, level of protection, construction quality and protection mechanisms. A focus group discussion was conducted with water committee members, V-WASHCC, Ward citizen forum, community leaders to collect qualitative data using a semi structured questionnaire. Household survey were carried out in order to get primary data through structured questionnaire survey.

B. Study Area

Parbat District lies in 280 00' 19" to 280 23'59" to the north in latitude and longitudinally 830 33'40" to 830 49'30" to the east. The area ranges from the height of 520 to 3300 meters from sea level covering total area is 536.86 sq.km (53686 hectors). This district experiences 3 types of climate; tropical climate by the 15.5% of landscape up to altitude of 1000 mt asl, sub-tropical by 69% of landscape up to altitude of 2000 m. and temperate climate by 15.5% of landscape and altitude up to 3300 m. The temperature ranges from maximum average temperature of 320C and minimum average temperature 7.50C. Annual average precipitation is recorded at 2400 mm – 2600 mm. There is 37% forest, 4% pasture land, 45% cultivated land and 4% water bodies. The district is divided in to 1 Municipalities,11 Ilaka, 47 VDCs (DDC book 2016

Major rivers of this district are Kaligandaki and Modi Rivers. Other river streams are Lungdi, Lasti, Seti Patikhola, Jahare, Malyandi, Lamaya, Chirdi, Luwa, Bachha, Khahare, and Payue. In Parbat district highest points of mountains are Panchase lekha (2100 m), Dahare lekha (2266 m), Hampal lekha (3309 m), Chisapani lekha (2266 m) and Gorlang lekha (2165 m). Various old ponds and natural lakes including falls like Sahasradhara, Khwang fall (Hosrangdi) are also consist of other water main bodies. Rural water supply and sanitation project, western Nepal (RWSSP-WN) project first phase was started at 2008 to 2013. RWSSP-WN project implemented only six VDC out of 55 VDC by DDC in Parbat district. In six VDC, project funded total 57 water supply schemes were completed during first phase of project. Fifty-Seven water supply schemes funded by RWSSP-WN and completed in its first phase are the population, all these population formed the sample size of the researcher.

C. *Data Collection*

In the study, both primary and secondary data were utilized by employing quantitative and qualitative methods. The primary data were collected by survey using structured questionnaires and semi-structured questionnaires for the FDG and pre-informed time. The key informants for the survey were District Officials pertinent to DWASH-CC, VDC secretary, WASH unit chief etc. The questionnaires related to the beneficiary and users committee were designed to identify general issues of water supply system, the involvement pattern in w/s projects funded by RWSSP-WN in Parbat district from inception to operation and maintenance phase.

Secondary information was collected from a wide range of literatures. These included published and unpublished journal articles, reports of DWSS, Project documents of RWSSP-WN, books and report on water and sanitation issues, academic thesis of national and international universities and newspapers articles. These were accessed from different organizations, internet, and different libraries. Secondary data and the field data were incorporated as supportive factors to the findings of the study.

D. Data Analysis

The classified data has been presented by using the suitable diagram like histogram, pie chart, trend chart etc. For the analysis of the quantitative data, basically MS Exel tools have been used in order to get the useful results. The statistics is used only for the quantitative data. The main objective of the study was to find out the nonfunctional schemes and reason behind it for such happening in the study area regarding its operation, maintenance and management of a Water Supply Project and to suggest improvements to the users committee. The study mainly focused on the users' committee that is the key player representing the beneficiaries of the rural water supply and sanitation project maintenance. Permanency of users' committee, observation of rural water supply and sanitation project operation and maintenance, involvement of various institutions, funding mechanism and mobilization, skill enhancement to both technicians and WUCs and analytical review of existing problems and probable solutions to maintain the rural water supply and sanitation project through WUCs and highlight other relevant issues. The study focused on roles and responsibilities of other stakeholders like DWSS and DWSO involved in the project.

III RESULTS AND DISCUSSIONS

It was found that among the respondents of beneficiary, 50.86% said that they were satisfied with the supplied water, 42.73% said that there has been moderate scarcity and 6.41% with service scarcity. It was found that among the respondents of beneficiary, 63% said that the plumbers were only capable of maintenance of defect associated with transmission/distribution pipe line. 15% of respondents said that they had dispute and 85% said that had no dispute about operation & maintenance of water supply system. 85% of respondents said that they were aware about WUC formation & 15% said that they were not aware about WUC formation. 96 % said that they were satisfied with present tariff system and 4% said that they were not satisfied water tariff system. 25 %of respondent used to pay NRS <50, 35% of respondents used to pay NRS.50-80, 25% of respondents used to pay NRS.80-100, 15% of respondents used to pay NRS. >100 for the average monthly water tariff. respondents of WUC. 53% said that they can perform O & M of structure and 47 % said that they cannot perform O & M of structure. 65 % water users committee said that they were registered legally. Out of 57 project ,19 scheme were well functioning. Among non functional project, 22 scheme were under the category of minor repair, 13 scheme were under major repair heading and 3 scheme were under rehabilitation heading.

a. Quantity and Quality of Supplied Water

Table 1.Quantity of Water Supplied

S.N	Catagories of Respondents	Number of Respondents			Total
		Service Scarcity(<20)	Moderate Scarcity(20-45lpcd)	Sufficient (>45lpcd)	
1	WUC Members	0	35	79	114
2	Consumers	15	65	40	120
Total Respondents		15	100	119	234
Percentage		**6.41**	**42.73**	**50.86**	**100**

Source: Field Survey,2016

Table 1 shows that 6.41 % of respondent feel the service scarcity, 42.73 % of respondent feel moderate scarcity and 50.86 % of respondent feel the quantity of water is sufficient.

b. Capacity of village maintenance worker and water tariff system

Table 2. Capacity of Village Maintenance Worker

Village Maintenance Worker	**Nos of respondent**	**Percentage%**
Yes	147	**62.82**
No	87	**37.17**
Total	234	**100**

Source: Field Survey, 2016

Major population (63%) said to yes and minor population (37%) said to no. Major water supply schemes members know about village maintenance workers and his work.

c.Knowledge of salary to the VMW

Table 3. Salary of Village Maintenance Worker

Salary of Village Maintenance Worker	Nos of respondent	Percentage%
No idea	140	60
Yes	76	32
Fixed salary	18	8
Total	234	100

Source: Field Survey, 2016

Maximum beneficiaries (60%) since not knowing the matter were unaware about operation and maintenance work. There was not any kind of fund established for operation and maintenance. Only 32% of beneficiary said to yes and 8% of beneficiary responded the different value.

d. Contribution in O & M

Table 4. Contribution in O & M

Contribution in O & M	Nos of respondent	Percentage%
No idea	115	49
Some Tariff	88	37
Fixed amount	19	14
Total	234	100

Source Field Survey:2016

On the question"Are you collecting water tariff for supplied water from each household to contribute O & M?" Majority of beneficiaries were unware of the subject while 37% responded that there exists some tariff and 14% respondents answered the fixed sum. Also, 61% of the beneficiaries were ready to pay water tariff.

e. Carry out O & M structure by VMW

Table 5. O & M structure by VMW

Carryut O & M Structure by VMW	Nos of respondent	Percentage%
YES	125	53
NO	109	47
Total	234	100

Source: Field Survey,2016

On the question "Can you carryout O & M of structures (Intake, CC, IC, RVT, BPT, and Taps) of your water supply project?" Majority of beneficiaries responded that they were capable to carryout O & M structure by VMW.

f. Capability of VMW for maintenance

The beneficiaries were asked if their VMW were capable of maintenance type of defect in transmission/ Distribution pipeline where 56% of population said to yes and 44% of population denied the capability to maintain.

g. Dispute regarding maintenance

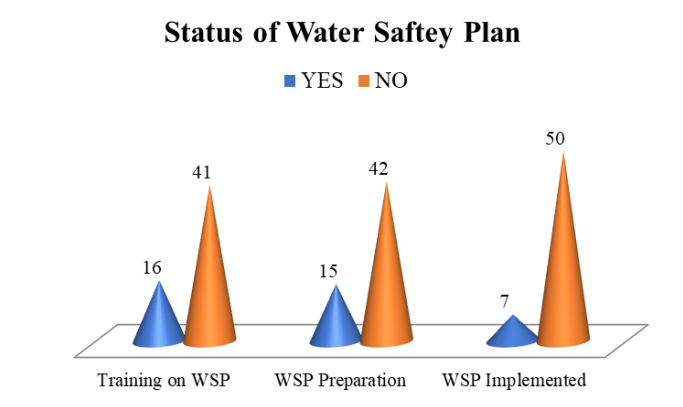
On the question if there was any dispute regarding operation and maintenance of water supply system 15% responded yes and 85% responded No. Larger number community member (44%) accept to maintenance only on economic support however 36% of community member accept it with particular technician. 12% of community accept the maintain with technical support from DWSO and 8% of community said that they can maintain pipe line works.

h. Satisfaction on monthly water tarrifing rate

On the question if they were satisfied on monthly water tariffing rate major numbers of community (96%) said to yes and minor community (4%) said no.

i. Water safety plan and Public audit

On the question regarding water safety plan and public auditing to beneficiaries if they have recevied any kind of water supply training about water safety plan, only 16 water supply schemes beneficiaries said that they have recieved water supply training about Water Safety Plan.



Status of Water Safety Plan

Table :Status of Public Audit

Description	Public Audit		Total
	Yes	No	
WUC	41	16	57
Percentage	72	18	100

Source: Field Survey,2016

j.Status of Functional and Non Functional Schemes

Table 6:Status of Functional and Non Functional Schemes

Project Categories	Well Functioning	Non Functioning				Total
		Minor	Major	Rehabilitation	Reconstruction	
Number	19	22	13	3	0	57
Percentage	33	38	22	3	0	100

Average Water Tariff Rate Required for Project Recover After Design Period All scheme

From this study it was found that the monthly water tariff rate for different scheme varied as per project cost and number of household served by the scheme.Indirect relationship was found between number of household and water tariff . Also the project cost was found to be directly related to the distance from the district headquarter.

k. Frequency of cleaning the structure

Table 7. Frequency of cleaning the structure.

S.No.	Category of respondents	Status of Response		Total
		Regular Interval (3-4 month)	After Monsoon	
1	WUC	38	76	114
2	Consumers	28	92	120
Total Respondent		66	168	234
Percentage		28	72	100

Source: Field Survey,2016

l. Preparation of Action Plan for O & M

Table 8: Preparation of Action Plan for O & M

S.No.	Category of respondents	Status of Response		Total
		Yes	No	
1	WUC	225	9	234
Percentage		96	4	100

Source: Field Survey,2016

Among the respondents of WUC, 96 % said that they have not any action plan for O & M.

Table 9 :-Operation and Maintenance Manual

S.No.	Category of respondents	Status of Response		Total
		Yes	No	
1	WUC Members	134	100	234
Percentage		57	43	100

Source: field Survey 2016

IV.CONCLUSION AND RECOMENDATIONS

A.CONCLUSION

Around 2/3 of Water user Committee were registered as per Water Resource Act, 2049. More than 85% of users were informed in formation of users' committee for the operation and maintenance works. In More than half scheme, designed water supply quantities were obtained. Similarly, around 43 % of scheme's yield quantity in moderate range. 6 % Scheme were run on very low yield. It was observed that around 2/3rd number of appointed plumbers were capable for the maintenance of water supply components. More than 85% of operation and maintenance activities were carried out without any dispute in communities. Leaving some cases, most of users were agreed with the collection of water tariff fund for operation and maintenance and future recovery of ongoing project. One third of schemes were worked well. Remaining Two Third no. of scheme were nonfunctional. They demand repair and maintenance activities for well-functioning. Out of nonfunctional scheme, around 5% were required rehabilitation work for smooth operation. The reason behind the scheme become nonfunctional were user did not care the maintenance activities in their priority as much operation. Supporting and executing agencies were also lagging in the devoting sufficient maintenance fund and related plan. In Parbat district, the water tariff rates were fixed by VWASH-CC which was constant for all village schemes. From the study it was found that the rate should be different for different schemes from data analysis. The water tariff cost was found to depend mainly upon the scheme construction cost. The other factor that contributed for water tariff cost were operation and maintenance cost & other management related cost of the project. The operation & maintenance action plan and its manual seemed necessary for the undisturbed operation and efficient delivery of service to users. Many users committee were also unaware about it. There were no robust efforts carried for the implementation of such action plan although some agencies were prepared it and it is the reason for nonfunctionally of many schemes after the short period of construction.

B. RECOMMENDATIONS

It is suggested to implement water supply project based on needs and interest of the communities and their active participation from very beginning of the project to the end mainly on planning and design. Operation and maintenance training should be provided to the selected UC members and technician for effective and sustainable operation and maintenance of the water supply schemes. It is suggested that to create a water supply fund for emergency maintenance. Implementing agencies have to prepare Annual water supply Maintenance Plan those water supplies with priority basis by contributing from beneficiary. The Water Safety Plan should be prepared for every scheme/project The scheme should be exposed with public audit for the transparency and accountability. To enhance the effectiveness and long-term sustainability of water supply systems, a series of recommendations are proposed to bolster the role of Water Users Committees (WUCs). Firstly, it's vital that all WUCs adhere to legal requirements by registering as per the Water Resource Act of 2049. During the formation of these committees, stakeholders must be kept informed to foster transparency and collaboration. Defining the authority and responsibilities of committee members at the outset and ensuring regular monitoring of their tasks can contribute to efficient operations. Scheduled maintenance, as outlined in operation and maintenance manuals or schedules, is crucial to prevent system degradation. Allocating adequate funds for maintenance is pivotal, requiring a budget that aligns with the maintenance plan. Sustainable water tariff rates should be practiced to recover project costs beyond the initial design period, while rates themselves should be determined through comprehensive analysis rather than ad-hoc methods. Appointing a water supply technician within the WUC can significantly contribute to effective operation and maintenance management.

Through these concerted efforts, the functioning and longevity of water supply systems can be significantly enhanced, underpinned by transparent governance, sound financial practices, stakeholder engagement, technical proficiency, and sustainable strategies in rural water supply initiatives.

REFERENCES

[1]. GoN, 2014; "Nationwide Coverage and Functionality Status of Water Supply and Sanitation in Nepal".
[2]. Gon, 2004; "Rural Water Supply and Sanitation National Policy", Ministry of Physical Planning and Works, Kathmandu.
[3]. GoN, 2004; " Rural water Supply and Sanitation Sectoral Strategic Action Plan", Ministry of Physical Planning and Works, Kathmandu.
[4]. GoN, 2004; " Rural water Supply and Sanitation National Strategy", Ministry of Physical Planning and Works, Kathmandu.
[5]. GoN, 2002; "Public Works Directives", Government of Nepal, Kathmandu.
[6]. GoN, 2002; "Water Resource Strategy", Government of Nepal, Kathmandu.
[7]. GoN, 2009; "National Water Plan", Government of Nepal, Kathmandu.
[8]. GoN, 1992; "Water Resource Act", Government of Nepal, Kathmandu.
[9]. GoN, DWSS, 2002; "Operation and Maintenance Manual for Community based Gravity Flow Rural Water Supply Schemes: Policy and Guidelines", Department of Water Supply and Sewerage, Kathmandu.
[10]. Punima, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, "Water Supply Engineering", New Delhi, India.
[11]. Modi, P.N.,2006; "Water Supply Engineering", Standard Book House, Second Edition, New Delhi.
[12]. RWSSP-WN, 2014; "Operation and Maintenance Mannual for Rural Water Suupply Schemes.
[13]. DWASHCC,2012;"District Strategic Water, Sanitation and Hygiene Plan" (DSWASHP 2013-2017), Parbat
[14]. Adhikari, Hari , 2014; "Operation and Maintenance of Kusma Water Supply System", Unpublished Master's Thesis, Submitted to Pokhara University.
[15]. WASH Plan Published by Different VDC of Parbat District.