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LONG TERM SUSTAINABILITY ASSESSMENT OF COMMUNITY MANAGED WATER SUPPLY SCHEMES USING MULTI CRITERIA ANALYSIS

(A Case of Finnish Funded Water Supply Schemes of Nawalparasi District)

DIPENDRAGHIMIRE

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CERTIFICATION

This is to certify that the thesis entitled **"Long Term Sustainability Assessment of Community Managed Water Supply Schemes Using Multi Criteria analysis"** submitted by **Dipendra Ghimire** of the student for the partial fulfillment for the degree of Masters of Science in Environment Management is based on the original research and study under the guidance of Er. Bhai Raja Manandhar. This thesis is a part or full property of **School of Environmental Science and Management (SchEMS)** and therefore should not be used for the purpose of awarding any academic degree in any other institution.

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ABSTRACT

Water availability is an essential component in sustainable development. Sustainability of water supply scheme is vital for water availability. This implies that sustainable development cannot be achieved without sustaining the water supply scheme's serviceability in long run. The high percentage of sustainability possible and sustainability unlikely water supply schemes nationally will limit the achievement of the vision MDG to SDG. For the country to achieve this vision and ensure sustainable development there is need to look into measures, including views of sector experts and community that will make the existing water supply schemes more sustainable.

Research has identified an array of critical factors that affect long-term sustainability of community managed water supply scheme incorporating views of sector experts and WUSC members. A sustainability assessment framework based on the Multi Criteria Analysis (MCA) was developed for sustainability assessment of community managed water supply schemes to meet the objectives of the research. The framework gives the results of the sustainability status of projects based on their performance across various indicators included in the framework. The sustainability status of a water supply scheme is dependent on the indicators used and weight and score distribution applied to the various indicators.

The sustainability assessment of forty chosen community managed water supply schemes implemented through the Finnish fund in Nawalparasi district, using developed sustainability assessment framework which incorporates social, financial, institutional/management, technical/service and environmental criteria. The result shows 10 % of water supply schemes are Sustainability Likely (SL), 70% of water supply schemes are Sustainability Possible (SP) and the remaining 20% of water supply schemes are Sustainability Unlikely (SU).

The application of MCA for sustainability assessment of water supply and sanitation schemes would be very useful in sustainability ranking and policy decision making for post project support in water supply schemes.

Key words: *Sustainability, Community managed water supply scheme, MCA*

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Dipendra Ghimire
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LIST OF ABBREVIATION

ADB	Asian Development Bank
CBO	Community Based Organization
CCA	Climate Change Adaptation
CHSAC	Community Hygiene and Sanitation Action Committee
CLTBCHS	Community Led Total Behavior Change in Hygiene and Sanitation
CLTS	Community Led Total Sanitation
DAG	Disadvantaged Group(s)
DDC	District Development Committee
DDF	District Development Fund
DEO	District Education Office
DFID	Department for International Development
DOLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DPHO	District Public Health Office
DRR	Disaster Risk Reduction
DTCO	District Treasury Controller Office
DTO	District Technical Office
DWIG	District Wash Implementation Guideline
DWSS	Department of Water Supply and Sewerage
DWASHCC	District Water Supply, Sanitation and Hygiene Coordination Committee
DWSSDO/WSSDO	Drinking Water Supply and Sanitation Divisional Office

FCGO	Financial Comptroller's General Office
FGD	Focus Group Discussion
FEDWASUN	Federation of Water Supply Users Nepal
GESI	Gender Equity and Social Inclusion
GOF	Government of Finland
GON	Government of Nepal
Helvetas	Swiss Association for International Cooperation
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HRBA	Human Rights Based Approach
HRD	Human Resources Development
IDE	International Development Enterprises
IMC	Institutional Management Committee (for Sanitation & Hygiene)
INGO	International Non-Governmental Organization
LBFAR	Local Bodies Financial Administrative Rules
LDO	Local Development Officer
LGCDP	Local Governance and Community Development Program
LSGA	Local Self Governance Act
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MFA	Ministry for Foreign Affairs of Finland
MIS	Management Information System
MFALD	Ministry of Federal Affairs and Local Development

MOF	Ministry of Finance
MUD	Ministry for Urban Development
MSP	Multi Stakeholder Platform
VMW	Village Maintenance Worker
NDHS	Nepal Demographic and Health Survey
NDWQS	National Drinking Water Quality Standard
NGO	Non-Governmental Organization
NMIP	National Management of Information Project
NPC	National Planning Commission
NWSSC	National Water Supply and Sanitation Committee
O&M	Operation and Maintenance
ODF	Open Defecation Free
PHAST	Participatory Hygiene and Sanitation Transformation
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
RMSO	Regional Monitoring and Support Office (DWSS)
RRRSDP	Rural Reconstruction & Rehabilitation Sector Development Project
RVWRMP	Rural Village Water Resource Management Project
RWASHCC	Regional Water Supply, Sanitation and Hygiene Coordination Committee
RWSSFDB	Rural Water Supply and Sanitation Fund Development Board
RWSSSP	Rural Water Supply and Sanitation Support Program
SC	Steering Committee

SIWI	Stockholm International Water Institute
SP	Service Provider
STWSSP	Small Town Water Supply and Sanitation Project
SWAp	Sector Wide Approach
TA	Technical Assistance
TBC	Total Behavioral Change
UNICEF	United Nations Children's Fund
UC	User Committee
VDC	Village Development Committee
VWASHCC	VDC Water Supply, Sanitation and Hygiene Coordination Committee
WASH	Water Supply, Sanitation and Hygiene
WATSAN	Water and Sanitation
WB	World Bank
WHO	World Health Organization
WUMP	Water Use Master Plan
WUSC	Water Users and Sanitation Committee

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURES

CHAPTER I: INTRODUCTION

1.1. Background of Study

Drinking water is the most important basic need of human beings. Water is a multifaceted symbol in Hinduism, regarded as one of the *panchatatawa* (earth, fire, air, ether and WATER) and means of spiritual purification. Modern concept of drinking water has overlooked the spiritual aspect of water. It is seen from the perspectives of easy accessibility, nearness, adequacy in quantity & quality, reduction in water-borne and water-related diseases and lessening of drudgery of women and children. Traditionally, most drinking water schemes in Nepal were developed base on indigenous initiatives of Parma, Pareli, Guhar, etc. Bir Samsher J.B. Rana in 1891 laid the foundation of modern piped water supply system in Nepal. The Ministry of Water Resources, Department of Irrigation and Water Supply was the first formal institution responsible for developing water supply systems in Nepal which was established in 1966.The Department of Water Supply and Sewerage (DWSS) was established in 1972 which has become the designated lead agency for the water supply and sanitation sector in Nepal.

Following the recommendation of World Water Conference- Argentina, 1977, the General Assembly of UN passed the resolution declaring the International Drinking Water Supply and Sanitation Decade: 1980-1990. After that, not only government but also non-governmental actors have been supporting drinking water and sanitation programs in Nepal. During and after the Water and Sanitation Decade, UNICEF, UMN, LWSF, Red Cross Society, HELVATES, FINNID (RWSSP, RWSSP-WN and RVWRMP), DANIDA, EC/EU, Water Aid, Save the Children, Redd Barna, World Bank, Asian Development Bank, RWSSFDB, PAF and a number of other CBOs are supporting in water supply and sanitation sector in Nepal.

Data of National Management Information Project (NMIP) under Ministry of Urban Development, updated in 2014 shows coverage of basic water supply and sanitation in the country are 83.59 percentages and 70.28 percentages respectively (NMIP/GON, 2014). This is the result of cumulative efforts of governmental and non-governmental actors in WASH sector.

Access to safe drinking water supply and sanitation services is fundamental to improve public health and to meet national poverty reduction objectives. As is now widely recognized, lack of access to these essential basic services contributes substantially to the high burden of disease that needlessly foreshortens and impairs the lives of Nepal's citizens (GON, 2014). Government of Nepal remains fully committed for providing basic level water supply and sanitation services to all by 2017, acknowledging it as a fundamental human need and a basic human right. It has also envisaged a need to improve the basic level of water supply and sanitation services to medium and higher levels for all by 2027 (GON, 2014).

In 2000, heads of state gathered at a special session at the United Nations in New York and adopted the Millennium Declaration. This provided the basis for the formulation of eight Millennium Development Goals (MDGs) aimed at achieving the objective of radically reducing poverty worldwide. One target under MDG 7 is to halve the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015. Nepal is a signatory to the Millennium Development Goal targets of halving the proportion of people without water and sanitation by 2015. Nepal has already met the MDG target regarding drinking water and sanitation facility coverage (73-percentage coverage in basic water supply and 53-percent coverage in sanitation facilities.)

Access to water, sanitation and hygiene is a precondition for health, economy and wellbeing. Without these, vulnerable groups of the community will face negative effect of present population and economic growth. Functionality of water services for changing communities with sustainable service delivery will increase access to sanitation and hygiene. The vulnerability of nonfunctioning of water facilities is increasing in the face of present climate change. Impacts of climate change and environmental constraints in sustaining existing services are being vital. In many cases, the conventional challenges will be much greater than the challenge from climate change. Nevertheless, addressing climate resilience is necessary to safeguard the progress made in achieving the MDG targets (WHO, 2009).

Water is the primary medium through which climate change will affect people, ecosystems and economies. Water resource management should be an early focus for adaptation to

climate change. It does not hold all of the answers to adaptation; a broad range of responses will be needed, however, water being both part of the problem and the solution; it is a good place to start (Sadoff & Muller, 2009). There is a wide range of potential climate change impacts on water supply schemes, including flood damage to infrastructure, increased contamination, deteriorating water quality, increased treatment requirements and reduced availability. All drinking water schemes will be vulnerable to climate change, but all have some adaptive potential. Investment in this adaptive potential will make systems and services more resilient in the face of extreme weather conditions (UNICEF/WHO, 2011).

1.2. Statement of Problem

Population growth, rapid urbanization and industrialization have resulted the increased demand for water supply. Non-operating systems and intermittent or unreliable supplies place an increased burden on the population to be serve, lead to household storage in often-unhygienic conditions and will increase health risks. The sustainability of improved drinking water sources often compromised by lack of technical skills, equipment or spare parts for operation and maintenance, and lack of sustained financing mechanisms for recurrent costs (UNICEF/WHO, 2011).

Despite good progress made in the provisioning of basic water supply and sanitation services to the rural and urban population, more efforts are required to sustain functionality of completed schemes and up-gradation of basic service levels to higher levels. Especial focus is needed to protect environmental and human health (GON, 2014).

NMIP report 2014 shows basic water supply coverage in Nepal is 83.59 percent through 41205 no of water supply schemes (irrespective of their size and served population). Gravity fed water supply scheme reveled more than 98.47 percent, followed by overhead of 0.80 percent and surface type by 0.49 percent. Among those 41205 no's of water supply schemes in Nepal, only 25.4 percent are functioning well, 36.1 percent need minor repair, 9.2 percent need major repair, 19.8 percent need rehabilitation, 8.6 percent need reconstruction and 0.9 percent is nonfunctional (NMIP/GON, 2014). This shows that actual functional water supply scheme service coverage is far lower, about 58.19 percentage of drinking water schemes counted as "coverage of drinking water" are not fully functional. This

indicates that existing schemes need to be properly maintained and assets need to be managed well to achieve the present national coverage of water supply 83.59 percentage and to fulfilling the national commitment of providing basic level water supply and sanitation services to all by 2017 along with achieving vision of SDG.

There has been extensive research, development and application work in this field, including Participatory Rural Appraisal (PRA), Rapid Rural Appraisal (RRA), Participatory Learning and Action (PLA) Initiative, Methodology for Participatory Assessment (MPA) and so on. Those studies focused on the assessment of the impact of water schemes on health or food security or on how individual variables like community participation affect sustainability of the water schemes and so on. All the methods generate massive amounts of information highlighting several factors that imparts in sustainability of water supply system separately or collectively. Some highlighted factors key to sustainability of rural water supply schemes are management capacity of water users and sanitation committee, local ownership and skilled maintenance worker, type and location of water sources used, scheme design, construction material and workmanship, operation and maintenance fund, tools and spare parts for operation and maintenance etc. These factors are obviously the basic for sustainability of water supply scheme and in parallel that the more information is generated, the greater becomes the challenge to assess and process of information's hence there is need felt of assembling those information for integrated assessment and interpretation of Sustainability. Assessment of sustainability of water schemes requires a holistic approach that considers all possible factors. This demands powerful integrated decision aid techniques to deliver the most rational decision of scheme sustainability.

1.3. Research Questions

This gives rise to the following questions.

- What will be the framework that could integrate all possible factors of sustainability to measure sustainability of community managed water supply schemes?
- What are the levels of sustainability in community managed water supply schemes in present context and what would be the applicability of those sustainability strata?

1.4. Research Objectives

The general objective of this study is to assess the long-term sustainability of community managed water supply schemes.

The specific objectives are:

- To establish a Sustainability Analysis Framework, building upon previous relevant works in the field, which could be used to assess the sustainability of community managed water supply schemes.
- To assess the long-term sustainability of Finnish funded community managed water supply schemes of Nawalparasi.

1.5. Importance of Research

UN Secretary-General Ban Ki-moon stated, "Safe drinking water and adequate sanitation are crucial for poverty reduction, crucial for sustainable development, and crucial for achieving any and every one of the MDGs."1The same is true for climate change since it is believed to be the crucial issue of 21'st century. "Water holds the key to sustainable development, we must work together to protect and carefully manage this fragile, finite resource."2This shows the importance of sustainable management of water services.

Improving the sustainability of rural water supplies has a number of consequences. It ensures the ongoing provision of a service that is fundamental to improving health, reducing the burden of carrying water long distances, and enabling users to live a life of dignity. Sustainability today invariably depends upon communities taking financial responsibility for their schemes; which, if achieved, will enable scarce resources from government and donors to be targeted specifically on areas where there is no improved water supply.

[1] Excerpt from former Secretary-General of the United Nations, Ban Ki Moon's speech on World Water Day, 2007.
[2]UN Secretary-General Ban Ki-moon, World Water Day, 2013

The study will assess long-term sustainability of the community managed water supply schemes and integrating the sustainability factors holistically. The study will provide in-depth information on the key thematic areas that are fundamental for addressing threats to long-term sustainability going deep to WUSC and users level. Findings of the study will lead to improvements in the strategic approaches to O&M and management of WASH facilities by providing further insight on institutional, social, environmental, financial and technical and so on issues of rural water supply schemes.

The study results will provide with important analysis of the long-term sustainability of Finnish funded water supply schemes of Nawalparasi. The research will answer to the call for more evidence-based grassroots evaluation regarding the sustainability of water supply scheme and it will improve in-depth understanding of the most significant factors hindering the sustainability of community based water supply schemes. Hopefully, it will help the national institutions to tailor their policies in better respond the challenges of the water sector. In addition, the study will add reliable evaluation data about Nepalese water sector and it will improve the general understanding of factors that would need more attention in order to ensure safe water in rural Nepal.

1.6. Limitation of the Study

The study has evaluated the sustainability of community managed water supply schemes based on the information obtained from quantitative field survey of 40 Finnish funded gravity flow water supply schemes more than 10 years old at Nawalparasi district, where Finland has long-term water sector interventions since 1990. Thus, the findings will show level of sustainability of rural water supply schemes within the concerned VDCs of Nawalparasi district that may or may not be relevant to other areas of Nepal and other funding agencies.

Both qualitative and quantitative data are collected for the research. There is ongoing debate regarding the reliability (the representativeness or explicability of data) and validity of quantitative versus qualitative research methodologies. Analyses of different methodologies can be found elsewhere and is outside the scope of this thesis.

A potential weakness of the approach used in this sustainability analysis tool is that information were collected only at a single point in time (about 10-15 years after construction) for systems with a design life of fifteen to twenty years.

1.7. Organization of Study

The study report has organized into six chapters. The first chapter is the introductory chapter, which provides information on the problem and objectives of the study, significance and limitations of study. The second chapter puts this particular research work in its context and gives background information to the readers that might not be familiar with the study's operational environment and basic information on study area. The third chapter highlights the systematic review of literature focusing on the sustainability issues of community managed water supply schemes, climate change and provisioning of climate resilient water services. The fourth chapter focuses on the methods and materials of research. The fifth chapter presents the results and discussion of the study. The sixth chapter summarizes the conclusion and offer recommendations.

CHAPTER II: RESEARCH CONTEXT

2.1. Introduction to Research Need

As mentioned earlier, these particular study responses to the research needs for more concrete and grass-roots-based evaluation regarding the Finnish funded water supply schemes and need to better understand the reasons behind the acknowledged sustainability challenge of community managed water supply schemes.

2.2. Sustainability

The word "sustainability" has gained significant ground in the media, politics, and common conversation in the past two decades but the root of the word and the concept as applied to development has been around since the early European enlightenment. In 1713 Hanns Carl von Carlowitz, the head of the Royal Mining Office in Saxony coined the word (nachhaltig in German) in reference to timber management practices (Grober, 2007). "Our Common Future" also known as the Brundtland report, written in 1987 that projected sustainability and sustainable development on to the global stage. The term sustainable development was popularizing by Our Common Future, a report published by the World Commission on Environment and Development in 1987. Also known as, the Brundtland report, Our Common Future included the "classic" definition of sustainable development: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." Acceptance of the report by the United Nations General Assembly gave the term political salience; and in 1992 leaders set out the principles of sustainable development at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil (Drexhage & Murphy, 2010).

Lockwood, Bakalian, & Wakeman (2003) reviewed the subsequent definitions of sustainability that appeared and have been applied to the rural water and sanitation sector. His review is summarized in Table 1. Included in the table are relevant publications, both those cited by (Lockwood, Bakalian, & Wakeman, 2003) and more recent publications. The ten examples provided in the table are not a comprehensive set of definitions because sustainability is dependent on perspective and therefore influenced by the individual or group seeking to define it.

Definitions and descriptions of sustainability relevant to the rural water and sanitation sector, derived from a review of post-project sustainability conducted by Lockwood, Bakalian, & Wakeman (2003).

Table 1: Definitions of Sustainability.

Sustainability Focus	Definitions/Descriptions	Sources/Related Citations
Environmental	Use or degradation of resources at a rate less than or equal to their replenishment or assimilation rates.	General
Ecological	Ability of an ecosystem to maintain ecological processes, functions, biodiversity, and productivity into the future.	REO (2009)
Institutional or Management	"Prevailing structures and processes have the capacity to continue their functions over the long term."	DFID (2000)
Economic	Within water and sanitation sector: financial aspects of service delivery and self-sufficiency of projects and cost sharing (user fees) even in low-income communities.	Black (1998)
Project	A project is sustainable if 1) sources not over-exploited 2) facilities maintained 3) benefits continue 4) project process cost-effective	Mancinni et al(2004) Harveyet al (2003)
Social	Socio-cultural respect, community participation, political cohesion	McConvilleetal,(2007)
Pragmatic	"Whether or not something [infrastructure] continues to work over time."	Abrams (1998
Triple Bottom Line: Ecological, Economic, Social	"Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs."	WCED(1987)Mihelcic et al(2003)
Flow of Benefits	Perceived benefits of projects. An improvement in the health and the subsequent positive impact on the broader welfare of the rural populations."	Lockwood(2003)
	"The resilience to risk of net benefit flows over time."	OED (2003)
Social Equity (gender and economic capacity)	Satisfactory functioning and effective use of services by everyone (men and women, rich and poor) having equal access to benefits	Mukherjee and van Wijk(2003)

Objective of this study is to obtain the most utilitarian definition for the rural water sector that is inclusive of the needs of beneficiaries, requirements of governments and societies. The flow of benefits is an aspect of patent importance in sustainability, however, in addition to measuring the flow of benefits, it is important to evaluate how they are utilize and distributed (Lockwood, Bakalian, & Wakeman, 2003). Equitable access among genders and between socio-economic classes is a critical concept raised by Mukherjee &

Wijk (2003). Another important concept, supported in recent literature, is the idea that sustainability does not exclude long term relationships between a community or community management (CM) organization and an external support institution (Lockwood, 2002; Schouten and Moriarty, 2003;Rosenweig, 2001). Based on a definition borrowed from WaterAid (2011), an international NGO also working on the Nepalese water sector also, the water schemes constructed as part of rural water supply and sanitation project are considered sustainable if they continue to work and deliver benefits over time for the water users. In fact, the earth's resources are limited and all human actives should emphasize the sustainable use of it. According to the International Union for Conservation of Nature, United Nations Environment Program and the World Wildlife Fund, sustainability consists of "improving the quality of human life while living within the carrying capacity of supporting eco-systems". Based on objectives set by the stakeholders of the project, there may be different views of looking at the sustainability aspect of the project. Sustainability of a project is viewed as an amalgam of technical, social/environmental, financial, and institutional aspects (Panthi & Bhattarai, 2008).When we talk about the sustainability of any infrastructure sustainability is directly associated with the value for money of the investment made in the development sector (Adhikari & Bhattarai, 2010). Hence, donors and government agencies tend to focus on economic indicators of sustainability while civil society and development institutions focus on project, managerial, or social indicators and users are often concerned only with service and convenience.

2.3. Sustainability Challenge in WASH Projects of Nepal

Most donors, have based their rural WASH projects in Nepal with community based approaches meaning that the communities are at first responsible for the operation and maintenance of their WASH schemes. In Finnish projects, the main responsibility for the operation and maintenance of water supply scheme was given to a group of selected water users called the Water Users and Sanitation Committee (WUSC). Still, there is not much grass-roots level information available on the long-term sustainability of this community-based approach nor has Nepal collected systematic feedback from the grassroots. According to the WASH Sector Status Report published in 2011 by Ministry of Physical

Planning and Works, the monitoring of WASH systems in the country is weak and there is no updated sector assessment available covering all the agencies managing the systems. Information related to water quality, service level, tariff system and hygiene are not systemically collected and there is a lack of systematic monitoring of the scheme performance. Also, the information available were used efficiently in annual planning processes neither at the district nor at the national levels (GON/ MPPW/WSSD/SEIU, 2011).

Nepal has set a national target for universal access to water and sanitation by 2017. Based on the National Management Information Project, the latest information has shown the national water supply coverage is slightly increased from 80.4% in 2010 to 83.59% Similarly sanitation coverage is also increase from 43% in 2010 to 70.28%. The water supply coverage is more than 80% in all Development Regions. Among them, the highest (85.21%) coverage is in Central Development Region (CDR) and the lowest (80.92%) in Mid-Western Development Region (MWDR). Geographically, the highest (84.89%) is observing in the Hill and the lowest (80.19%) in the Mountain. In case of sanitation coverage, the highest (86.29%) is observing in MWDR and the lowest (62.58%) in EDR. Geographically, the hill has the highest coverage of 87.14% and the Tarai has the lowest coverage of 56.93 % (NMIP/GON, 2014).

This means that currently approximately 5 million people do not have adequate water supply service and 8 million lack adequate sanitation facilities in Nepal. According to the WASH sector report, it know that these coverage figures do not reflect the sector realities on the grassroots as monitoring of the functionality and quality of the services is limited. Based on the NMIP/GON (2014), the water and sanitation coverage differs widely between different development and ecological regions as well as the ethnic groups in Nepal. Figure 1 shows the sector development since 2010. As seen in the table, the WASH situation is notably better in Hilly environment than in Mountain and Tarai.

Figure 1: Status of Water and Sanitation Coverage by National and Ecological Zone (NMIP/GON, 2014)

Region	2010			2012					Mid 2014		
	Water	san	Projected Pop[a]	Total	Water		Sanitation		Water	San	Projected Pop[a]
	%	%		HH	HH	%	HH	%	%	%	
EDR	76.4	42.2	6,374,298	1,142,476	885,902	77.5	560,752	49.1	82.45	62.58	5,997,378
CDR	81.3	46.1	9,859,227	1,723,142	1,340,244	77.8	894,612	51.9	85.21	62.77	10,324,734
WDR	84.6	53.5	5,468,946	900,637	791,925	87.9	623,169	69.2	82.84	80.6	5,076,207
MWDR	76.3	30.7	3,646,321	638,510	491,595	77.0	341,692	53.5	80.92	86.29	3,776,833
FWDR	83.32	29.1	2,694,765	43,2659	331,282	76.6	170,353	39.4	84.68	78.19	2,660,729
Ecological											
Mountain	77.6	33.6	1,987,700	296,850	221,366	74.6	136,469	46.0	80.19	74.48	1,549,734
Hill	79.9	52.9	12,292,169	2,265,392	1,819,154	80.3	1,450,040	64.0	84.89	87.14	12,220,211
Tarai	81.2	35.6	13,763,688	2,261,182	1,800,428	79.6	1,004,069	44.4	84.79	56.93	14,065,936
Nepal	**80.4**	**43.3**	**28,043,657**	**4,823,424**	**3,840,948**	**79.6**	**2,590,578**	**53.7**	**83.59**	**70.28**	**27,835,882**

The Nepal WASH Sector Status Report states that the coverage figures themselves can give false impression as they do not adequately represent service sustainability related to quality, accessibility, quantity and reliability parameters. This is due to the weak monitoring and data updating systems. The report estimates that although the rural water supply coverage is reported being as high as 78%, more than half (43%) of the water supply schemes are not fully functional. According to the report, most sector donors and actors emphasize new projects and schemes rather than repair, maintenance, and rehabilitation of the existing ones. This results in reduced functionality of the existing schemes.

Figure 2: Current Functionality Status of Existing Water Supply Scheme in Nepal (NMIP/GON, 2014)

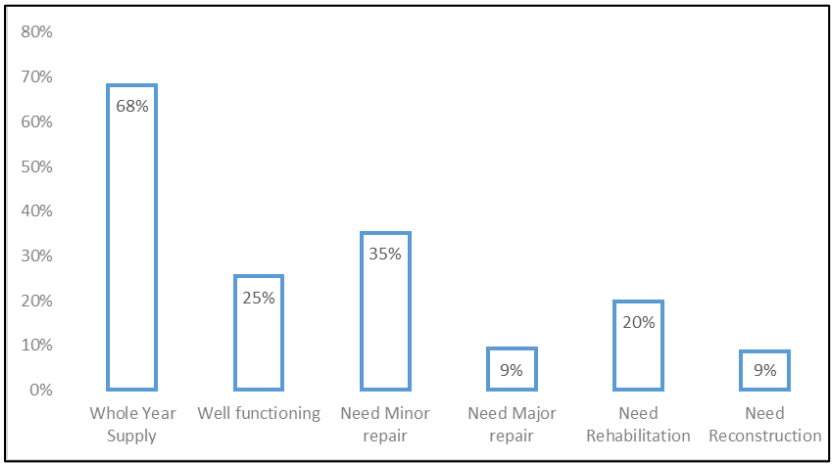


Figure 2 presents the current functionality status of water supply schemes in Nepal. It shows among 41205 water supply systems percentage of well-functioning system is 25.4, system need minor repair is 36.1, system

need major repair is 9.2, system need rehabitation is 19.8 and system need reconstruction is 8.6 (NMIP/GON, 2014).

The nation-wide World Bank study conducted between 2012 and 2013 highlights the low managerial and technical skills reasons for system functionality problemsand inadequate managerial skills of WUSC were most often mentioned, followed by the absence of the village maintenance worker and the lack of proper support services to maintain the water supply. Factors such as location and age also had a clear correlation as older and more remote schemes seemed to have more functionality problems. Natural calamities and source depletion didn't come out as very common causes for functionality problems in the studied schemes. Still, natural calamities were the reason that most likely made the schemes dysfunctional among all the reasons for functionality problems.

2.4. Nepal WASH Sector

The water and sanitation situation in Nepal is challenging in many ways. According to the sector overview, the water and sanitation sector is commonly characterized by institutional fragmentation, institutional weakness and limited sector coordination. There is an inadequate capacity of local bodies to implement and survey national water and sanitation policies and to support WUSCs in operating and maintaining the water and sanitation systems. The decade long political conflict between the Maoists and HMG Nepal shook the foundations of many established administrative systems. Many local body offices were destroyed and the development of the water and sanitation sector slowed down for years. Up today, the sector is characterized by lack of funds and bureaucratic funding procedures as well as an inequitable targeting and distribution of resources.Many communities rely on capital hand-outs from the government and other donors, which is seldom sustainable in long-term. According to the report, there is also an overall lack of updated and reliable sector information and too little attention is paid to water resource management and water quality issues (GON/ MPPW/WSSD/SEIU, 2011).

As the overall administration in Nepal, also the water sector administration is fragmented covering a large number of institutions with a lack of clarity on roles and overlapping responsibilities at all levels of the governance (GON/ MPPW/WSSD/SEIU, 2011). In the

last years, also the water sector administration has followed the governmental policy of decentralization. According to the Local Self Governance Act 1999, local government bodies are responsible for providing water and sanitation facilities to the people. (Government of Nepal, 2011)

At the central level, the key ministries for the water sector are Ministry of Federal Affairs and Local Development, Ministry of Urban Development, Ministry of Finance, Ministry of Health and Population, and Ministry of Education. Some of the key sectoral agencies are Department of Water Supply and Sewerage (DWSS) under the Ministry of Urban Development and Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) under the Ministry of Federal Affairs and Local Development (GON/ MPPW/WSSD/SEIU, 2011).

At the district level, thereare several governing actors that together make up a rather complex combination. The official state representative on the district level is the District Development Committee (DDC). The head of DDC is elected Chairpersson, in absence of him the Local Development Officer (LDO) chairs the DDC and also chairs the District Water Supply and Sanitation Coordination Committee (DWSSCC). All the district level water and sanitation related agencies belong to DWSSCC which is a coordination platform and mechanism for inter-pectoral linkage between the different agencies. Under DWSS, in each district, there is a Water Supply and Sanitation Division Office (WSSDO) which also both implements projects and allocates funding for water and sanitation related projects. In addition, there are various other water-related district level agencies under the ministries and their various departments such as the District Soil Conservation Office and District Health Office. In addition, various national and international NGOs play an important role in water sector in the districts (GON/ MPPW/WSSD/SEIU, 2011).

The governmental body most close to WUSCs is the VDC. Similarly as DWSSCC at the district level, there should be a Village Water Supply and Sanitation Coordination Committee (VWSSCC) in each VDC or municipality coordinating activities of several actors working for the water sector on the local level. In addition to the VDC, numerous community based organizations and actors such as traditional women's or mothers' groups, forest users groups, cooperatives, ex-army groups, youth clubs and Female

CommunityHealth Volunteers (FCHV) are usually active at the local level for cultural, social, health and community welfare activities. Among over 20,000 NGOs registered in Nepal, about 200 NGOs are active in water and sanitation sector (Government of Nepal, 2011).

In case WUSC is in a need of budget support for the operation and maintenance of its water scheme, the scheme users usually have two options to apply for funding from – the DDC and the WSSDO of their corresponding district. Applying for funding is a slow, bureaucratic and often a difficult task. First, the WUSC needs a recommendation letter from its corresponding VDC. Then VDC may send the recommendation further to the Ilaka-level decision board. Ilakas are governing units of four to five VDCs. After, the Ilaka makes its own recommendation list and sends it further to DDC. Finally, DDC makes the decision, which schemes should receive funding from the annual budget. Finally the National Planning Commission on the central level approves the annual budget use. (GON/ MPPW/WSSD/SEIU, 2011)

There is also another way. With the VDC recommendation letter, the WUSC may also contact straight WSSDO of the responding district and apply for funding. WSSDO gets its budget from different funds than DDC and the two are thus not exclusionary. In addition to DDC and WSSDO, WUSCs may also apply for funding from any district level agency that has their own annual budgets such as the Soil Conservation Office. (GON/ MPPW/WSSD/SEIU, 2011)

Receiving funding is often not an easy task. According to the Nepal WASH Sector Status Report 2011, the country has an overall inadequate investment in the scheme rehabilitation. The existing national policy that states that 20 % of budget allocated to rural water supply and sanitation should be spent for rehabilitation and repair is not currently implemented. (GON/ MPPW/WSSD/SEIU, 2011)

There are various factors that are and will contribute to scheme functionality challenges now and in the future in Nepal. The Nepal WASH Sector Status Report mentions that many of the implemented schemes are based on so called community taps that do not reflect today's consumer demands such as household connection. There is also a widespread attitude that O&M costs for water services should be provided for free as the users already

contributed during the scheme construction. The society is also changing: many young people have the objective of high education and moving abroad. Earlier notions and assumptions of voluntary community management are changing especially in rural areas. Part of the functionality problems arises from the fact that there is a lack of minimum construction standard of infrastructure and regular repair, maintenance and replacement of spare parts. WUSCs receive overall poor support after scheme completion and their technical and managerial knowledge and skills may not respond to the needs. Declining source reliability and reduced water availability might also increasingly lead to conflicts about water rights and distribution within and between settlements and communities. (GON/ MPPW/WSSD/SEIU, 2011)

2.5. Finnish Aid in Nepal and RWSSP

Finland and Nepal have a relatively long history in development cooperation. The bilateral development cooperation started already in 1982, which makes Nepal one of Finland's longest bilateral aid partners. Increasing the access to safe drinking water and sanitation especially in the rural areas is one of the principal objectives of the Nepal country program. Now, Finland is implementing two bilateral projects in the Nepalese water sector namely RWSSP-WN and RVWRMP. In addition to the bilateral cooperation, MFA also funds non-governmental organizations, such as Water finnsry, that are implementing smaller scale projects in the country (GON/MOF, 2014).

RWSSP I was Finland’s first water and sanitation project in Nepal, was launch in 1990. It was continue over a decade until 2005 through its three phases. Common in all the three phases of RWSSP is the strong community based approach. According to this approach, communities were responsible for the planning, implementation, operation and maintenance of their own water schemes. Governmental institutions support the communities in their objectives but finally communities are responsible for the functionality of their own services. Community based approach is justified especially in the rural areas of Nepal where the villages are often scattered and located in remote areas. As maintaining efficient centralized water supply services in scattered communities would demand many resources, simple, small-scale, community run schemes were consider the most relevant option by RWSSP (RWSSP I, 1991)

RWSSP gave the communities a strong role throughout the project. In order to ensure efficient management of the community based water schemes, the project established WUSCs and given the right to collect funds for the operation and maintenance of water and sanitation schemes. They received a comprehensive training in the scheme operation and maintenance. After the scheme completion, they are handover to WUSC, since WUSC have the responsibility for everyday scheme governance, operation and maintenance. All the three RWSSP projects were based on step-by-step approach. The step-by-step approach emphasized community participation throughout the project. It had an objective to bring the decision making and resource management down to the community level to get the communities closely involved in the planning and implementation processes (RWSSP WN II, 2016).

2.6. Sustainability Measurement Framework for WSS Scheme

Many frameworks have used to measure the sustainability in development listing, dozens of factors affecting sustainability and the indicators measured to determine the impact of each factor. The focus of this analysis is on the long-term (e.g. post project) issues in community operation and maintenance of rural water supply schemes and therefore the analytical framework must reflect appropriate factors and subsequent indicators.

To develop the sustainability analysis framework for sustainability assessment of community managed water supply schemes in this study, following precedent framework of measuring sustainability were evaluate.

2.6.1. The Sustainability Snapshot

The Sustainability Snapshot is a rapid assessment tool developed by Water Aid in Malawi in 2003 to determine the likelihood that a water supply system will remain functioning in the future. It was apply in existing infrastructure or to evaluate a community's ability to manage future installations. Stakeholders at the community and district level are asked to rate their confidence in relation to three thematic areas (finance, technical skills, spare parts and equipment). The snapshot seeks to determine if the community has: 1) the funds to carry out repairs, 2) the skills to carry out repairs, and 3) access to the necessary spare parts and equipment to carry out repairs. The scores of the snapshot were used to determine

strengths and weakness with regard to community management of water supply infrastructure. Water Aid found that rather than evaluating the sustainability of individual water points, the snapshot was most useful when used to highlight key issues that may be undermining sustainability across a region, district or country. Because of the straightforward nature of the snapshot, the level of effort required is minimal.

Table 2, presents most commonly cited factors for post construction sustainability separated by category (Financial, Technical skills, Equipment and spare parts) and A score for each theme (1-3) and an overall sustainability score (3-9). The information is taken from sustainability snapshot and modified from its original format.

Table 2: Sustainability Assessment Factors Purposed by Sustainability Snapshot

	Financial
1	No funds available for maintenance when needed
2	Funds available but not sufficient for the most expensive maintenance process
3	Funds available and sufficient for the most expensive maintenance process
	Technical skills
1	Technical skills not available* for maintenance when needed *Available in this context means available to an average community member within a reasonable time
2	Some technical skills for maintenance, but not for all
3	Technical skills for all maintenance processes available
	Equipment and spare parts
1	Not available when needed
2	Available but not for all repairs
3	Available for all repairs

The "Sustainability Snapshot" assumes that for these factors to have a positive contribution towards sustainability all other necessary conditions must be sufficient. For example, if the community's technical skills are sufficient (or positively affect the sustainability of the system) and the pumps are working, then the institutional training must have been sufficient to get to that point. Therefore, it seeks to measure the three dependent variables only and assumes that this will account for all the preconditions or independent variables.

2.6.2. Unit of Operation and Maintenance (UNOM) method

The National Water Supply and Sanitation Company of Nicaragua developed an evaluation methodology for use in their regional operations and maintenance support unit well known Unit of Operation and Maintenance (UNOM) method. It was use by technicians to identify which communities will require priority attention. Like the sustainability snapshot, the UNOM method is straightforward and replicable. It was based upon the three "principal aspects" of the water supply project:

- Organization
- Administration
- Technical condition

Various indicators are measured within each category and an overall ranking of "above average," "acceptable," or "below average" is determined for each community. The sub indicators used to determine the ranking provided in Table 3 below. Table is adapted from Lockwood (2001) page 75.

Table 3: Sustainability Aspects and Indicators Purposed by UNOM method

Aspects	Above Average	Acceptable	Below Average
Organization	Committee functioning with all members active	Committee functioning but not completely	Committee not functioning
	Decisions made in previous month respected and adhered to by community	Decisions made by committee in previous month not universally agreed on nor respected	No decisions taken in previous month
	Meetings and decisions fully recorded	Committee functioning but with some need for external support	Organization impossible without external support
	Committee functions without external support		
Administration	Tariff system operable with 90% of h/h contributing	Tariff system operable but with less than 90% h/h contributing	Tariff system does not function
	Accounting ledgers balanced with monthly financial report	Accounting ledgers incomplete and reporting period is more than 1 month	Accounting ledgers incomplete and no financial report
	Income covers 100% of running and repair costs of system plus balance	Income covers 100% of running costs only	Income does not cover full running costs
Technical	Physical systems fully functional, out of service <1 day in previous month	System partially functional, out of service 1-3 days in previous month	System functions poorly, out of service >3 days in previous month
	Disinfection on regular basis	Sporadic disinfection	No disinfection
	Water supply 24 hours/day	Water supply at least 8 hours/day	Water supply < 8 hours per day.

2.6.3. Lockwood: Post-Project Sustainability Report

Lockwood (2003) evaluated literature and project documentation from over 70 different reports and publications (including the Water Aid sustainability snapshot and the database used in Nicaragua) and identified twenty of the most commonly cited factors that influence post construction sustainability of rural water systems. The twenty are divided into five categories with a four-point rating system: 1-highly critical importance, 2-critical importance, 3-less critical importance, 4-limited importance (see Table 4).

Lockwood (2003) evaluates different frameworks used to evaluate post project sustainability and concludes that the factors fall into five general categories.

- Technical
- Community and Social
- Institutional
- Environmental
- Financial

In addition to this classification, the factors can be separated by whether they fall within the sphere of control of the community (willingness to pay, social capital or cohesion, and motivation) or out of the communities' hands (legal framework, technical design, water source, spare parts availability, and institutional support). Not all factors are exclusively internal or external and, instead, are dependent upon variables from each. An example is the management capacity of the community, which affected by the human resources within the community (internal) but also the supply of institutions willing to train community members (external).

Lockwood determined that the factors most integrally related to post project sustainability (and thus having a rating of highly critical importance) are sufficient financial generation (tariffs, user fees, etc.) and external follow up or post-construction support, shown in row 1 of Table 4. The results reflect a composite picture of various studies and are to be used "primarily a tool which serves as the starting point for taking forward the analysis of such factors" (Lockwood, 2003). Twenty most commonly cited factors for post construction sustainability separated by category (technical, financial, community and social,

institutional and policy, and environment) and rated from highly critical importance (1) to limited importance (4). The information taken from Lockwood (2003) and modified from its original format was present in Table 4 below.

Table 4: Factors for Post Construction Sustainability Propose by Lockwood (2003)

Criteria	Factors
Technical	• Maintenance preventative • Spare parts availability • Tools/equipment availability • Electricity supply/affordability • Standardization of components • Maintenance major repairs or replacement
Financial	• Adequate tariff for recurrent costs • Adequate tariff for system replacement and expansion
Community and Social	• Community management capacity • User satisfaction, motivation, willingness to pay • Involvement of women • Social capital or cohesion • Continued training and capacity building
Institutional and Policy	• External follow-up support • Continued training and support to sanitation/hygiene education • Private sector involvement • Supportive policy/regulatory environment • Legal framework, recognition of water committees and ownership • Clarity of roles for operation and maintenance
Environment	• Water Source: production, quality, and conservation

2.6.4. Framework for Sustainability Monitoring and Evaluation

Figure 3: Components of Sustainable Project

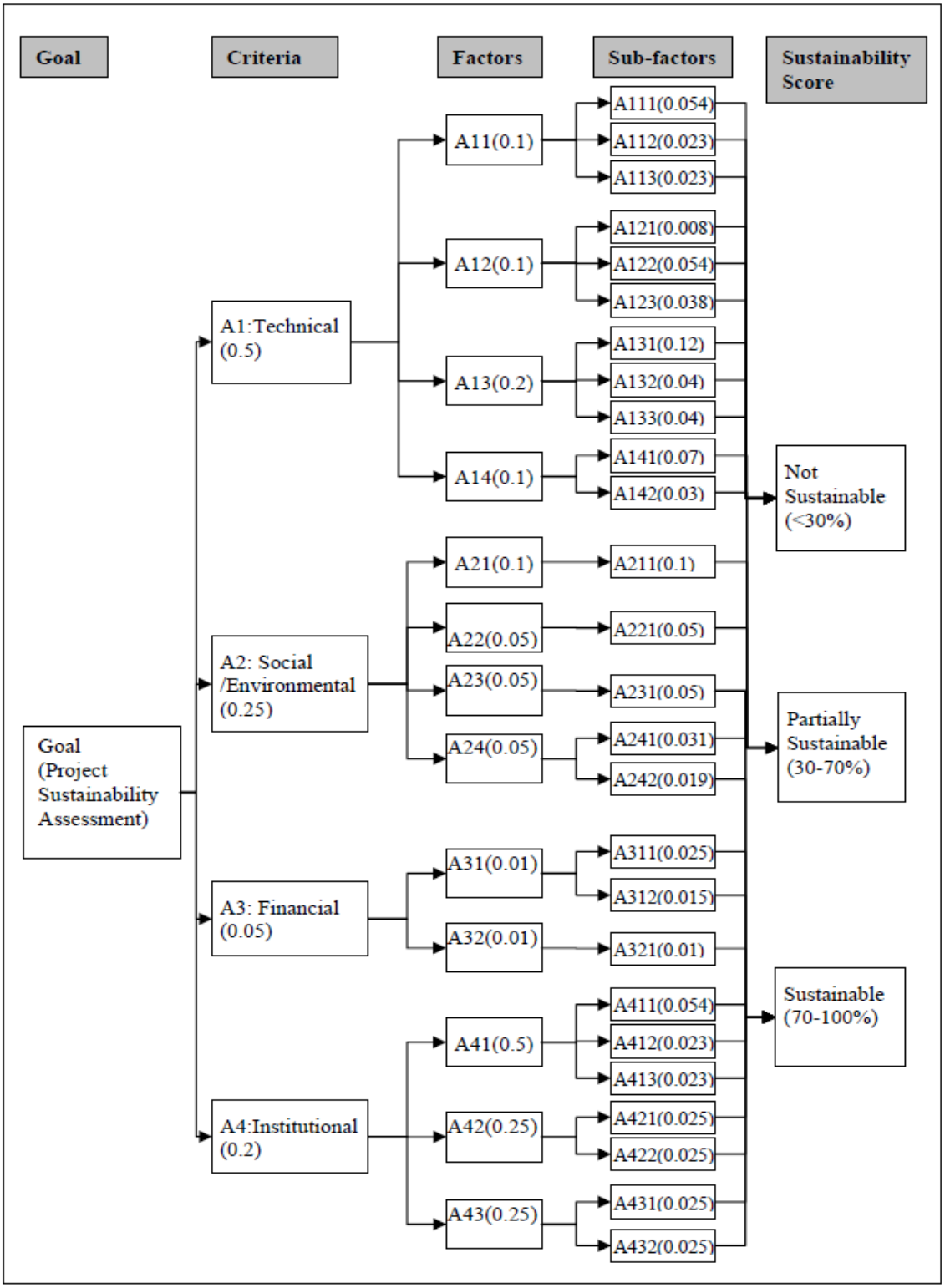
The framework for sustainability monitoring and evaluation developed by Panthi and Bhattarai in 2008 consists, technical, social/environmental, financial and institutional criteria for monitoring sustainability of water supply projects. The framework is the basis of sustainability monitoring and generating sustainability score by analytic hierarchy process (AHP). Base on this framework factors and sub factors under Technical, Social/Environmental, Financial and Institutional criteria are principle components for sustainability of water supply projects. The sustainability-monitoring framework consists of four criteria, thirteen factors and twenty-six sub factors. Sustainability assessment criteria, factors and sub factors proposed by Panthi and Bhattarai were presented in Figure 4 Below.

Figure 4: Sustainability Assessment Criteria, Factors and Sub-factors, Panthi & Bhattarai: 2008

Criteria	Factors	Sub factors
A1: Technical	A11: Source Yield & Quality	A111: Reliability, adequacy, depletion A112: Water quality at source A113: Accessibility, chance of contamination & Conflict
	A12: Physical Condition of System	A121: Design adequacy, site & technology A122: Condition & functionality of system A123: Natural threat to physical system
	AS13: Water point functioning	A131: Maintaining Design Flow A132: Water quality A133: Surrounding condition/Drainage system
	A14: Meeting Demand	A141: Water fetching time A142: Status of meeting additional demand
A2: Social/ Environmental	A21: Use of water facility	A211: Status of use by targeted population
	A22: Community participation	A221: Decision making and O&M
	A23: Environmental	A231: Mitigation measure & Drainage
	A24: Social Inclusion & Equity	A241: Inclusion (ethnic group) A242: Equity (men, women, reach & poor)
A3: Financial	A31: Availability of fund	A311: Establishment of O&M fund & saving A312: Regularity & transparency
	A32: Use of fund	A321: Use of saving / surplus fund
A4: Institutional	A41: Users' committee	A411: Existence, functioning & meetings A412: Ownership & activities A413: Representation on UC
	A42: Maintenance committee / Care taker	A421: Existence A422: Functioning
	A43: Coordination and Linkage	A431: With local authority & other agencies A432: Training & external support

The information of sub factors generated in isolation needed to integrate with the scoring system, making it comparatively easy to judge whether the project under consideration is sustainable or not. Further, each score was classified as one of the three situations sustained, partially sustained and not sustaining. A high-end tool based on AHP, utilized to generate sustainability score of water supply projects. Figure 5 below presents a hierarchical structure that was form by grouping factors into different level.

Figure 5: Hierarchical Structure of Criteria, Factors and Sub-factors and their Weights, Panthi and Bhattarai: 2008



CHAPTER III: LITERATURE REVIEW

3.1. Sustainability of WASH Projects in Global Context

ACF-International (2007) published a practical manual of recommendations and good practices based on a case study of five ACF-In in Water, Sanitation and Hygiene projects titled "How to make WASH projects sustainable and successfully disengage in vulnerable contexts." This document is primarily concerned with WASH programs as opposed to water supply in general. However, the document considers factors affecting sustainability particularly with regard to social context and management of systems, which is equally relevant to water supply systems. Particular emphasis was also given to the move from short-term response in fragile environments to longer-term projects. Factors affecting sustainability are considered in the following overarching categories of External and Internal to community or influenced by project design are listed below.

- **External**
    1. Legislation, policies and political support
    2. Efficiency of intermediate level actors – Govt., NGOs, private sector
    3. Standardization of approaches across the sector
    4. Availability of external funds for major works
    5. Sustainable availability of spares at reasonable cost
    6. Water resource availability
    7. Risks from natural disasters, conflicts and vulnerability
    8. Quality of leadership in the community
    9. Gender, division's inequality and social cohesion
    10. Appropriate management system for the facility
    11. Management capacities, baseline skills, education and capacities
    12. Existence and enforcement of rules
- **Internal to community or influenced by project design.**
    1. Community sense of ownership and legal ownership
    2. Community commitment to the project, willingness and ability to pay for recurrent costs
    3. Willingness and ability to pay for major rehabilitation or replacement

4. Appropriate service level and technology
5. Appropriate methodologies for encouraging and reinforcing good hygiene practice
6. Systems appropriate to livelihood
7. Environmental sustainability

The factors listed are comprehensive but do not necessarily fit easily into these two overarching sections (for example, the external category includes quality of leadership in the community which is surely applicable to both categories). Nevertheless, it does provide a useful checklist and consideration of management from self-supply to institutional is useful.

Peltz (2008) submitted MSc thesis on "Community Water Supply: Project Effectiveness and Sustainability" in Department of Forest, Rangeland, and Watershed Stewardship in Colorado State University. The primary objective of this research is the development of a series of best practices for conducting the assessment and monitoring phases of community water supply projects for rural areas in developing countries. This thesis considers sustainability of community water supply utilizing an example case study from La Laguneta. A framework for assessing sustainability has developed 'The Water Project Framework'. The results of this research indicate that, there are four major topic areas contributing to water system sustainability and effectiveness, including physical, environmental, financial conditions, and socio-political context of the country and community. The community's ability to access some form of outside development assistance, be it private, public, or non-governmental is another key factor. Furthermore, this research found that participatory methods, when used during the assessment phase of a water supply project, support better information collection and communication, ultimately leading to more effective and sustainable water supply systems.

Ademiluyi & Odugbesan (2008) published a research article about "Sustainability and impact of community water supply and sanitation programs in Nigeria: An overview" in African Journal of Agricultural Research. The objective of the research was to evaluate community water supply and sanitation programs, with a view to determining their impact as well offering sustainable strategies for meeting the prevailing problems and challenges

of the sector. One of the common features in Nigeria and indeed in many developing countries is that the impacts of community water and sanitation programs are limited, because many of them are ill conceived and abandoned prematurely due to numerous attitudinal, institutional and economic factors. Thus, there is lack of sustainability in the sense of service delivery and upkeep of services. This paper proposes a set of pragmatic strategy that would involve all stakeholders, by ensuring effective partnership with a view to raising the sustainability level of community water and sanitation programs. The paper believes that the key to sustainability is that all stakeholders involved in the consumption/use, maintenance, cost recovery and continuing support, perceive it in their best interest to deliver good and high quality services. Elements key to ensuring sustainability was identified as:

- Caretakers should be in post and fulfilling their assigned job descriptions.
- Committees should be meeting regularly, keeping minutes, and functioning in a manner acceptable to the community.
- Revenue collection should be taking place in the manner agreed at the construction phase, or in some other effective way.
- The backstopping agency (Government or NGO) should be in regular and effective contact with the community.
- Usage of water supply, excreta disposal and wastewater disposal facilities should be continuing at high levels.
- Physical infrastructure should be fully functional

Water Aid, IRC & WSCC (2008) published a paper summarizing the discussions and messages papers of workshop held in BRAC's Centre for Development Management in Rajendrapur, Bangladesh from 29 to 31 January 2008, naming "Beyond Construction. Use by All. A collection of case studies from sanitation and hygiene promotion practitioners in South Asia". The workshop organized by Water Aid, IRC International Water and Sanitation Centre and Water Supply and Sanitation Collaborative Council during the start of the International Year of Sanitation (IYS). Several papers contained in this case study document referring to rural sanitation provision from pg. 121 onwards. Example paper,

Ganguly, Sumita C. India's national sanitation and hygiene program: From experience to policy West Bengal and Maharashtra models provide keys to success.

Key lessons included in this refer to

- Transparency
- Need to analyze further than coverage figures to ascertain success.
- Need for affordable technology.

Ganguly identified the following factors as key to success:

- National pride and priority
- Political will.
- Leadership that review and monitors
- Robust institutions
- Links with CBOs & NGOs
- Potential for links with private entrepreneurship in service provision and management
- Efficient transparent delivery mechanisms
- Women's self-help groups and promotion of micro-credit

Harvey (2009) published a short two paged paper on "Sustainable Operation and Maintenance of Rural Water Supplies: Are We Moving in the Right Direction?" as a perspective of Rural Water Supply Network. This short summary 2 pager paper focuses on operation and maintenance of technology as the "heart of sustainability". Key elements of project versus programmatic approaches are listed and considered in light of the following factors influencing sustainability:

- Policy context
- Management and institutional arrangements
- Community and social aspects
- Financial issues
- Technology
- Environment
- Supply chains.

3.2. Sustainability of WASH Projects in Nepalese Context

NEWAH & Water Aid (2006) published a study report on "Long Term Sustainability Study (LTSS) Findings. "The objective of the study was assessing the sustainability of 298 NEWAH supported project during 1987 to 1998, that the organization could improve the weaker projects and adopt the lesson learnt for further improvement.

The major finding of the study was Community management and technological approaches were appropriate. However, challenges to sustainability included:

- Inability of local government to provide support
- Appropriate models for sustainability may differ according to area. For example, a large project area, single WSUC, central maintenance fund and regular collection may not found to be suitable for Tarai areas although it could be model for hill-based projects.
- Reflection and innovation has allowed the project to be responsive and self-critical both key to long-term sustainability.

Key areas for consideration in future projects included:

- Improved quality of baseline data collection
- Increased level of technical supervision in construction
- Explore new approaches for the different geo-social regions (eg.Tarai).

Bhandari & Grant (2007) published a research article about "User satisfaction and sustainability of drinking water schemes in rural communities of Nepal" in Sustainability: Science, Practice, & Policy journal. The objective of the study was to examine the variables that influence users' willingness to pay for the operation and maintenance of rural water supply schemes in Nepal and comparison of core problems based on an institutional survey regarding the sustainable operation and maintenance of water supply schemes in the country. A three-pronged survey instrument was applied in this study of drinking water schemes in Nepal. The methodology first called for informal discussions with key informants about the strengths and weak-nesses of existing water-supply schemes and their management. In the second phase, a random institutional survey of water-user committees

was conducted. At final stage of this process involved implementation of a systematic random survey of 205 Nepalese households and 12 water users' committees. Logistic regression model in application of statistical software program was used to analyze the obtained data with variables of degree of satisfaction, trustworthiness of water-user committees, and affordability to describe users.

The major findings of the study were water supply programs consist of three essential components: technology, people, and institutions. Weak institutional capacity is the prime obstacle in the provision of drinking water in the rural villages while technicalities such as insufficient water quality and inconvenient water-point locations are the major issues in the rural market centers. Levels of user satisfaction influence the operation and maintenance of both types of systems and water quantity, reliability, WUSC trust-worthiness, convenience of water-point locations, water quality, and water-flow pressure are the most crucial and correlated variables in the performance of water-supply systems.

The study tries to assess the variables for functionality and sustainability of water supply schemes with strong statistical base focusing on user-satisfaction level, WUSC trustworthiness, affordability and willingness to pay. This study is successful in identifying the user-satisfaction parameters and the overall influence of satisfaction on user's willingness to pay and sustainability of water supply schemes in rural villages and rural market centers in Nepal. The research method, model and results may be useful in further research within other parts of Nepal as well.

Helvetas (2013) published a study report on "The Effectiveness and Outcomes of Approaches to Functionality of Drinking Water and Sanitation Schemes." with findings of a study conducted on the functionality of drinking water and sanitation schemes supported by Helvetas Swiss Intercooperation Nepal. The key objectives of the study were to identify overall functional status of the schemes and how they function, to assess the effectiveness and outcomes of the program's approaches and to provide input for revising or redesigning subsequent plans and policies. 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. Finally, the data collected from both

qualitative and quantitative methods were processed and presented in different data tables, and were further analyzed and interpreted.

The major findings of the study on the total 92 gravity flow schemes surveyed, 23 percent were categorized as functioning well, 48 percent needed minor repair, 22 percent needed major repair, 5 percent needed rehabilitation, 1percent needed reconstruction, and the remaining 1percent were not in good enough condition to be rehabilitated. Even though the first four categories of 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. The key generic factors that are particular to community managed drinking water and sanitation schemes affecting the proper functioning schemes are; 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 their productive use of water.

The major recommendation of the study was establishing institutional mechanism at the local level that would monitor drinking water and sanitation schemes function. Regular monitoring ensures that repairs carried out 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 and integration of WASH system 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.

The study has highlighted 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 of these approaches. This definitely provides 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.

Raut (2014) submitted the research thesis on "Sustainability of Community Water Supply Systems Managed by Water User Committee: A Case Study of Rural Water Supply System in Nepal" to the Norwegian University of Life Sciences. The major objective of the study was to analyze sustainability of rural water supply project managed by water user committee; In addition, the thesis also reviewed water supply system and its sustainability in Nepal. Author has taken cases of Dhulikhel water supply system, Bhakundebesi water supply system and Panchdhara water supply system for her study. Primary data obtained from household survey, focus group discussion, informal interview with key informant and observation were utilize to evaluate technical, financial, social, environmental viability and institutional arrangements of the water supply system. Statistical methods were used to analyze the data through MS Excel and ANOVA was utilized to analyze and interpret the performance of system.

The major findings of the study were, all the three schemes studied able to recover operation and maintenance cost at their own resources and provides a good quality of water to the costumer. When local communities participate directly in the planning and have adequate financial and administrative capacity for system operation and maintenance, these systems are more likely to be sustainable. Provisioning of community capacity building and awareness raising on sanitation, establishment of water quality monitoring mechanism on the basis of national drinking water quality, provisioning of skilled human resource to operate and maintain of the water supply system and assuring of equitable distribution of water facilities through WUCs is vital for sustainability of community managed water supply facilities.

3.3. Water and Development from MDG to SDG

SIWI (2015) published a research report about "Water for Development – Charting a Water Wise Path". The objective of research was to provide input to 2015 World Water Week – themed Water for Development. The research share the thinking of experts and propose new avenues for development in themes of taking insight of water is crucial for human sustenance, health and dignity; as a driver for business; for food and energy security; and for the ecosystems upon which our societies and continued development depend.

The major findings of the report was Water scarcity, variability and unreliability pose significant risks to all economic activities in a society. Poorly managed water resources cause serious social, environmental and economic challenges – but if managed well, they are a source of prosperity. This calls for investments in water security, in risk management, and in knowledge, people and partnerships. It is vital to build resilient societies and to secure functioning ecosystems while developing our economies. In increasingly unpredictable conditions, we must ensure that human activities operate within safe limits of the planetary boundaries. This includes recognizing and addressing competing demands and tradeoffs between different water uses and users. Securing ecosystem services is an important building block in addressing the challenges ahead.

The report has addressed the necessity to integrate water in disaster risk reduction, in the SDG framework and in efforts to adapt and mitigate climate change. In the implementation, coherence between different policy areas and between economic sectors remains a challenge. It is not only important to mainstream water in the sustainability efforts to increase the opportunities for prosperity, environmental quality, equity and dignity; water resources management, is also a means for coherence and collaboration across borders, sectors and stakeholder groups. Identifying innovative incentives schemes for more efficient water use, and reuse – like different forms of water pricing – would not only contribute to raising financial means for investments in necessary infrastructure, it would also secure universal access to safe and affordable drinking water and appropriate sanitation for all.

Kjellén & Marianne (2015) published rsearch article "Water and development: From MDGs towards SDGs" on chapter one of "Water for Development – Charting a Water Wise Path" published by Stockholm International Water Institute. The article spotlight on the MDG progress, discusses the future SDGs, and concludes water is essential for achieving the SDGs, with adaptive and flexible approach on the key drivers – such as population growth, climate change and consumption highlighting need to build the governance framework and enabling environment. Societal changes, such as population growth, urbanization, increased income levels and changing patterns of consumption and production, and climate change continuously alter the circumstances for planning and

action. While time is passing, the agenda must keep too firmly in order to efficiently enhancing equity: meeting the needs of the poor and enhancing rights, power and inclusion of currently marginalized groups – which is especially relevant for low-income countries.

3.4. Climate Change and Resilient WASH Facilities

Yates (2011) published a research article about "Limits to adapting to water variability in rural Nepal: Gaps in community-based governance" in journal of Water Alliance published by Practical Action. The objective of research was to contribute in literature on livelihood adaptation and the governance of water resources, to build empirical data on what water-related impacts people have to manage, what their management strategies are, and whether these strategies can lead to effective livelihood adaptation in the long term. The research was carried in Chitwan and Nawalparasi districts on Nepal. Participatory tools such as community resource and hazard mapping, seasonal calendars, historical timelines, hazard ranking, impact ranking (on both resources and livelihoods), capacity assessments and Venn diagramming to identify and develop understanding of community perceptions of climate change and the adaptive practices in their villages.

The major findings of the study was in response to the increasingly erratic behavior of water, rural communities in Chitwan and Nawalparasi are struggling to alter their livelihood practices and protect their villages against dangerous extreme events. The livelihood practices are sensitive to changes in watershed dynamics. Short-term strategies of coping with hazards enable livelihoods to bounce back to their previous states, Water governance remains absent from conversations with community members. The institutions underpinning water resource management were weak. There is a gap in local participation in decision-making and has continuous disputes between downstream and upstream communities.

The major recommendation of the research was for the attention of district offices, User Committee federation, VDCs and non-governmental actors in reviving effective and autonomous watershed management committees, which can provide a tangible locus for resolving conflicts around water related issues and institutional reform, in order to take advantage of opportunities to make planned changes in environmental governance regimes.

Attention should take on local power relations and strengthening water user's committee institutions that ensure the equal representation of community members and their concerns of stability and sustainability through water management.

The major strength of the study was its findings in the present context of vulnerability of changes in watershed dynamics in rural communities of Nepal. Water shed management is vital for the sustainability of provisioned water facilities with resolution of conflict between local water users (both upstream, downstream, within and between villages in the same watershed).

WHO (2009) published a study document as "Summary and policy implications Vision 2030: the resilience of water supply and sanitation in the face of climate change". WHO and DFID have collaborated to carry out this study, has brought together our joint knowledge and expertise in water, sanitation, health and development. Ensuring optimal resilience of water and sanitation services in a globally changing climate context will be crucial to maintaining the momentum of making progress in health and development. The study brought together evidence from projections on climate change, trends in technology application, and developing knowledge about the adaptability and resilience of drinking water and sanitation. While the reports emanating from this study focus on issues related to the provision of water and sanitation services, installing services with a greater resilience to the impacts of climate change will rely in turn on improved management of water resources.

The major findings of the study were

1. Climate change is widely perceived as a threat rather than an opportunity. There may be significant overall benefits to health and development in adapting to climate change.
2. Major changes in policy and planning are needed if ongoing and future investments are not to be wasted
3. Potential adaptive capacity is high but rarely achieved. Resilience needs to integrate into drinking water and sanitation management to cope with present climate variability. It will be critical in controlling adverse impacts of future variability

4. Although some of the climate trends at regional level are uncertain, there is sufficient knowledge to inform urgent and prudent changes in policy and planning in most regions.
5. There are important gaps in our knowledge that already or soon will impede effective action. Targeted research is urgent need to fill gaps in technology and basic information, to develop simple tools, and to provide regional information on climate change.

Drinking water and sanitation are foundations of public health and development. If the widely anticipated flood and drought consequences of climate change happen, then both established water and sanitation services and future gains in access and service quality will be at real risk. The study had identified several gaps in basic information that we require to understand the situation and to plan for its improvement with identification of community management of community sources and small supplies is associated with high rates of failure and contamination

Howard, Charles, Pond, Brookshaw, Hossain, & Bartram (2010) published a research article about "Securing 2020 vision for 2030: climate change and ensuring resilience in water and sanitation services" in Journal of Water and Climate Change. The major objective of the study was to assess the resilience of water supply and sanitation systems against forecasted climate changes by 2020 and 2030. The resilience of technologies and management approaches to key climatic threats assessed through literature review and collection of data from sector professionals. The data from the literature review, questionnaire and semi-structured interviews were used to categorize the resilience based on evidence of resilience and vulnerability to current climate variability and ability to withstand forecast future changes. To assess the scale of impact of resilience of the different technologies and management approaches to climate change, forecasts of coverage were undertaken and Predictions for expected changes in the average precipitation and the frequency of 5-day heavy rainfall events were undertaken using the decadal prediction system (DePreSys).

The major findings of the study shows climate change represents a significant future threat to sustainable drinking-water and sanitation services, which are essential in protecting public health. Management approaches are more important than technology in building resilience for water supply, but the reverse is true for sanitation.

The major recommendation of the study was prioritizations of climate resilient technologies for future investments. Reducing losses and preventing contamination are major responses, which are desirable regardless of climate change in water supply schemes. The research has opened the avenue for further research that would warrant on improving technology resilience in order to increase the applicability of water supply system.

Well-executed and well-functioning schemes are more resilient. Additional measures should be in place for adaptation to climate change. Ways to adaptation may vary from place to place. Sector needs to work under collaborative effort and explore appropriate technology and management system for water, sanitation and hygiene behavior under various scenarios. Model for climate resilient water safety plan and climate resilient sanitation system should explored and implemented. Guideline and materials should be prepared for the communities to develop climate resilient WASH system.[3]

3.5. Multi Criteria Analysis to Assess Sustainability

Bhattarai & Starkl (2005) published a research article "Rural Water Supply and Sanitation in Developing Countries" as a proceedings of International Symposium on Analytic Hierarchy Process (ISAHP 2005). The objective of research was to raise awareness among the consulting community as well as RWSS planners and managers about the availability of the AHP tool as well as to demonstrate the power of the tool in planning, management, sustainability assessment and benchmarking of RWSS in developing countries. The methodology used in the assessment was AHP, a kind of multi-criteria analysis.

The processes of social learning and decision-making increasingly demand an integrated approach to handle the information, which is generated, perhaps for planning and management of new projects, forsustainability assessment or for benchmarking of

[3]Declaration point 7, National Conference on Climate Change and WASH, 2015, Pokhara

completed projects. Among various tools assessed, the AHP-based MCA tool is a promising one. The paper, with brief literature review, concludes with recommendations on further research, study and action required on the application of AHP for RWSSsystem analysis in developing countries.

Zuzani, Ackim, & Kalulu (2013) published a research article about "Sustainability of Piped Water Supply Schemes in Rural Malawi through Community Management" in Journal of Basic and Applied Scientific Research. The objective of the research was to investigate the sustainability of rural gravity fed piped water supply schemes through community based management in Malwi. The study area was Dowa Rural Water Supply Schemes, operated by Malawi's Central Region Water Board, Located in the Central Region of Malawi. The research approach used in this study was the multi-criteria analysis, which was adapted from Panthi and Bhattarai (2008).

The major findings of the study were 25% of the schemes are sustainable, 25% partially sustainable and 50%unsustainable. These problems of unsustainability was emanate from insufficient funding, ineffective community water committees, lack of training, age of the system and political interference.

This study concluded gravity fed piped water supply schemes in rural Malawi were unsustainable.The study had recommanded communities should contribute through proper participation, high level of commitment and proper management of funds to make water supply schemes sustainable

Jararaa (2013) submitted a master's thesis entitled "Multi Criteria Decision Analysis (MCDA) to identify the setting priorities of the Sanitation Sector in the West Bank" to An-Najah National University. The major objectives of this research was to overview and assess the sanitation sector investments, progress, deficiencies, problems, existing and future plan, similarly this research also aims to identify the criteria that affects the decision making in the sanitation sector. Both primary and secondary data were used to analysis. Moreover, this research was carried out in the five phase: Phase 1=Data Collection, Phase 2= Criteria Identification, Phase 3=MCDA tools development, Phase 4=Priorities setting and Phase 5=Results and thesis writing.

The research found out that target areas for sanitation projects were selected base on the policies of the donor or a non-scientific method, similarly research showed that almost 56% of the population suffers from problems of wastewater and 78% believed that sanitation project would ease the financial burden resulting from the disposal of wastewater. Similarly this research point out that the criteria that affect the decision making process in the sanitation sector the most are: Demography, Water consumption/Wastewater production, Reusing Wastewater, Environmental factor, Operation Body, Risk of Industrial waste, Socio-economic factor, Geographical factor and Political Issues.

This study had recommended that the Palestinian Water Authority should start to identify target areas to sanitation projects by taking all the right criteria to make right decision and oblige donors on it. Similarly, it has also point out that the Palestinian Water Authority should use the MCDA method to identify the setting priorities of the sanitation sector in the West Bank. This research has used 64 communities for its study as well as used people perspective to its study. The research fails to input the donor's perspective to its study.

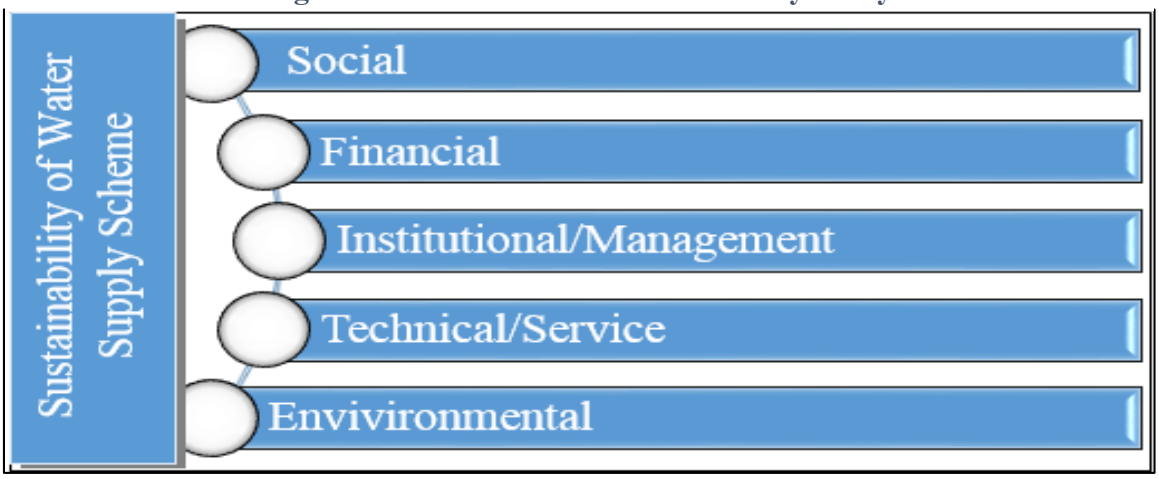
CHAPTER IV: METHODS AND MATERIALS

4.1. Theoretical Framework

Measuring the sustainability status of any infrastructure is a complex job and offers many opportunities for argument. Development workers and evaluators have a tough time while making complex decisions around prioritizing old water supply schemes in terms of sustainability status, proportionate investment for rehabilitation, making public service policies, etc. There are no perfect indicators to measure sustainability, but there are agencies that provide indicators that address the critical issues of sustainability (Sustainable Measures, 2015). The fundamental integrated dimensions of sustainability are often taken to be ecological, social and economic, also known as the "three pillars" that govern the sustainability (Adams, 2006). It is generally accepted that sustainable development calls for a convergence between the three pillars of economic development, social equity, and environmental protection (Drexhage & Murphy, 2010). Longer-term sustainability is certainly a desired result expected from most of the human undertakings in the WASH sector, which is governed by a number of sustainability dimensions, corresponding factors and sometimes many sub-factors in a complex manner. Panthi & Bhattarai (2008) points out that a multi-criteria analysis approach to sustainability enables the researcher to establish various aspects that have influence on sustainability. There is whole amalgam of factors that affect the sustainability of water schemes, including financial, institutional, technical and social/environmental aspects (Panthi & Bhattarai, 2008). Availability of water is essential for sustainable development, sustainability of water supply schemes is essential for availability of water. Hence, sustainable development cannot achieved without sustainable use of water in the country.

Therefore, by measuring social, institutional/management, financial, technical/service and environmental factors and sub factors we can assess the sustainability of water supply scheme. Figure 6 presents the overall theoretical framework of the study.

Figure 6: Framework for Sustainability Study



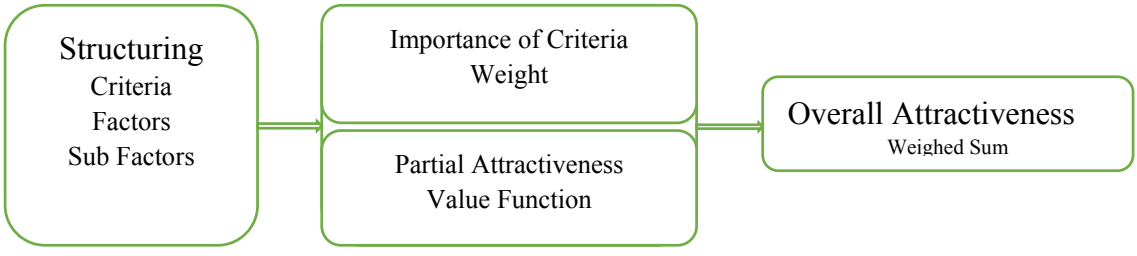
4.1.1. Precedent for Measuring Sustainability

Sustainability snapshot developed by Water Aid, Unit of Operation and Maintenance (UNOM) evaluation method developed by National Water supply and Sanitation Company of Nicaragua, Lockwood: Post-Project Sustainability Report, Framework for sustainability monitoring and evaluation of projects developed by Panthi and Bhattarai were taken as precedent, starting point for framework of this research. Coalescing those precedents with literature in the sustainability of water supply schemes and the author's twelve year in country field experience, synthesize the list of factors affecting the sustainability of water supply scheme.

4.2. Conceptual Framework

Multi Criteria Analysis structurers the factors of sustainability evaluates the importance and identifies the overall weights of those structured factors. Figure 7 presents the MCA framework for sustainability assessment.

Figure 7: MCA Framework



4.2.1. Structuring of Criteria, Factors and Sub Factors

The research was concentrated within the MCA Framework for Sustainability Analysis with hierarchal structure of criteria, factors and sub factors presented in Table 5 below. The Developed framework coalesce the sustainability snapshot, UNOM method, Lockwood's critical factors affecting RWS, Panthi and Bhattarai's Framework for sustainability monitoring and evaluation of projects along with preceding reviews of literature and authors in country experience of WASH sector.

Each community managed water supply schemes was evaluated using 34 indicators that are grouped into five general areas: social, financial, institutional/management, technical/service and environmental. Three critical thresholds were established for overall sustainability rating summing the scores of each 34 indicators. Table 5 below shows the list of indicative factors of sustainability developed for this study. Survey reference numbers are associated with the water user and sanitation committee and household survey questionnaire codes presented in Annex I.

Table 5: MCA Framework for Sustainability Assessment

Goal	Criteria	Factors	Sub factors	Survey Ref. No
Goal (Project Sustainability Assessment)	Social	Social Conflict	Conflict in source / component location	WS6-X1, WM5-6
		Social Inclusion & Equity	Proportionate representation of cast / ethnicity in WUSC	WU1, WU2, WU4, WU5, WU6, WM14, WM15
			Proportionate representation of man and women in WUSC	WM12, WM13
		User satisfaction/motivation	Satisfaction of users in service provided by WUSC	HA5
		Community Participation	Participation of users in scheme related activities	HW6, HA2, HA6
	Financial	Availability of Fund	Users willingness to pay water tariff	WF5, HW15, HW20
			Establishment of O&M fund & saving	WF6, WF7
		Use of Fund	Use of saving / surplus fund in repair and replacement	WF14
			Financial transparency in fund mobilization	WM10, HA7
		Financial durability	Sufficient tariff collection for O&M, repair and replacement	WF17
			External financial support in O&M and major repair and replacement works	WK4

Goal	Criteria	Factors	Sub factors	Survey Ref. No
Goal (Project Sustainability Assessment)	Institutional/ Management	Water Users and Sanitation Committee (WUSC)	Existence and functioning of WUSC	WM1, WM3, WM7
			Written statute and registration of WUSC in DWRC	WM4
			Leadership quality and activeness of WUSC	HA11a
		Operation Management System	Existence, functioning & Clarity of roles for operation and maintenance management	WG10-C,WM16
		Governance	WUSC selection system & practice of AGM	WA2, HA1
			Decision making process of WUSC	WA4
			Public hearing and public audit system of WUSC	WA9
	Institutional/ Management	Coordination and Linkage	Linkage of WUSC to FEDWASUN	WK1
			Linkage with private entrepreneurship in service provision and management	WK2-X
			Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	WK2
		External support	External capacity building and follow-up support	WM16
	Technical/ Service	Technical Skill	Availability of Technical skills for all operation and maintenance work	WT1, WT3, WT4
		Tools and Fittings	Availability of Tools and Fittings for all operation and maintenance work	WT7
		Appropriate Technology	System appropriate for multiple application of water (MUS)	HW3-F
		Functionality of System	Scheme providing Basic Level of Water Supply service	HL1 to HL11
	Environmental	CCA/DRR/WSP	Strategy of WUSC to combat CC and mitigate Natural Calamity	WE22
			Measures taken to minimize threat in physical system of WS scheme	WE1
		Water source conservation	Strategy of WUSC to combat source depiction problem	WE2
			Measures taken to combat threat of water source contamination	WG26-WC4, WG27-WC4
			Identification and protection of alternative sources for emergency situation	WE17, WG27
		Water and Environmental Sanitation	Implementation of encouraging and reinforcing good hygiene practice	WM17
			Measures taken to combat threat of water born disease	WG24, WE9, HS2
			Proper management of excess water	WE1-C, WE1-D

4.2.2. Benchmark Factors of Sustainability

4.2.2.1. Social Conflict

Social Conflict is the term that is widely used in development discourse, and the adoption of conflict resolution is evident among many NGOs and government staff in Nepal. Conflict does not end itself and is vital for service-oriented sustainable systems. Conflict in source / component location was taken as an indicator of social conflict in this study. Due to climatic variability, water induced disasters and high rate of population growth, water sources and productive land is being scares resource day by day. War between two communities and damage to water infrastructures, disturbing water supplies, threat to skilled person (VMW) to access component locations, theft of pipes and spare parts, unauthorized connection and supply of water are some examples of effects of social conflict and conflict in source / component location.

4.2.2.2. Social Inclusion & Equity

Development policies put special emphasis on social inclusion of gender, caste/ethnicity and disadvantaged groups. This degree of social cohesion is indeed a myth. Reality in communities is dominated by heterogeneity, division of interests, and differences in power. These divisions are based on deeply rooted cultural patterns and beliefs, or on economic or political differences. Sustainable management of water resources and sanitation provides great benefits to a society and the economy as a whole. Thus, it is crucial, first, to involve the cast /ethnical women and men in water resource management and sanitation policies and to ensure that the specific needs and concerns of women and men from all social groups are taken into account. As the WSUC is the key group representing interests of the community, it is crucial to include a variety of different community members. Hence, Proportionate representation of cast / ethnicity and proportionate representation of man and women in WUSC are taken as an indicator of Social inclusion and equity in WUSC, which is vital to make informed choices regarding participation in the project, willingness to share project cost and commitment to bear associated contribution.

4.2.2.3. User Satisfaction/Motivation

The WUSC and employed VMW have responsibility of, first, controlling and assuring the cleanness of the water at required level; and then have to ensure that the water point is appropriately protected, maintained and providing service. The resource needed to cover the cost of maintenance would be collected from users. User's satisfaction in operation and maintenance and water supply service provided by WUSC is vital to collect those resources and enable the user's motivation in scheme related activities. Hence, Satisfaction of users in service provided by WUSC was taken as a factor of sustainability in this study.

4.2.2.4. Community Participation

Community participation is one of the important factors in the achievement of goals of any development activities. People's participation is known as the most effective way in promoting and achieving sustainability of rural development projects, particularly in developing countries. It is viewed as a tool for improving the efficiency of a project, assuming that where people are involved they are more likely to accept the new project and partake in its ongoing operation. It is also seen as a fundamental right; that beneficiaries should have a say about interventions that affect their lives. It is vitally important to determine what people (consumers of water and sanitation) want, what they can and will contribute and how they will participate in scheme related activities on the types and levels of service, location of facilities and operation and maintenance. For reaching this, Participation of users in scheme related activity was analyzed from a sustainability perspective.

4.2.2.5. Availability of Fund

The volume of external financial assistance is not likely to grow fast enough to meet water and sanitation needs around the world. Governments will have to continue to be primarily responsible for raising and establishment of O&M funds (from general revenue, cross subsidization, user fees, and borrowing) for water and sanitation infrastructure needs and savings for emergency. Users must be willing to pay for water from the system both in times of limited cash income, and in times of high water availability from alternative source. What is more, these entire core factors capacity, trust and willingness to pay must

be present to make cost recovery work. Hence, Users willingness to pay water tariff and Establishment of O&M fund & saving are taken as indicators of availability of fund for WUSC, which is vital to execute the routine and emergency works and sustainability of water supply scheme.

4.2.2.6. Use of Fund

Water supply systems may require sediment be removed from storage tanks or repairs for leaky taps and cracked pipes. In addition, work is required to keep the water source free from contamination. These tasks require some sort of time, money and labor. WUSCs capacity to use the O&M and collect money on scheme related activities and transparency of used community time, labor and money is vital for operation and maintenance aspect of a water supply system, which is one of the major determinants of sustainability. In addition, the minimum level of accounting organization necessary is a ledger notebook. In all case where a ledger or some type of similar accounting record was not used, used community time, labor and money will be questionable and therefore the sustainability will remain in question. The connection between administrative tools (minutes, income/expenditures books, or registries) and the proper functioning of the system is vital for transparency of work done by WUSC.

4.2.2.7. Financial Durability

A community with a strong financial management would have a differential tariff structure that is adjusted to cover O&M costs and to generate savings for future repairs and system replacement. In order to be sustainable, the community must have sufficient income to cover operation and maintenance costs and in addition have "significant savings" for eventual crisis maintenance activities. With limited economic capacities and very little assets, in the absence of sufficient tariff generation and with insignificant savings, the sustainability of a system would be endangered by extreme weather events, which are common in the Nepal. It is clear that rural consumers normally payless than average system costs, and frequently even fail to cover operation and maintenance costs in those cases external financial support in O&M and major repair and replacement works by governments and external agencies would be asset for scheme sustainability. To do so

successfully, projects must create opportunities and incentives for communities to express demand for services, and allow this demand to government and external bodies and guide key investment decisions.

4.2.2.8. Water Users and Sanitation Committee

Water Users and Sanitation Committees serve as water users' management body. The water users during the initial period of intervention elect members for their water user committee. The committees are responsible to mobilize resource for construction, operation and management of water supply scheme and collecting and managing water fees. Several NGOs, both local and international invariably make sure that water committees are established on the inception of projects. To make the organizational function possible, an enabling environment has to be created. This requires water policies, including human resources development and normative and executive legislation. This is the constitutional function. These higher-level actions are important because ineffective rules, accountability and policing mechanisms assure that water use and sustainability problems cannot be solved. Existence and functioning of WUSC, written statute and registration of WUSC in DWRC, leadership quality and activeness of WUSC member was measured to evaluate the institutional/management aspect through WUSC.

4.2.2.9. Operation Management System

The operation and maintenance aspect of a water supply system is one of the major determinants of sustainability. The way in which Operation and Maintenance lead to sustainability is it overcomes common problems. One of this is reduction in massive unaccounted water loss. This represents not only a loss of scarce resources but also the loss of an income opportunity. This income, if collected, could be used to pay for running costs and to build new facilities to meet the needs of more people. Another way O&M contribute for system sustainability is by reducing frequent and long breaks in supply and consequently by improving service delivery.

This is because if there is poor service users are usually unwilling to pay for poor service. This in turn causes further deterioration in services as finance is not available for repairs and maintenance. But, if there is proper system functioning, users are prepared to pay for

a reliable service. Thus, proper consideration of how O&M is to be financed and managed will avoid this cycle of poor service, dissatisfaction, poor payment and deterioration. O&M considerations are an integral part of all decision-making on water supply and sanitation and are detrimental in addressing frequent system failure and insuring sustainability. Hence Existence, functioning & Clarity of roles for operation and maintenance management is taken as an indicator of sustainable operation management system which can be achieved through raising awareness and providing training to water management bodies (water committee) for equipping users with the right knowledge in managing their scheme and responding to system failure.

4.2.2.10. Governance

As mentioned above Water Users and Sanitation committees serve as water users' management body. Members of a water committee are elected from and by the water users during the initial period of intervention. The committees are responsible to mobilize resource for construction, operation and management of water supply scheme and collecting and managing water fees. The sustainability of the system is dependent on participatory processes involving a significant amount (at least simple majority) of the community, and under the ideal situation, the water committee plays an active and facilitative role making recommendations to the community for major decisions and taking the initiative on smaller issues. WUSC selection system and practice of AGM, Decision-making system in WUSC meetings and public audit and public hearing system of WUSC are essential to create a sense of local ownership as governance aspect of WSUC. These are vital to resolve the conflict between different group of a community, financial problems, lack of transparency and unethical leadership regarding water use from activities, facilitation election when the terms of services terminate and other water scheme related sustainability problem.

4.2.2.11. Coordination and Linkage

Raising awareness and providing training to water management bodies (water committee) could be important to equip users with the right knowledge in managing their scheme and responding to system failure. Moreover, by creating awareness and training the potential

benefits of clean water could be promoted to the community. The community will then be willing to take responsibility for handling operation and maintenance issues, which will create a sustainable system. Therefore, education about the linkages between unsafe water, inadequate excreta disposal, and disease should be integrated to water supply schemes of rural communities. In this case, the involvement of supporting and of implementing agencies that include local NGO and local government is something paramount

4.2.2.12. External Support

Another very important factor identified by different literatures was concerning the provision of follow-up support by water supply owners and other private sectors to rural communities in the long-term. Households and community institutions experience numerous challenges in relation to skills and knowledge, material resources, relationships and trust, and power.

When management issues arise in water supply services, external support is needed. The household or institution on its own can solve all instances of conflict, breakdown of trust, fatigue with voluntarism, or mishap. External support is a key determinant factor for sustainability of water supply scheme. External support on technical assistance, training, monitoring and information collection, coordination, follow-up, and facilitation will be an asset to sustainability of water supply system for long run.

4.2.2.13. Technical Skill

The majority of recent documents focus attention on the creation and support of technical person outlet chains, normally based on private sector providers, precisely to fill this perceived weakness of sustainability. The presence of external support has to be in place once the water committee is formed and the provision of technical training and support for repairs has to be maintained in order to keep them encouraged and committed. In this case, availability of technical skill (VMW/Technical Person) for all operation and maintenance management of water supply scheme within and vicinity of the community and their proper mobilization is considered vital for sustainability of water supply system.

4.2.2.14. Tools and Fittings

The availability of tools and spare parts is a critical factor to keep the system infrastructure working properly. An adequate supply of spare parts and maintenance tools is obviously of primary importance to long-term sustainability. Supply chains are now recognized as one of the key determinants of sustainability especially where the technology provided is imported. In this case, Availability of Tools and Fittings for all operation and maintenance work is taken as an indicator of technical or service sustainability.

4.2.2.15. Appropriate Technology

In order to make rural water supply sustainable, appropriate technology must be used. Where the technology deployed is remote from the users' capacity to maintain, operator pays for it, prospects of sustainability of services are equally remote, therefore, it is experienced with a number of projects that can ultimately lead to a better choice of technology. It needs to be both technologically appropriate to their physical and social environment and financially affordable during the operation and maintenance phases. Technology that fails to fulfill the needs of its users, which is poorly installed or which is difficult to maintain, poses significant challenges for sustainability. In the case of physical infrastructure, the quality of construction – the installation of technology – is a necessary but not sufficient condition for sustainability. The quality of implementation of the 'software' aspects of interventions is also crucial. Water availability for increased livestock production, crop production, fruit and vegetable production and food and drink vending will create the financial opportunities to users hence System appropriate for multiple application of water (MUS) is taken as an indicator of appropriate technology intervened.

4.2.2.16. Functionality of System

Functionality of community managed water supply system is defined being based on Quality, Quantity, Accessibility and Reliability; these indicators provide a framework for measuring and monitoring functionality. According to National Water Supply and Sanitation Sector Policy 2014 draft, service level are categorized into High, Medium and Low on the basis of quality, quantity, accessibility and reliability (duration of supply and continuity)

Table 6: Service Level Definition

Service Indicators	Service Levels		
	High	Medium	Basic
Quantity(lpcd)	≥112	≥65	≥45
Quality	Meets NDWQS	Meets NDWQS	Potable
Accessibility	≥75% consumers	≥50% consumers	≥75% consumers
	Having private taps	Having private taps	dependent on
Duration of supply (hrs/day)	24[1](18-24)[2]	24[1](12-18)[2]	24[1](6-12)[2]
Continuity (Months/year)	12[3]	12[3](7 days of interruption in a year	12[3](7-14 days of interruption in a

Notes:

1 System to be designed for 24 hour supply.
2 These reduced hours are for system performance evaluation purposes.
3 System to be designed for round the year uninterrupted supply.
4 Short interruption of supply in a year is acceptable for system performance Purposes.

4.2.2.17. CCA/DRR/WSP

Evidence of changing rainfall and weather patterns as a result of climate change is well documented. Rural villagers depending on springs for their water supply have observed the gradual drying up and reduced yields. Occurrences of landslides and floods have long been considered as unavoidable natural disasters and are now increasingly linked to the effects of climate change. Water safety planning in wide focus is very practical in terms of measures of minimizing threats of physical system of water supply scheme and providing water security touching climate change and disaster. It is unreasonable to expect that communities will be able to cope with all the trends and shocks which may occur in the future. Furthermore, there is considerable uncertainty as to the exact nature and magnitude of future shocks that communities will experience. Adaptation, therefore, has to focus on generic capabilities of communities and support organizations (especially local government) to analyze and solve their own problems; to generate income and savings; to

develop contingency plans; to reduce their vulnerability to specific types of shock; and to forge links with other communities and support organizations. Such actions are often referred as components of 'no-regrets' adaptation strategies, since they will serve communities well whatever the future holds. In this research, Strategy of WUSC to combat CC and mitigate Natural Calamity and Measures taken to minimize threat in physical system of WS scheme through WSP was taken as sustainability factor to mitigate CCA and DRR.

4.2.2.18. Water Source Conservation

Another external factor for post-project sustainability is sustainability of the water source itself. Obviously, deterioration of source water quantity is of major concern in areas of low rainfall, or poor groundwater re-charge, where there is greater sensitivity to source depiction and drying. Water quality may also suffer from contamination from agricultural by-products or chemicals. In either case, care must be taken in the design of projects to determine the likely of sustainability of the source over a long period. In fact, several recent project designs have incorporated water conservation components to address this specific issue. Water saving designs and the construction of recharge mechanisms, such as check dams and infiltration structures, in the watershed area of the projects will combat source depiction problem. Deforestation and poor protection of sources/catchment area also contribute to the problem of diminishing water sources. In this research Strategy of WUSC to combat source depiction problem, Measures taken to combat threat of water source contamination and Identification and protection of alternative sources for emergency were taken as indicator of water source conservation and environmental concern.

4.2.2.19. Water and Environmental Sanitation

Water and sanitation projects are intended to improve environmental health conditions for beneficiaries. However, poor design, construction, implementation of activities in this sector can result in environmental failures that eliminate or offset the intended benefits. These failures range from heightened risks to human health, to damage to ecosystems and economic activities, to depletion and degradation of water resources available to neighboring and downstream communities. Two important inter-related environmental

aspects need consideration while designing and implementing water and sanitation interventions. The first is the security of the water resource, from both quantity and quality points of view. The second is the way we conceptualize sanitation. Even if a water supply system is functioning and used, if the water resources on which it depends are deteriorating in either quantity or quality relative to need, then the system is under threat. If a sanitation service is polluting the environment, and therefore threatening the health of its users or others, then it cannot said to be sustainable. Experience has shown that population of the rural areas and especially those low-income communities frequently ignore the need for safe waste disposal as a health protection measure. Hygiene education is needed to correct this situation. As a result of insanitary storage practices, lack of hand washing and poor excreta disposal water safe at the point of collection frequently becomes contaminated. Education programs in personal hygiene and environmental sanitation may need in household water management and use. Regarding community awareness raising and education about advantages of safe water, personal hygiene and environmental sanitation, Implementation of encouraging and reinforcing good hygiene practice, Measures taken to combat threat of water born disease and Proper management of excess water were taken as indicative factor for water and environmental sanitation sustainability.

4.2.3. Importance of Criteria

Since the literature suggests that each indicator is not of equal importance, a weighting system was used where each of the 34 sub factors was provided a numerical weight. As per the principles of multi criteria approaches, each set criteria is rated depending upon its potential contribution or its significance in making the case sustainable. The comparative weights given to dimensions, factors and sub factors were determined through participatory methods involving sector professionals and field workers. Further, each factor and sub-factors is rated considering its significance to make the case sustainable. The sector professionals and field workers were sent online survey questionnaires that asked the relative importance and pair wise comparison of each sub factor on the sustainability of water supply scheme, using numerical scoring designations that quantified relative weight of criteria on Less Important (=0.5), Equal Important (=1), More Important (=2). The

response from experts was evaluated using Multi Criteria Analysis techniques and overall weights of each sub factors, factors and criteria were identified.

4.2.3.1. Selection of Experts for MCA

Getting weights of the sub factors and factors is major task of the research work that was obtained from the expert's survey proceeding pair wise comparison of sub factors giving relative importance based on the impacts of those sub factors on Sustainability of Water supply scheme.

A thoughtful selection of experts was considered to obtain the quality of the study. Persons of professional experience and doing works in WASH projects of Governmental / international aid or member of a nationally recognized committee or practitioner, and/or policy maker, experience and engagement in rural water service sustainability were taken as criterion to select experts for survey.

4.2.3.2. Pair Wise Comparison and Development of Comparison Matrix

Pair wise comparison is a kind of divide-and-conquer problem solving method. It allows one to determine the ranking (relative order) of a group of criteria. The process was followed through expert's online survey, using the pair wise comparison tool developed by the author in Microsoft EXCEL format. In pair wise comparison chart, each row possesses checking the relative importance of factor in left column with respect to factor in the right column of same row. In the middle column of the matrix, experts assign the relative importance between those factors (Less Important or Equal Important or More Important) considering their effects in sustainability of water supply scheme. The Pair wise comparison tool converts the qualitative data given by the experts in Numerical data and automatically fill the N x N reciprocal comparison matrix.

IF:

Matrix "A"	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC
Conflict in source / component location	1	MI	MI	EI
Proportionate representation of cast / ethnicity in WUSC	LI	1	EI	LI
Proportionate representation of man and women in WUSC	LI	EI	1	LI
Satisfaction of users in service provided by WUSC	EI	MI	MI	1

THAN:

Matrix "A"	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC
Conflict in source / component location	1	2	2	1
Proportionate representation of cast / ethnicity in WUSC	½	1	1	1/2
Proportionate representation of man and women in WUSC	½	1	1	1/2
Satisfaction of users in service provided by WUSC	1	2	2	1

4.2.4. Partial Attractiveness

Weight of factors were computed by analyzing the Principal Eigen Value in previously developed comparison matrix of section 4.2.3.2.

Development of Normalized Matrix

Normalized matrix	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC
Conflict in source / component location	0.33	0.33	0.33	0.33
Proportionate representation of cast / ethnicity in WUSC	0.17	0.17	0.17	0.17
Proportionate representation of man and women in WUSC	0.17	0.17	0.17	0.17
Satisfaction of users in service provided by WUSC	0.33	0.33	0.33	0.33

Computation of Normalized Principle Eigen Value

Final	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC		Weights (w)
Conflict in source / component location	0.33	0.33	0.33	0.33		0.3333
Proportionate representation of cast / ethnicity in WUSC	0.17	0.17	0.17	0.17		0.1667
Proportionate representation of man and women in WUSC	0.17	0.17	0.17	0.17		0.1667
Satisfaction of users in service provided by WUSC	0.33	0.33	0.33	0.33		0.3333

4.2.5. Overall Attractiveness

4.2.5.1. Weight of Benchmark Sustainability Factor

Overall weight of sustainability factor was identified by averaging the Principal Eigen Value obtained in section 4.2.4 from judgments of different expert.

Computation of Benchmark Factors Weight

Benchmark Factors	Weights (W1)	Weights (W2)	Weights (W3)		Final Weights (W)
Conflict in source / component location	0.3333	0.3300	0.3700		0.3444
Proportionate representation of cast / ethnicity in WUSC	0.1667	0.1700	0.1300		0.1556
Proportionate representation of man and women in WUSC	0.1667	0.1700	0.3000		0.2122
Satisfaction of users in service provided by WUSC	0.3333	0.3300	0.2000		0.2878

4.2.5.2. Ranking of Sustainability Factors

Final rank of sustainability factors was identified being based on the weight gained by the sustainability factor in section 4.2.5.1.

4.3. Measurement of WUSC and HH Response on Sustainability Factors

Questionnaire survey with WSUC and Users of water supply scheme and their response in current scenario of the scheme relating to benchmark factors provides the marks of individual benchmark factor provided by the WUSC and users themselves. In order to simplify data analysis, whenever possible, responses of survey questionnaire in sustainability factors from WUSC members, and water users were represented numerically. For those indicators that did not depend on a numeric response, data were assigned a score based upon the principle that (**1**) represents positive contribution towards an indicator and (**0**) represents no contribution.

Table 6 below shows the four data types and scoring system used for each, as well as an example question from the WUSC and HH level Interview presented in Annex I.

Table 7: Data Type and Response Scoring System

Data type	Example question from the WUSC and HH level questionnaire	Committee/ HH interview form score
Binary	Affiliation of WUSC with FEDWASUN	Yes=+1 No=0
Ordinal	Level of service provided by WUSC	Excellent =+1 Very Good =+0.75 Good=+0.5 Fair=+0.25 Poor=0
Numeric/Continuous	Total no of HHs in Scheme area	Numeric value used (no score)
Qualitative Analysis	What decision making process does the WUSC use?	Range of responses established and divided into appropriate subdivisions.

4.4. Sustainability Score of Water Supply Scheme

Questionnaire survey with WUSC and users of water supply scheme and their response in current scenario of the scheme relating to benchmark factors provides the marks of individual benchmark factor provided by the WUSC and users themselves. Multiplication of these marks with weight of sustainability factor given by experts in section 4.2.5.1 will provide overall score of benchmark factor. Sustainability score of water supply scheme was computed mathematically summing the overall score of benchmark factors.

Overall score of benchmark factor =

Final weights
(Obtained from Experts Survey)

X

Score of benchmark factor given by WUSC and Users
(Obtained from field survey)
(0 or 0.25 or 0.5 or 0.75 or 1)

Sustainability Score of water supply scheme = ∑ (Overall score of benchmark factor)

4.5. Sustainability Threshold

Sustainability thresholds were obtained based on responses WUSC members in Question #WS5 "Evaluation of WUSC in present serviceability of water supply scheme". The response was "Fully Serviceable" or "Requires Minor Maintenance" or "Requires Major Maintenance" or "Requires Rehabilitation" or "Not Serviceable". Water supply schemes were categorized based on their responses as "Fully Serviceable", "Requires Maintenance (Minor/Major)" and "Requires Rehabilitation /Not serviceable" scheme and average sustainability score of each categorical division was identified, that was the threshold score for Sustainability Rating. It was necessary to explicitly identify the thresholds (quantitative and/or qualitative) among those categories.

Definitions were developed to establish divisions among the three categories of performance used in this study: "Sustainability Likely", "Sustainability Possible", and "Sustainability Unlikely" (referred as SL, SP, and SU, respectively, from here on).

Sustainability Likely (SL) –Social, Financial, Institutional/management, technical service and environmental aspects are significant. The water supply scheme obtains a score greater than upper threshold value, aggregating score of all of the sustainability dimensions.

Sustainability Possible (SP) - Social, Financial, Institutional/management, technical service and environmental aspects are acceptable. The water supply scheme obtains a score in between the upper and lower threshold value, aggregating score of all of the sustainability dimensions.

Sustainability Unlikely (SU) - Social, Financial, Institutional/management, technical service and environmental aspects are unacceptable. The water supply scheme obtains a score below than lower threshold value, aggregating score of all of the sustainability dimensions.

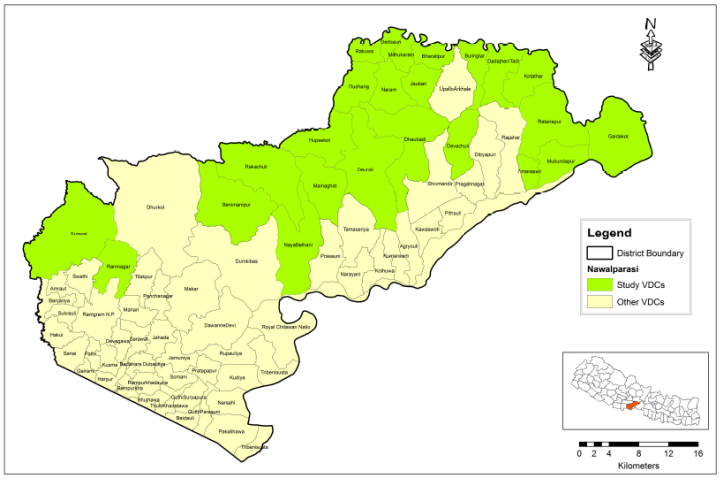
4.6. Sustainability Rating

Based on the Overall sustainability score, the schemes are rated in terms of Sustainability Likely (SL), Sustainability Possible (SP) Sustainability Unlikely (SU). The objective of this type of ranking was to help decisions for future investment. The assumption is that does not need to provide any support for Sustainability Likely (SL), needs to provide some follow up support to Sustainability Possible (SP) schemes and needs to provide significant scheme rehabilitation support to Sustainability Unlikely (SU) projects. The ranking was made following previously made definitions on section 4.5.

4.7. Study Area

The Government of Finland has been supporting large-scale water supply and sanitation projects in Nepal since early 1990s. The user committees of the water schemes in the focus of this study have been established during the Rural Water Supply and Sanitation Support Program (RWSSSP), which was implemented in the eight districts (including Nawalparasi) of Lumbini Zone in Western Nepal during 1990-2004. It was a bilateral project partly funded by the governments of Finland and Nepal. RWSSSP was the first water supply and sanitation program in Nepal to entrust the users committees with an independent financial management of the scheme budget including user's committee account and procurement of the materials. Rural water supply and sanitation program western Nepal (RWSSPWN), which was started in 2008 and is currently on second phase. RWSSP-WN is also a bilateral development cooperation project funded by the governments of Nepal and Finland. The phase II started in September 2013 and will end September 2018, which has its interventions in districts of western development region including Nawalparasi. NAPAWASH is the first Finnish funded sustainability research project to study of long-term sustainability of rural water supply and sanitation schemes and providing its interventions in the field of sustainability. Considering those area of long-term water sector intervention by Finland since 1990 to until now and fresh research data availability through NAPAWASH, Nawalparasi districts (belonging to the Lumbini zone) where selected for study. Thus, it will also contribute to knowledge on sustainability and impact of Finland's bilateral water-sector projects in Nepal.

Figure 8: Study Area



4.8. Quantitative Research Design

The quantitative data collection is based on a structured questionnaire that targets WUSC members, VDC officials, VMWs and water users' households (HH). The quantitative study

design consisted of five different steps: the preparation of a representative sampling framework, sampling, formulating the survey questionnaire, conducting the survey and analyzing the results. All the steps from designing the sampling framework to formulate the questionnaire were shared with the research students for input and comments. Field assessment team of supervisors and enumerators provided by NAPAWASH project conducted quantitative survey.

4.8.1. Sampling Frame of the Study

The objective of the NAPA WASH field assessment is to study the long-term sustainability of gravity-based water schemes funded by Finland during RWSSP. These parameters (RWSSP and the scheme age) were the two first sampling criteria. The three last criteria have to do with the maximum variation principal: samples of different age, size and geographical areas were included to ensure variation and diversity of findings. Statistical experts of CATN designed the sampling framework. According to the framework, the scheme selection criterion for the Nawalparasi district is the following:

1. Only Finnish supported gravity flow schemes (RWSSP) that were more than 10 years old are included in the sample
2. Only schemes with 50:50 funding modality were included
3. The selection must include schemes considering different phases of RWSSP (I, II, III)
4. The selection must include samples from different geographical locations (Tarai, Inner Tarai and Hill)
5. The selection must include both large and small schemes (Large >= 150HH; Small <150 HH)

4.8.2. Sampling of Schemes

Altogether, 76 Finnish supported schemes in Nawalparasi fulfilled the two first criteria. These schemes were located in 24 different VDCs or municipalities of Nawalparasi. A proper representative sample size for Nawalparasi district was considered being 40 schemes (52.6 % of the full number of schemes fulfilling the criteria). These schemes were sampled so that at least one scheme was selected from each of the 24 VDCs or

municipalities of Nawalparasi. VDCs or municipalities with more than one scheme fulfilling the two first criteria were sampled using the criteria 3 - 5. The final selection includes 15 RWSSP phase I schemes, 17 phase II schemes and 8 phase III schemes, 12 large schemes (>=150 HHs) and 28 small schemes (<150 HHs), 25 schemes in the Hills, 13 schemes in Inner Tarai and 2 schemes in Tarai of Nawalparasi. The small number of Tarai schemes is understandable as the study is limited only to gravity schemes and most of the Tarai schemes are based on different technology due to topographic features.

For the household level survey, the sample size was set 17 HHs per each scheme the total sample being thus 680 HHs in the Nawalparasi district. According to the terms of reference, each scheme's HHs should include members from three different ethnic groups Brahmin/Chhetri/Thakuri, Janajati and Dalit. The number of sample HHs for each ethnic representation is proportionate to the percentage of ethnic composition in total user households of the scheme. Before the interviews, the enumerator calculated the proportion of each ethnic group HHs needed to be interviewed. A systematic random method was used to select the HHs finally included in the data collection.

4.8.3. Data Collection

The quantitative data collection was conducted sample groups, VDC or municipality personnel, WUSCs, VMWs and HHs. CATN formulated the first version of the questionnaire, after which the student researchers could modify it and add questions based on their own research topics. The selected questionnaire applied in this research is presented in the Annex I.

The WUSC level quantitative data collection was conducted through group interviews, in which all WUSCs members were invited. The study's term of reference calls for at least 51% women and Dalit participation in the interviews but this requirement was not always fulfilled. According to the terms of reference, the interviewer should seek for answers agreed by all interviewees. In addition to interviewing, the enumerators observed statutes, financial records and other documents to validate the responses.

Regarding the HH level interviews, a corresponding percentage of each water user ethnic groups as there was in the total water users was selected to be interviewed. Per each 40 schemes, in total 17 HHs were interviewed.

The data enumerators were trained by CATN before stating the data collection and the questionnaire and other data collection tools were tried with a test group before starting the procedure. The questionnaire was improved based on the outcomes of the test-sample and again on a needed basis. Statistical experts entered raw data obtained from field in database for further analysis and provided to other stakeholders. The student researchers could analyze the quantitative data independently and use it freely in their own research projects.

4.8.4. Method of Data Analysis

Complicated data analysis techniques have been used to describe the interaction between specific variables and indicators of sustainability. Often this type of statistical analysis is utilized for making policy decisions, yet criticism exists that the richness of the collected data is not fully expressed and furthermore such an approach although more complex "inevitably removes the focus of the investigation away from the community, and even out of the country completely" (Lockwood, Bakalian, & Wakeman, 2003). Organizations with extensive resources available, such as the World Bank, have tried to develop a statistically intensive evaluation methodology, but success has been limited because it is difficult if not impossible to fit the laundry list of interdependent variables into a "black box" solution (Lockwood, Moriarty, & Schouten, 2009).

It was determined that a less complicated tabular analysis using descriptive and fewer inferential statistics based on percentages, ratios, correlations was used to achieve the objectives set forth and that methodologies emphasizing a more complicated statistical analysis are beyond the scope of this study.

CHAPTER V: RESULTS AND DISCUSSION

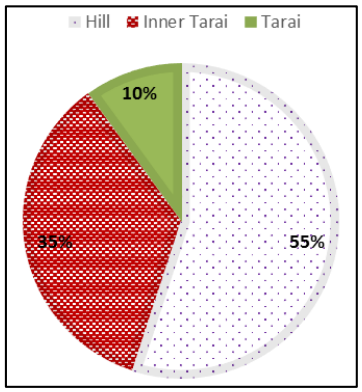
5.1. Study Results

5.1.1. General System Profile

As prescribed above, considering area of long-term water sector intervention by Finland since 1990 to till now and fresh research data availability through NAPAWASH, RWSSS schemes of Nawalparasi districts (belonging to the Lumbini zone) where selected for study.

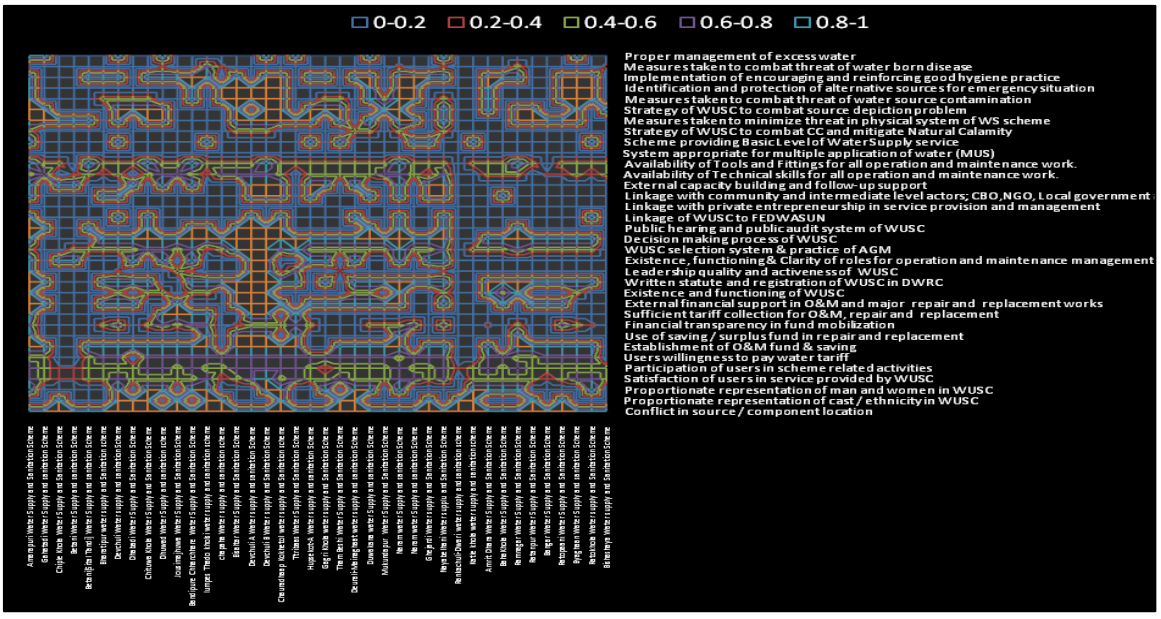
Figure 9 presents geographical distribution of sampled scheme. Among 40 water supply schemes sampled for sustainability study, geographically 4 schemes were from Tarai, 14 schemes were from Inner Tarai and 22 schemes were from Hill.

Figure 9: Geografical Distribution of Scheme



Similarly, Figure 10 with corresponding table at annex IV provides a summary profile of WUSC and user responses in sustainability factors. The responses from WSUC and users were represented numerically base on the principle that (**1**) represents the positive contribution toward an indicator and (**0**) represents no contribution.

Figure 10: Water Supply and Sanitation Scheme's Performance Response Profile



The surveyed water supply schemes are providing the water supply services to 64000 populations of 11,516 households from 24 VDCs at Nawalparasi district.

Focusing on the social criteria of sustainability assessment, social conflict revealing conflict in source and component location does not prevail in any of the surveyed water supply schemes. Water supply scheme fulfilling the requirements of proportionate representation of cast/ethnicity and proportionate representation of man and woman in their WUSC are 37.5% and 42.5% respectively. Perception percentage of users in service provided by WSUC was found Excellent in 2.5%, Very good in 27.5%, Good in 57.5% Fair in 10% and Poor in 2.5% of water supply schemes. Likewise, participation of users in scheme related activities was found Very Good in 32.5%, Good in 57.5% and Fair in 10% of schemes.

Similarly, concentrating on financial criteria of sustainability assessment, user's willingness to pay water tariffs was found Very Good in 70%, Good in 15% and Poor in 10% of surveyed water supply schemes. 75% of WUSCs has established O&M fund and have some short of savings /surplus fund in their bank account but only 20% of schemes uses their saving /surplus fund for repair and replacement of water supply schemes. Similarly, system for financial transparency was found Very Good in 22.5% of WUSCs, Good in 30% of WUSCs, Fair in 7.5% of WUSCs and Poor in 40% of WUSCs. The collected water tariff is sufficient to operation, management, repair and replacement work of water supply scheme in 20% of surveyed schemes. Currently 55% of WUSCs are getting external financial support for the operation, management, major repair and replacement works of their water supply scheme.

Regarding the institutional management criteria for sustainability assessment, WUSC exists in all of the surveyed water supply schemes. Functioning of water users and sanitation committee was found excellent in 17.5%, Good in 25% and Poor in 57.5% of surveyed water supply schemes. 75% of WUSCs has written statute and are registered in district water resources committee. Leadership quality of WUSC members was found Excellent in 7.5%, Very Good in 2.5%, Good in 2.5%, Fair in 12.5% and Poor in 75% of water supply schemes. 35% of WUSC have proper operation and management system and are clear in their role of operation, maintenance and management related to water supply

scheme. WUSC selection system and Practice of AGM was found Excellent in 12.5%, Very Good in 15%, Good in 60%, Fair in 2.5% and Poor in 10% of WUSCs. Decision making process was found Excellent in 82.5% and Poor in 17.5% of WUSCs. 35% of WUSCs has established public hearing and public audit system in their activities. 22.5% of WUSCs has linkage with FEDWASUN but no schemes found having Linkage with private entrepreneurship in service provision and management. Similarly, 30% of WUSCs has Linkage with community and intermediate level actors like CBO, NGO, Local government and other groups for their support. 37.5% of WUSCs has got capacity building and follow-up support from peripheral support organizations.

Concerning on Technical / Service capability criteria for sustainability assessment of water supply scheme, availability of technical skills for all operation and maintenance work within the vicinity of WUSC was found Very good in 25%, Good in 42.5%, Fair in 17.5% and Poor in 15% of water supply schemes. Similarly, availability of tools and fittings for all operation and maintenance work was found excellent in 17.5%, good in 75% and Poor in 7.5 % of water supply schemes and respective WUSCs. All of the system are designed and constructed without considering the MUS application. Functionality of system based on provisioning of basic level of water supply services was found excellent in 22.5% of Water supply schemes.

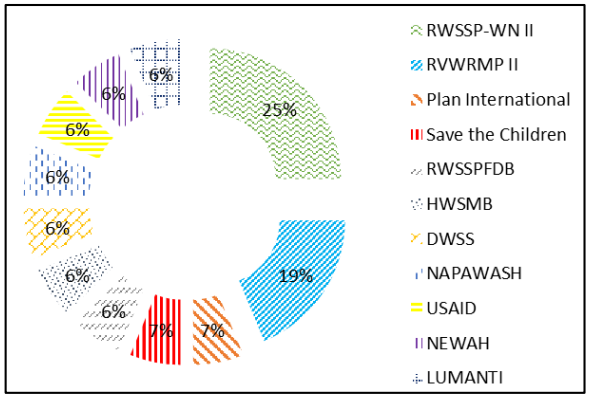
Regarding the environmental criteria of sustainability assessment, 20% of WUSCs were in process of preparing strategy to combat CC and mitigate natural calamity, 60% WUSCs has taken some sort of measures to minimize threat in physical system of WS scheme and 50% of WUSCs has strategy to combat source depiction problem through WSP. Measures taken to combat threat of water source contamination was found excellent in 35%, good in 20% and poor in 45% of water supply schemes. 35% of WUSC has identified and protected the alternative sources for emergency purpose. 65% of WUSCs has implemented encouraging and reinforcing good hygiene practice in their scheme level. Measures taken to combat threat of water born disease in household and WUSC level was found Very Good in 2.5%, Good in 2.5%, fair in 12.5% and Poor in 82.5% of water supply scheme. Similarly 22.5% of WUSCs has practiced proper management of excess water from WASH components and HHs.

5.1.2. Expert Survey and Factors Weight

Getting weights of the sub factors and factors is major task of the research work that was obtained from the expert's survey proceeding pair wise comparison of sub factors giving relative importance base on the impacts of those sub factors on Sustainability of Water supply scheme.

Figure 11 presents the profile of respondent experts involved in the MCA following pair wise comparison survey of research work. A total of 16 experts responded and participated in the online survey. Among 16 experts, 4 were from RWSSP-WN II, 3 from RVWRMP II, 1 from Plan International Nepal, 1 from Save the Children, 1 from RWSSPFDB, 1 from NEWAH, 1 from LUMANTI,1 from USAID,1 from NAPAWASH, 1 from Water and sanitation Management Board and 1 from Department of water supply and sanitation. Among them; 4 were specialists, 2 were managers/coordinators, 4 were advisors, 5 were officers and 1 was supervisor of WASH sectored organization.

Figure 11: Organization Profile of Experts Involved in Pair Wise Comparison Survey



The experts were sent online survey questionnaires that asked to select the relative importance of sustainability factor based on their influence in sustainability of water supply scheme. Getting comparative judgment between factors through pair wise comparison, individual weight of each factor was determined using a method known as Multi Criteria Analysis (MCA).

Sustainability analysis framework with hierarchal structure of criteria, factors and sub factors and their weights averaging the responses of relative importance obtained from expert survey are presented in Table 8. The result of expert survey obtained in the form of weights of sustainability sub factors, factors and criteria shows, that 15% weights belongs by social sustainability criteria, 18% weights belongs by Financial sustainability criteria, 32% weights belongs by Institutional/management sustainability criteria, 12 % weights

belongs by technical criteria and 23% weights belongs by Environmental sustainability criteria.

Table 8: Factors Weight Obtained from Expert Survey

Weights of Sustainability Factors for Community Managed Water Supply Schemes								
Goal	**Criteria**	**Average weight of Criteria**	**Factors**	**Code**	**Weight of Factor**	**Sub factors**	**Code**	**Weight of Sub Factors**
Project Sustainability Assessment	**A. Social**	0.15	Social Conflict	A.1	0.035	Conflict in source / component location	A.1.1	0.035
			Social Inclusion & Equity	A.2	0.046	Proportionate representation of cast / ethnicity in WUSC	A.2.1	0.023
						Proportionate representation of man and women in WUSC	A.2.2	0.023
			User satisfaction / motivation	A.3	0.034	Satisfaction of users in service provided by WUSC	A.3.1	0.034
			Community Participation	A.4	0.030	Participation of users in scheme related activities	A.4.1	0.030
	B. Financial	0.18	Availability of Fund	B.1	0.062	Users willingness to pay water tariff	B.1.1	0.031
						Establishment of O&M fund & saving	B.1.2	0.031
			Use of Fund	B.2	0.063	Use of saving / surplus fund in repair and replacement	B.2.1	0.029
						Financial transparency in fund mobilization	B.2.2	0.033
			Financial durability	B.3	0.056	Sufficient tariff collection for O&M, repair and replacement	B.3.1	0.029
						External financial support in O&M and major repair and replacement works	B.3.2	0.027

Conti…

Goal	Criteria	Average weight of Criteria	Factors	Code	Weight of Factor	Sub factors	Code	Weight of Sub Factors
	C. Institutional/ Management	0.32	Water Users and Sanitation Committee (WUSC)	C.1	0.097	Existence and functioning of WUSC	C.1.1	0.032
						Written statute and registration of WUSC in DWRC	C.1.2	0.033
						Leadership quality and activeness of WUSC	C.1.3	0.032
			Operation Management System	C.2	0.029	Existence, functioning & Clarity of roles for operation and maintenance management	C.2.1	0.029
			Governance	C.3	0.090	WUSC selection system & practice of AGM	C.3.1	0.029
						Decision making process of WUSC	C.3.2	0.029
						Public hearing and public audit system of WUSC	C.3.3	0.032
			Coordination and Linkage	C.4	0.076	Linkage of WUSC to FEDWASUN	C.4.1	0.024
						Linkage with private entrepreneurship in service provision and management	C.4.2	0.025
						Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	C.4.3	0.026
			External support	C.5	0.025	External capacity building and follow-up support	C.5.1	0.025

Conti…

Goal	Criteria	Average weight of Criteria	Factors	Code	Weight of Factor	Sub factors	Code	Weight of Sub Factors
	D. Technical/ Service	0.12	Technical Skill	D.1	0.034	Availability of Technical skills for all operation and maintenance work	D.1.1	0.034
			Tools and Fittings	D.2	0.032	Availability of Tools and Fittings for all operation and maintenance work	D.2.1	0.032
			Appropriate Technology	D.3	0.027	System appropriate for multiple application of water (MUS)	D.3.1	0.027
			Functionality of System	D.4	0.031	Scheme providing Basic Level of Water Supply service	D.4.1	0.031
	E. Environmental	0.23	CCA/DRR/ WSP	E.1	0.058	Strategy of WUSC to combat CC and mitigate Natural Calamity	E.1.1	0.028
						Measures taken to minimize threat in physical system of WS scheme	E.1.2	0.030
			Water source conservation	E.2	0.090	Strategy of WUSC to combat source depiction problem	E.2.1	0.030
						Measures taken to combat threat of water source contamination	E.2.2	0.031
						Identification and protection of alternative sources for emergency situation	E.2.3	0.028
			Water and Environmental Sanitation	E.3	0.084	Implementation of encouraging and reinforcing good hygiene practice	E.3.1	0.028
						Measures taken to combat threat of water born disease	E.3.2	0.030
						Proper management of excess water	E.3.3	0.026

Similarly, Table 9 illustrates the ranking of sustainability factors based on result of expert survey. The presented rank of weights in 34 sustainability factors of community managed water supply schemes ranged from smaller as 0.023 on Proportionate representation of cast / ethnicity in WUSC to higher as 0.035 in Conflict in source / component location .

Table 9: Ranking of Sustainability Factors base on Factors Weight

Rank	Sub Factors	Factors Weight
1	Conflict in source / component location	0.035
2	Availability of Technical skills for all operation and maintenance work	0.034
3	Satisfaction of users in service provided by WUSC	0.034
4	Financial transparency in fund mobilization	0.033
5	Written statute and registration of WUSC in DWRC	0.033
6	Leadership quality and activeness of WUSC	0.032
7	Availability of Tools and Fittings for all operation and maintenance work	0.032
8	Public hearing and public audit system of WUSC	0.032
9	Existence and functioning of WUSC	0.032
10	Users willingness to pay water tariff	0.031
11	Measures taken to combat threat of water source contamination	0.031
12	Scheme providing Basic Level of Water Supply service	0.031
13	Establishment of O&M fund & saving	0.031
14	Strategy of WUSC to combat source depiction problem	0.030
15	Participation of users in scheme related activities	0.030
16	Measures taken to combat threat of water born disease	0.030
17	Measures taken to minimize threat in physical system of WS scheme	0.030
18	WUSC selection system & practice of AGM	0.029
19	Use of saving / surplus fund in repair and replacement	0.029
20	Sufficient tariff collection for O&M, repair and replacement	0.029
21	Existence, functioning & Clarity of roles for operation and maintenance management	0.029
22	Decision making process of WUSC	0.029
23	Strategy of WUSC to combat CC and mitigate Natural Calamity	0.028
24	Identification and protection of alternative sources for emergency situation	0.028
25	Implementation of encouraging and reinforcing good hygiene practice	0.028
26	System appropriate for multiple application of water (MUS)	0.027
27	External financial support in O&M and major repair and replacement works	0.027
28	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	0.026
29	Proper management of excess water	0.026
30	Linkage with private entrepreneurship in service provision and management	0.025
31	External capacity building and follow-up support	0.025
32	Linkage of WUSC to FEDWASUN	0.024
33	Proportionate representation of man and women in WUSC	0.023
34	Proportionate representation of cast / ethnicity in WUSC	0.023

5.1.3. Sustainability Scores

Table 10 presents the sustainability score of studied water supply schemes of Nawalparasi. Based on the framework used, sustainability score ranges from 0 to 100 percent. The lower the percentage scored, the lower the sustainability levels of the scheme and the higher the percentage scored, the higher the sustainability level of that particular scheme. Sustainability scores of 40 community managed water supply schemes studied ranges from as low as 6.6% in Rankachuli-Dwari water supply and sanitation scheme, Rakachuli to as high as 80.8% in Amarapuri Water Supply and Sanitation Scheme, Amarapuri.

Table 10: Sustainability Score of Water Supply and Sanitation Scheme

Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Sustainability Score	Remarks
1	Amarapuri	Amarapuri Water Supply and Sanitation Scheme	1760	80.8%	
2		Gahatadi Water Supply and sanitation Scheme	225	33.4%	
3	Benimanipur	Chiple Khola Water Supply and Sanitation Scheme	210	17.4%	
4		Betani Water Supply and sanitation Scheme	76	15.8%	
5		Betani(Sital Tandi) Water Supply and sanitation Scheme	183	26.7%	
6	Bharatipur	Bharatipur water supply and Sanitation scheme	153	33.6%	
7	Bulingtaar	Devchuli Water supply and sanitation Scheme	79	57.3%	
8	Dadajheri	Dhabadi Water Supply and Sanitation Scheme	34	34.0%	
9	Dedgaun	Chituwa Khola Water Supply and Sanitation Scheme	108	50.1%	
10		Dhuwad Water Supply and sanitation scheme	52	49.0%	
11		Jousimajhuwa Water Supply and Sanitation Scheme	155	34.6%	
12		Bandipure Chharchhare Water Supply and Sanitation Scheme	66	53.6%	
13	Deurali	lumpes Thado kholsi water supply and sanitation scheme	63	48.3%	
14		chapaha Water supply and sanitation scheme	64	29.1%	

Conti…

Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Sustainability Score	Remarks
15	Devchuli	Bisaltar Water Supply and Sanitation Scheme	450	55.2%	
16		Devchuli A Water supply and sanitation Scheme	459	70.6%	
17		Devchuli B Water supply and Sanitation Scheme	350	78.4%	
18	Dhaubadi	Chauradhaap Kokhetol water supply and Sanitation scheme	49	59.9%	
19	Gaindakot	Ttribaas Water Supply and Sanitation Scheme	68	40.8%	
20	Hupsekot	Hupsekot-A Water supply and sanitation Scheme	146	41.0%	
21	Jaubaari	Gagri Khola water supply and Sanitation Scheme	109	37.1%	
22	Kotthar	Tham Beshi Water Supply and Sanitation Scheme	87	37.1%	
23	Mainaghat	Deurali-Mainaghaat water supply and sanitation Scheme	146	44.1%	
24		Duwakana water Supply and sanitation Scheme	125	53.0%	
25	Mithukaram	Mukundapur Water Supply and Sanitation Scheme	244	32.9%	
26	Mukundapur	Naram water Supply and sanitation Scheme	2849	71.2%	
27	Naram	Naram water Supply and sanitation Scheme	50	38.2%	
28		Ghejardi Water supply and Sanitation Scheme	84	38.4%	
29	Nayabelhani	Nayabelhani Water supply and Sanitation Scheme	269	62.7%	
30	Rakachuli	Rankachuli-Dwari water supply and sanitation scheme	19	6.6%	
31		Katle khola water supply and sanitation scheme	42	17.5%	
32	Rakuwa	Amrit Dhara Water Supply and Sanitation Scheme	123	42.0%	
33		BahaKhola Water Supply and Sanitation Scheme	216	32.1%	
34	Ramnagar	Ramnagar Water Supply and Sanitation Scheme	1000	49.0%	
35	Ratanpur	Ratanpur Water Supply and Sanitation Scheme	60	31.6%	
36		Bangar Water Supply and Sanitation Scheme	105	25.5%	
37	Ruchang	Ratopaani Water Supply and Sanitation Scheme	48	41.5%	
38		Byaghaan Water Supply and sanitation Scheme	64	44.6%	
39		Ratokhola Water supply and Sanitation Scheme	126	40.5%	
40	Sunwal	Bishashaya Water supply and Sanitation Scheme	1000	13.8%	

5.1.4. Cutoff Score for Sustainability Rating

It was necessary to explicitly identify the quantitative thresholds between Sustainability Likely, Sustainability Possible and Sustainability Unlikely. Sustainability Thresholds were obtained based on responses WUSC members in Question #WS5 "Evaluation of WUSC in present serviceability of water supply scheme". The responses were Fully Serviceable in 6 WUSCs, Requires Minor Maintenance in 9 WUSCs, Requires Major Maintenance in 17 WUSCs, Requires Rehabilitation in 4 WUSCs and are Not Serviceable in 4 WUSCs". Grouping those in three categories' Fully Serviceable, Requires Maintenance (Minor/Major) and Requires Rehabilitation /Not serviceable, it was found 6,26,8 schemes are falls under each category respectively. Average sustainability score obtained by each categorical water supply schemes and standardized threshold score utilized to demarcate the sustainability rating is presented in Table 11 below.

Table 11:Cut-off Score for Sustainability Rating

Categorization	**Average Score Obtained (#WS5)**	**Standardized Threshold Score**	**Sustainability Rating**
Fully Functional	70.58 %	**>70%**	**Sustainability Likely (SL)**
Requires Maintenance (Minor/Major)	38.32 %	**31%-70%**	**Sustainability Possible (SP)**
Requires Rehab and Not Functional	31.17%	**<31%**	**Sustainability Unlikely (SU)**

5.1.5. Sustainability Rating

The results of sustainability rating of water supply schemes based on sustainability scores attained by individual water supply scheme arranging in three categories: less than 31 % score attained (Sustainability Unlikely); score attained in between 31-70 % (Sustainability Possible) and score attained more than 70 % (Sustainability Likely) are presented in Table 12 below.

Table 12: Sustainability Rating of Water Supply and Sanitation Scheme

Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Sustainability Score	Sustainability Rating
1	Amarapuri	Amarapuri Water Supply and Sanitation Scheme	1760	80.8%	Sustainability Likely
2		Gahatadi Water Supply and sanitation Scheme	225	33.4%	Sustainability Possible
3	Benimanipur	Chiple Khola Water Supply and Sanitation Scheme	210	17.4%	Sustainability Unlikely
4		Betani Water Supply and sanitation Scheme	76	15.8%	Sustainability Unlikely
5		Betani(Sital Tandi) Water Supply and sanitation Scheme	183	26.7%	Sustainability Unlikely
6	Bharatipur	Bharatipur water supply and Sanitation scheme	153	33.6%	Sustainability Possible
7	Bulingtaar	Devchuli Water supply and sanitation Scheme	79	57.3%	Sustainability Possible
8	Dadajheri	Dhabadi Water Supply and Sanitation Scheme	34	34.0%	Sustainability Possible
9	Dedgaun	Chituwa Khola Water Supply and Sanitation Scheme	108	50.1%	Sustainability Possible
10		Dhuwad Water Supply and sanitation scheme	52	49.0%	Sustainability Possible
11		Jousimajhuwa Water Supply and Sanitation Scheme	155	34.6%	Sustainability Possible
12		Bandipure Chharchhare Water Supply and Sanitation Scheme	66	53.6%	Sustainability Possible
13	Deurali	lumpes Thado kholsi water supply and sanitation scheme	63	48.3%	Sustainability Possible
14		chapaha Water supply and sanitation scheme	64	29.1%	Sustainability Unlikely
15	Devchuli	Bisaltar Water Supply and Sanitation Scheme	450	55.2%	Sustainability Possible
16		Devchuli A Water supply and sanitation Scheme	459	70.6%	Sustainability Likely
17		Devchuli B Water supply and Sanitation Scheme	350	78.4%	Sustainability Likely

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Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Sustainability Score	Sustainability Rating
18	Dhaubadi	Chauradhaap Kokhetol water supply and Sanitation scheme	49	59.9%	Sustainability Possible
19	Gaindakot	Ttribaas Water Supply and Sanitation Scheme	68	40.8%	Sustainability Possible
20	Hupsekot	Hupsekot-A Water supply and sanitation Scheme	146	41.0%	Sustainability Possible
21	Jaubaari	Gagri Khola water supply and Sanitation Scheme	109	37.1%	Sustainability Possible
22	Kotthar	Tham Beshi Water Supply and Sanitation Scheme	87	37.1%	Sustainability Possible
23	Mainaghat	Deurali-Mainaghaat water supply and sanitation Scheme	146	44.1%	Sustainability Possible
24		Duwakana water Supply and sanitation Scheme	125	53.0%	Sustainability Possible
25	Mithukaram	Mukundapur Water Supply and Sanitation Scheme	244	32.9%	Sustainability Possible
26	Mukundapur	Naram water Supply and sanitation Scheme	2849	71.2%	Sustainability Likely
27	Naram	Naram water Supply and sanitation Scheme	50	38.2%	Sustainability Possible
28		Ghejardi Water supply and Sanitation Scheme	84	38.4%	Sustainability Possible
29	Nayabelhani	Nayabelhani Water supply and Sanitation Scheme	269	62.7%	Sustainability Possible
30	Rakachuli	Rankachuli-Dwari water supply and sanitation scheme	19	6.6%	Sustainability Unlikely
31		Katle khola water supply and sanitation scheme	42	17.5%	Sustainability Unlikely
32	Rakuwa	Amrit Dhara Water Supply and Sanitation Scheme	123	42.0%	Sustainability Possible
33		BahaKhola Water Supply and Sanitation Scheme	216	32.1%	Sustainability Possible

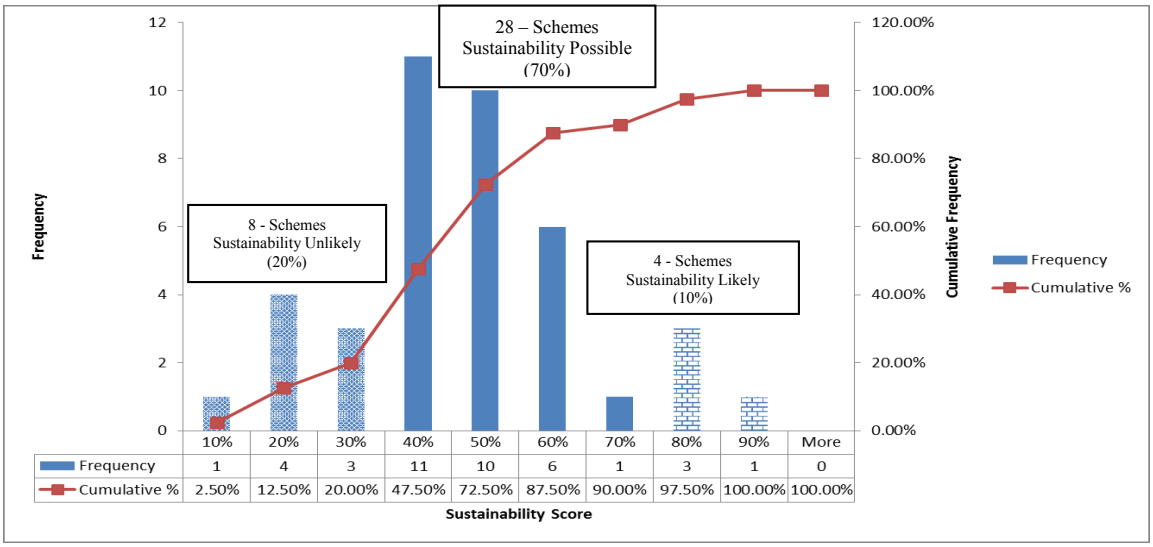
Conti…

Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Sustainability Score	Sustainability Rating
34	Ramnagar	Ramnagar Water Supply and Sanitation Scheme	1000	49.0%	Sustainability Possible
35	Ratanpur	Ratanpur Water Supply and Sanitation Scheme	60	31.6%	Sustainability Possible
36		Bangar Water Supply and Sanitation Scheme	105	25.5%	Sustainability Unlikely
37	Ruchang	Ratopaani Water Supply and Sanitation Scheme	48	41.5%	Sustainability Possible
38		Byaghaan Water Supply and sanitation Scheme	64	44.6%	Sustainability Possible
39		Ratokhola Water supply and Sanitation Scheme	126	40.5%	Sustainability Possible
40	Sunwal	Bishashaya Water supply and Sanitation Scheme	1000	13.8%	Sustainability Unlikely

Among 40 water supply scheme evaluated, the majority of the water supply schemes were fallen either into Sustainability Possible or into Sustainability Unlikely category, only 4nos (10%) water supply schemes were fallen into the Sustainability likely category. The sustainability score of Sustainability Likely water supply schemes were not found very high, since the highest score obtained by water supply scheme was only 80.8%. The majority of water supply schemes fallen into Sustainability possible category also has sustainability score near about to lower range of the category(31-70) and are likely to drop into the Sustainable unlikely category if immediate corrective measures were not taken.

Grouped relative frequency histograms for the sustainability scores of sampled water supply schemes are presented below in Figure 12. It is important to note that an overall assessment of “sustainability likely” does not mean that sustainability is guaranteed, nor does an overall assessment of “sustainability unlikely” mean that sustainability is impossible.

Figure 12: Grouped Relative Frequency Histograms of the Sustainability Scores



Using the definition of sustainability of water supply scheme developed at the outset of the thesis, the concern for the systems that are deemed "Sustainability Unlikely" is that social, financial, institutional/management, technical service and environmental aspects are unacceptable. Resources (man, money and material) are not available when needed or insufficient. The water supply scheme fails to attain 31% score in aggregated. According to the thresholds established in this research, eight out of forty (20%) water supply schemes were rated Sustainability Unlikely (SU).

"Sustainability Possible" water supply scheme is that scheme where social, financial, institutional/management, technical service and environmental aspects are acceptable. Resources (man, money and material) are available when needed but not sufficient. The water supply scheme obtains a 31% to 70% score in aggregate. According to the thresholds established in this research, twenty-eight out of forty (70 %) water supply schemes were rated Sustainability Possible (SP).

"Sustainability Likely" water supply scheme is that scheme where social, financial, institutional/management, technical service and environmental aspects are significant. Resources (man, money and material) are available and sufficient. The water supply scheme attains more than 70% score in aggregate. According to the thresholds established in this research, four out of forty (10%) water supply schemes were rated Sustainability Likely (SL).

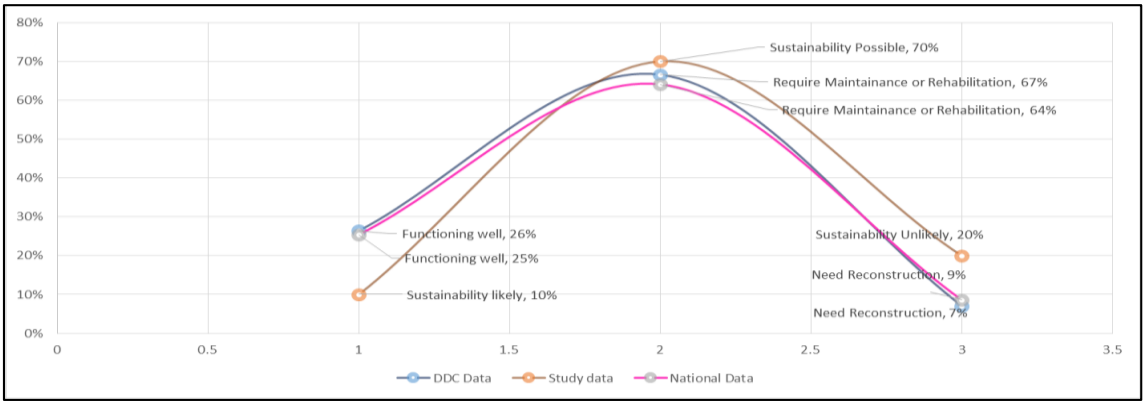
5.2. Discussion

5.2.1. Comparison of Research Results and GON Data

The water supply schemes taken for assessment of long-term sustainability in study area were aged almost more than 10 years. The sustainability analysis in this research using MCA determined 20% water supply schemes in the study area are Sustainability Unlikely (SU), 70% water supply schemes are Sustainability Possible (SP) and the remaining 10% water supply schemes are Sustainability Likely (SL). Similarly, GON result of functionality assessment of water supply schemes of same geographical area published in "National wide coverage and functionality Status of Water supply and sanitation in Nepal". National data show that water supply systems of Nepal, well-functioning systems are 25.4%, systems that need minor repair are 35.1%, systems that need major repair are 9.2%, systems that need habitation are 19.8% and systems that need reconstruction are 8.6%. Similarly, the same data shows, among 369 water supply systems of Nawalparasi district, well-functioning system are 26.4%, systems that need minor repair are 37.9%, systems that need major repair are 12.2%, systems that need habitation are 16.5% and systems that need reconstruction are 7.1%. Grouping those systems into three categories of functionality viz. (i) Functioning well, (ii) Requires maintenance & rehabilitation and (iii) Need reconstruction, it was found that out of those systems 25.4 %, 64.1% and 8.6% at national level and 26.4%, 66.6% and 7.1% at district level belong to these three categories.

Figure 13 illustrates the comparison between the result of sustainability assessment using MCA during this research and that of GON/NMIP (2014).

Figure 13: Comparative Results of Sustainability Study.



Both results follow the standard normal distribution property, with highest percentage of water supply schemes that are sustainability possible or requiring maintenance and rehabilitation for their long-term sustainability.

5.2.2. Correlation between Sustainability Factor and Sustainability Score

Non-parametric correlation techniques was used to estimate the correlation or association between score obtained by the individual sustainability factors and overall sustainability of water supply schemes. Such technique was used to assess how well an arbitrary monotonic function can describe the relationship between two variables, without making any other assumptions about the particular nature of the relationship between the variables. The goal of this comparison is to see if the calculated indicator scores are correlated to an objective measure of system sustainability.

Table 13 below illustrates the ranking of sustainability factors based on their correlation coefficient obtained from correlation analysis of individual score and overall sustainability score of water supply schemes. Based on the properties of correlation coefficient ($-1 \leq 0 \leq +1$), correlation coefficient ranges from -1 to +1. The value of correlation coefficient, 0 indicates no linear relationship. +1 indicates a perfect positive linear relationship: as one variable increases in its values, the other variable also increases in its values and -1 indicates a perfect negative linear relationship: as one variable increases in its values, the other variable decreases in its values via an exact linear rule. Values between 0 and 0.5 (0 and -0.5) indicate a weak positive (negative) linear relationship. Values between 0.5 and 0.7 (-0.5 and -0.7) indicate a moderate positive (negative) linear relationship. Values between 0.7 and 1.0 (-0.7 and -1.0) indicate a strong positive (negative) linear relationship (Rumsey, 2016). The presented rank of correlation coefficients in 34 sustainability factors of community managed water supply schemes ranged from smaller as -0.024 on proportionate representation of cast / ethnicity to higher as 0.754 in Participation of users in scheme related activities. Participation of users in scheme related activities, Existence and functioning of WUSC and Satisfaction of users in service provided by WUSC has strong positive correlation with sustainability sore of water supply scheme.

Table 13: Ranking of Sustainability Factors Base on Correlation Coefficients

Rank	Sub Factors	Correlation coefficient (r)
1	Participation of users in scheme related activities	0.754
2	Existence and functioning of WUSC	0.749
3	Satisfaction of users in service provided by WUSC	0.715
4	WUSC selection system & practice of AGM	0.688
5	Strategy of WUSC to combat CC and mitigate Natural Calamity	0.675
6	Financial transparency in fund mobilization	0.658
7	Public hearing and public audit system of WUSC	0.649
8	Decision making process of WUSC	0.628
9	Measures taken to combat threat of water source contamination	0.600
10	Use of saving / surplus fund in repair and replacement	0.595
11	Leadership quality and activeness of WUSC	0.592
12	Availability of Tools and Fittings for all operation and maintenance work.	0.590
13	Establishment of O&M fund & saving	0.578
14	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	0.577
15	Linkage of WUSC to FEDWASUN	0.574
16	Implementation of encouraging and reinforcing good hygiene practice	0.553
17	Users willingness to pay water tariff	0.546
18	Identification and protection of alternative sources for emergency situation	0.542
19	Written statute and registration of WUSC in DWRC	0.540
20	Availability of Technical skills for all operation and maintenance work.	0.531
21	Proportionate representation of man and women in WUSC	0.464
22	Strategy of WUSC to combat source depiction problem	0.462
23	Sufficient tariff collection for O&M, repair and replacement	0.453
24	Proper management of excess water	0.442
25	External capacity building and follow-up support	0.392
26	Measures taken to minimize threat in physical system of WS scheme	0.392
27	External financial support in O&M and major repair and replacement works	0.386
28	Existence, functioning & Clarity of roles for operation and maintenance management.	0.342
29	Measures taken to combat threat of water born disease	0.123
30	Scheme providing Basic Level of Water Supply service	0.084
31	Conflict in source / component location	0.000
32	Linkage with private entrepreneurship in service provision and management	0.000
33	System appropriate for multiple application of water (MUS)	0.000
34	Proportionate representation of cast / ethnicity in WUSC	-0.240

5.2.3. Core Sustainability Factor

Table 14 below presents the core sustainability factors significant to sustainability of community managed water supply scheme. Those factors were identified based on their correlation coefficient (r >0.5, i.e. Factors having greater than moderate positive linear relationship with sustainability score of water supply scheme) and weights of factor (>.029) given by experts during the judgmental survey and multi criteria analysis. Those factors are repetitive in both frameworks of computed correlation coefficient rank and factors weight rank given by expert judgement. Proposed rank of factor was identified averaging the positional rank of the factor in correlation coefficient rank (Table 13) and factors weight rank (Table 9).

Table 14: Core Sustainability Factors

Rank	Sustainability Factor	Remarks
1	Satisfaction of users in service provided by WUSC	
2	Financial transparency in fund mobilization	
3	Existence and functioning of WUSC	
4	Public hearing and public audit system of WUSC	
5	Participation of users in scheme related activities	
6	Leadership quality and activeness of WUSC	
7	Availability of Tools and Fittings for all operation and maintenance work.	
8	Measures taken to combat threat of water source contamination	
9	WUSC selection system & practice of AGM	
10	Availability of Technical skills for all operation and maintenance work.	
11	Written statute and registration of WUSC in DWRC	
12	Establishment of O&M fund & saving	
13	Users willingness to pay water tariff	
14	Use of saving / surplus fund in repair and replacement	

CHAPTER VI: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusions

Water availability is an essential component in socio-economic development and sustainable development. Therefore, water availability must be sustainable. Majority of the water projects in study area was sustainability possible rank, making those sustainability possible is a major challenge. This implies that sustainable development cannot be achieved without sustainability in the use of water. As the water supply schemes are not sustainable, they are not likely to perform well and will eventually collapse. The high percentage of sustainability possible and sustainability unlikely water supply schemes observed nationally and in the study region will limit the achievement of the vision MDG to SDG. For the country to achieve this vision and ensure sustainable development there is need to look into measures, including views of sector experts and community that will make the existing water supply schemes more sustainable.

The Sustainability Analysis Framework based on literature in the community managed water supply field, best practices within Nepal, and the author's experience. It intended to use as a diagnostic tool for development organizations to identify water supply schemes that are in need of further support. This has particular importance for ranking water supply schemes according to the level of their need, in order to prioritize post project support activities. It can also apply to determine for any specific community what needs are most urgent within the indicator categories. This information is useful to development organizations for strategic planning, but can also use by WUSCs as an "auto-assessment" in order to identify the most appropriate support organization or agency to meet the specific community's needs.

The framework gives the results of the sustainability status of projects based on their performance across various indicators included in the framework. The sustainability status of a project is dependent on the indicators used and weight and score distribution applied to the various indicators. The application of MCA for sustainability assessment of water supply and sanitation schemes would be worth full in sustainability ranking and policy decision making for post project support.

The sustainability analysis in this research determined that, 20 % of Finnish funded community managed water supply schemes in study area has social, financial, institutional/management, technical/service and environmental aspects unacceptable. Resources (man, money and material) are not available when needed or insufficient and are Sustainable Unlikely (SU). 70% of water supply schemes has social, financial, institutional/management, technical/service and environmental aspects acceptable. Resources (man, money and material) are available when needed but not sufficient and are Sustainability Possible (SP). The remaining 10 % of water supply schemes has social, financial, institutional/management, technical/service and environmental aspects significant. Resources (man, money and material) are available and sufficient and are Sustainability Likely (SL)

From the result of the study, we can conclude that, sustainability assessment framework based on the Multi Criteria Analysis (MCA) is superlative instrument for sustainability assessment of community managed water supply schemes. The application of MCA for sustainability assessment of water supply and sanitation schemes would be very useful in sustainability ranking and policy decision making for post project supports.

Satisfaction of users in service provided by WUSC and participation of users in scheme related activities are core factors for social sustainability. Financial transparency in fund mobilization, establishment of O&M fund & saving, users willingness to pay water tariff, and use of saving / surplus fund in repair and replacement are core factors for financial sustainability. Existence and functioning of WUSC, public hearing and public audit system of WUSC, leadership quality and activeness of WUSC, WUSC selection system & practice of AGM and written statute and registration of WUSC in DWRC are core factors for institutional/management sustainability. Availability of tools and fittings for all operation and maintenance work and availability of technical skills for all operation and maintenance work are core factors for technical sustainability. Moreover, measures taken to combat threat of water source contamination is core factors for environmental sustainability of community managed water supply scheme.

6.2. Recommendations

Water supply and sanitation scheme planning, management and sustainability assessment in developing countries like Nepal needs further research, study and action on the following, in order to address practical problems in their sustainability.

- The sustainability analysis tool and the framework established by this research can be utilized to investigate the impacts of post construction support and other important factors on sustainability of community managed water systems in Nepal. This research was the first step in identifying the proper adjusts that need to be made to ensure the sustainability of community managed water supply scheme

- The utility of the framework can be improved by carrying out sensitivity analysis to see the effects of changes in weights of different sub-factors to the overall sustainability score. The system, since it was piloted only in a small number of water supply schemes, needs further improvement in terms of technical, intellectual, contextual and methodological aspects in the future. This piece of work will help allow the beginning of a meaningful debate on the sustainability issue of existing projects in Nawalparasi and other parts of countries.

- Since the sustainability, status of a project is dependent on the indicators used and weight, score distribution applied to the various indicators, the first, and the foremost thing is there should be consensus on indicators and weight distribution in the framework among all the concerned agencies that are using the framework in future.

- Recommended to emphasis on capacity enhancement of WUSC on those core sustainability factors presented in Table 14 before providing maintenance and rehabilitation support of water supply scheme.

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ANNEXES

Annex I: WUSC and Household Survey Questionnaire.

Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation Project (NAPA WASH), Nepal

फिनल्याण्ड सरकारको सहयोगमा बनेका ग्रामीण खानेपानी योजनाहरुको दिगोपना सम्बन्धी अध्ययन

जिल्ला: नवलपरासी

खानेपानी तथा सरसफाई उपभोक्ता समिति (खापाउस) स्तरिय अध्ययन

अन्तर्वार्ता सम्बन्धी जानकारी:

WI1	खापायोजनाको नाम र कोड न.:	WI1.1: नाम : _____ WI1.2: कोड: ___ ___
WI3	अन्तर्वार्ता मिति:	___ ___ / ___ ___ / 2015 (DD/MM/YYYY)

खापाउस संगको अन्तर्वार्ता:

WI5: सि न	WI6: सहभागिहरुको नाम	WI7: पद	WI8: सम्पर्क नम्बर
1	_____	_____	__ __ __ __ __ __ __ __ __ __
2	_____	_____	__ __ __ __ __ __ __ __ __ __
3	_____	_____	__ __ __ __ __ __ __ __ __ __
5	_____	_____	
5	_____	_____	
6	_____	_____	
7	_____	_____	
8	_____	_____	
9	_____	_____	

खण्ड-B2: सामान्य जानकारी

प्रश्ननं.	प्रश्न	जवाफ	Skipping
WG6	यो खापायोजनाको निर्माण कहिले सम्पन्न भएको हो? (बर्ष वि.सं.मा)	बर्ष: ___ ___ ___ ___ वि.सं.	
WG7	खापायोजनामा कुनै पुनर्स्थापन (Rehab) कार्य गरिएको छ?	छ..... 1 छैन..... 2	
WG8	कुन दातृ निकायले पुनर्स्थापन कार्यमा सहयोग गरेको हो?(प्रमुख निकायको नाम)	नाम: _____	
WG9	पुनर्स्थापन कार्य कहिले गरिएको हो? (बर्ष वि.सं.मा)	बर्ष: ___ ___ ___ ___ वि.सं.	

प्रश्ननं.	प्रश्न	जवाफ	Skipping
WG10	के कारणले खापायोजनाको पुनर्स्थापन कार्य गर्नु भएको हो? (बहुउत्तर)	प्राकृतिक प्रकोप........ A योजनाको उपयुक्त डिजाईन नभएकोले....... B संचालन तथा संभार निरन्तर रुपमा नभएकोले... C अन्य (खुलाउने): ______________________ X1	
WG11	यो खापायोजनामा कुनै बिस्तार कार्य (Extension) भएको थियो?	थियो...... 1 थिएन.......... 2	
WG12	कुन दातृ निकायले विस्तार कार्यमा सहयोग गरेको हो? (प्रमुख निकायको नाम)	नाम: ______________________	
WG13	कहिले विस्तार कार्य गरिएको थियो?(बर्ष वि.सं.मा)	बर्ष: ___ ___ ___ ___ वि.सं.	

विभिन्न समयमा (निर्माण, पुनर्स्थापन, विस्तार गरेको समयमा) यस खापायोजनाको स्थिति बिबरण दिनुहोस् । यदि योजनामा पुनर्स्थापन वा विस्तार कार्य नभएको भए, WG7 र WG 11 को skipping निर्देशन अनुसार WC2 वा WC3 भर्न नपर्ने हुनसक्छ ।

प्रश्ननं.	प्रश्न	WC1: योजना निर्माण सम्पन्न भएको बर्षमा	WC2: पुनर्स्थापन (Rehab) सम्पन्न भएकोबर्षमा	WC3: योजनाबिस्तार (extention) सम्पन्न बर्षमा	WC4: हालको अबस्था (2071)
WG22	यस खापायोजनामा प्रयोग भएको मुहान कुन प्रकारको हो? नोटः मूल (spring): *मुल भन्नाले जमीन भित्रबाट निस्केको पानी जसमा बर्षातको भलपानी नपस्ने र सुरक्षित हुन्छ ।* खोल्साको पानी (spring-fed-stream): *खोल्साको पानी भन्नाले बर्षातको भलपानी पस्ने खोल्साको मुल वा खोल्सा हुदै बगेको मुलपानी हो जसमा बर्षातको भलपानी नपस्ने गर्न नसकिने र असुरक्षित हुन्छ ।* खोला/नदी: *खोला वा नदी आदि स्रोत जो असुरक्षित हुन्छ ।*	मूल (वर्षातको भलपानी नमिसिने)..... 1 खोल्साको पानी (वर्षातको भलपानी मिसिने)..... 2 खोला/नदि.... 3 मूल र खोल्सा.... 4 मूल र खोल्सा/ खोला/नदि.... 5	मूल (वर्षातको भलपानी नमिसिने)..... 1 खोल्साको पानी (वर्षातको भलपानी मिसिने)..... 2 खोला/नदि.... 3 मूल र खोल्सा.... 4 मूल र खोल्सा/ खोला/नदि.... 5	मूल (वर्षातको भलपानी नमिसिने)..... 1 खोल्साको पानी (वर्षातको भलपानी मिसिने)..... 2 खोला/नदि.... 3 मूल र खोल्सा.... 4 मूल र खोल्सा/ खोला/नदि.... 5	मूल (वर्षातको भलपानी नमिसिने)..... 1 खोल्साको पानी (वर्षातको भलपानी मिसिने)..... 2 खोला/नदि.... 3 मूल र खोल्सा.... 4 मूल र खोल्सा/ खोला/नदि.... 5
WG23	यस खापायोजनामा प्रयोग भएका मुहानहरु सुरक्षित (improved) किसिमको हो कि असुरक्षित (unimproved) किसिमको हो? मुहानको किसिम र इन्टेक निर्माणको आधारमा मुहानको पानीमा हुनसक्ने प्रदुषणको सम्भावनालाई हेरि सुरक्षित वा असुरक्षित मुहान भन्नुहोस् । नोटः सुरक्षितः *खापायोजनाको मुहानको किसिम, इन्टेक निर्माण र इन्टेक क्षेत्रमा सुरक्षा/संरक्षण निर्माण गरिएको आधारमा मुहानको पानीमा प्रदुषणको सम्भावना नभएको ।* असुरक्षितः *खापायोजनाको मुहानको किसिम, इन्टेक निर्माण र इन्टेक क्षेत्रमा सुरक्षा/संरक्षण निर्माण गरिएको आधारमा मुहानको पानीमा प्रदुषणको सम्भावना भएको ।*	सबै मुहान सुरक्षित किसिमको हो... 1 कुनै मुहान सुरक्षित र कुनै असुरक्षित किसिमको हो... 2 सबै मुहान असुरक्षित किसिमको हो.... 3 थाहा छैन..... 4	सबै मुहान सुरक्षित किसिमको हो... 1 कुनै मुहान सुरक्षित र कुनै असुरक्षित किसिमको हो... 2 सबै मुहान असुरक्षित किसिमको हो... 3 थाहा छैन... 4	सबै मुहान सुरक्षित किसिमको हो... 1 कुनै मुहान सुरक्षित र कुनै असुरक्षित किसिमको हो... 2 सबै मुहान असुरक्षित किसिमको हो... 3 थाहा छैन..... 4	सबै मुहान सुरक्षित किसिमको हो... 1 कुनै मुहान सुरक्षित र कुनै असुरक्षित किसिमको हो... 2 सबै मुहान असुरक्षित किसिमको हो... 3 थाहा छैन... 4

प्रश्ननं.	प्रश्न	**WC1:** योजना निर्माण सम्पन्न भएको बर्षमा	**WC2:** पुनर्स्थापन **(Rehab)** सम्पन्न भएकोबर्षमा	**WC3:** योजनाबिस्तार **(extention)** सम्पन्न बर्षमा	**WC4:** हालको अबस्था **(2071)**
WG24	यस खापायोजनाको पानीको गुणस्तर परिक्षण गरेको छ? NDWQS= Nepal Drinking Water Quality Standards	छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छ… 1 छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छैन.. 2 छैन (गुणस्तर परिक्षण गरेको छैन)…. 3	छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छ… 1 छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छैन.. 2 छैन (गुणस्तर परिक्षण गरेको छैन)…. 3	छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छ… 1 छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छैन.. 2 छैन (गुणस्तर परिक्षण गरेको छैन)…. 3	छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छ… 1 छ, पानीको गुणस्तर **NDWQS/WHO** मापदण्ड भित्र छैन.. 2 छैन (गुणस्तर परिक्षण गरेको छैन)…. 3
	Skipping	**1→WG26** **3→WG26**	**1→WG26** **3→WG26**	**1→WG26** **3→WG26**	**1→WG26** **3→WG26**
WG26	यस खापायोजनामा पानी शुद्धिकरण गर्ने मुख्य प्रणाली के छ? *यदि खापायोजनामा एक भन्दा बढि शुद्धिकरणका संरचना भएमा अन्तिम शुद्धिकरण प्रणालीमा गोलो लगाउने ।*	सेडिमेन्टेसन.... 1 र्‍यापिडस्यान्ड... 2 स्लोस्यान्ड … 3 केहि छैन…. 4	सेडिमेन्टेसन.... 1 र्‍यापिडस्यान्ड... 2 स्लोस्यान्ड … 3 केहि छैन…. 4	सेडिमेन्टेसन.... 1 र्‍यापिडस्यान्ड... 2 स्लोस्यान्ड … 3 केहि छैन…. 4	सेडिमेन्टेसन.... 1 र्‍यापिडस्यान्ड... 2 स्लोस्यान्ड … 3 केहि छैन…. 4
WG27	यो खापायोजनामा पानी सुरक्षा योजना **(WSP)** लागु भएको छ साथै संरचनाहरुमा अनुगमन नियमित गरिएको छ?	छ........ 1 छैन.... 2 थाहा छैन… 8	छ ..... 1 छैन.... 2 थाहा छैन… 8	छ ..... 1 छैन.... 2 थाहा छैन… 8	छ ...... 1 छैन.... 2 थाहा छैन… 8

खण्ड-B3: उपभोक्ता घरपरिवार संवन्धी हालको बिवरण

प्रश्न नं	जातजाती	उपभोक्ता घरसंख्या (हालको)
WU1	दलित	☐ ☐ ☐
WU2	जनजाती	☐ ☐ ☐
WU3	ब्राह्मण/क्षेत्री/ठकुरी	☐ ☐ ☐
WU4	मधेशी	☐ ☐ ☐
WU5	अन्य	☐ ☐ ☐
WU6	जम्मा घरसंख्या	☐ ☐ ☐

खण्ड-B4: योजनाको दिगो संस्थागत ब्यबस्थापन

प्रश्ननं.	प्रश्न	ज्वाफ	skipping
WM1	पहिलो पटक खापाउस गठन भएको बर्ष?	शुरुको गठन भएको बर्ष: __ __ __ __ वि.सं.	
WM3	हालको खापाउस गठन भएको बर्ष?	बर्तमान खापाउस गठन भएको बर्ष: __ __ __ __ वि.सं.	
WM4	खापाउस जिल्ला जलस्रोत समितिमा दर्ता भएको छ?	छ.......... 1 छैन……. 2	

WM5	यदि दर्ता भएको छैन भने, मूख्य कारण के होला?	अनिवार्यरुपमा दर्ता गर्नुपर्छ भन्ने थाहा नभएको..... 1 आवश्यकता महशुस नगरिएको..... 2 दर्ता गरेर कुनै फाईदा नदेखेको..... 3 अन्य (खुलाउने): _____ 6 थाहा छैन..... 8	
WM6	खापाउसको लिखित विधान छ? (उपलब्धभए विधान हेर्नें)	विधान छतरजिल्ला जलस्रोत समितिमा दर्ता भएको छैन... 1 लिखित विधान छैन..... 2 थाहाछैन..... 8	
WM7	बिगत बाह्र महिना भित्र खापाउसको बैठक कतिपटक बसेको थियो?	☐☐	
WM8	बिगत बाह्र महिना भित्रआमभेला कतिपटक भएको थियो?	☐☐	
WM9	गत बर्ष बार्षिक साधरण सभा भयो? *AGM=annual general meeting*	भयो..... 1 भएन..... 2	
WM10	खापाउसले आर्थिक अभिलेख तथा संबन्धित कागजात राखेको छ? *(अभिलेख हेर्नें)*	छ..... 1 छैन..... 2	
WM11	खापाउसमा जम्मा सदस्य संख्याकति छन्?	☐☐	
WM12	खापाउसमा जम्मा महिला सदस्य संख्याकति छन्?	☐☐	
WM13	खापाउसको जिम्मेवार पदमा जम्मा महिला संख्या कति छन्? *(अध्यक्ष, उपाध्यक्ष, सचिव, कोषाध्यक्ष पदहरुमा)*	☐☐	
WM14	खापाउसमा जम्मा दलित सदस्य संख्याकति छन्?	☐☐	
WM15	खापाउसमा जम्मा जनजाती सदस्य संख्याकति छन्?	☐☐	
WM16	खापाउसका वर्तमान सदस्यहरु मध्ये कतिजनाले योजना संचालन तथा संभार संबन्धि तालिम प्राप्त गरेका छन्? *(वित्तिय, प्राविधिक, आदि तालिम)*	☐☐	
WM17	खापायोजना स्तरमा सरसफाई र स्वच्छता संवन्धी सवालमा को जिम्मेवार छ?	खापाउस..... 1 बिशेष समिति (वडा समिति, आदि)..... 2 खापाउस र अन्य समितिबिचमा साझा जिम्मेवारी..... 3 कुनै पनि समितिले जिम्मेबारी नलिएको..... 4	

खण्ड-B5: खापाउसकोअन्य निकाय संगकोसम्बन्ध

प्रश्न नं	प्रश्न	ज्वाफ	Skipping
WK1	खापाउस फेडवासनमाआबद्ध भएको छ? *(FEDWASUN– खानेपानी तथा सरसफाई उपभोक्ता महासंघ)*	छ..... 1 छैन..... 2	

प्रश्न नं	प्रश्न	ज्वाफ	Skipping
WK2	खापाउसले कुन कुन समुहहरुसंग मिलेर योजना संचालन तथा संभार कार्य गरेको छ? (बहुउत्तर)	आमा समुह..... A बन उपभोक्ता समुह..... B बचत तथा लगानीसमुह..... C सहकारी..... D बैंक..... E वीमा कम्पनी..... F सरसफाई समिति... G अरु खापाउस..... H कुनै पनि छैन..... I अन्य(खुलाउने): _____ X1	
WK3	ब्यबहारमा, उक्त निकायहरुसंग कसरी कार्य गरिएको छ? (बहुउत्तर)	मिलेर समस्या समाधान गर्ने गरेको..... A स्रोतसाधन ऐंचोपैंचो गर्ने गरेको (औजार, ठाउं, आदि).... B दक्ष कर्मचारी आदान प्रदान गर्ने गरेको..... C संयुक्त बैठक र अन्यकार्य गरि समुदायलाई जानकारि दिने... D अन्य (खुलाउने): _____ X1	
WK4	खापाउसले योजना संचालनमा सुधारको लागि कुन कुन निकायहरुसंग (आर्थिक सहयोग, प्राविधिक सहयोग तथा क्षमता अभिवृद्धिका लागि) सम्बन्ध राखेको छ? (बहुउत्तर) *(आर्थिक, प्राविधिक, क्षमता अभिवृद्धि आदि सहयोगको विषयमा सम्बन्ध रहेका निकायहरु)*	भिवाससिसि..... A डिवाससिसि..... B जि.वि.स.को WASH Unit..... C खापा तथा सस डिभिजन कार्यालयको मर्मत संभार शाखा.... D गैह्रसहकारी संस्था..... E **FEDWASUN**..... F अन्य (उल्लेख गर्ने): _____ X1	

खण्ड-B6: योजनाको दिगो वित्तिय व्यवस्थापन

प्रश्न नं	प्रश्न	ज्वाफ	Skipping
WF5	गत वर्ष बास्तविक पानी महशुल संकलन दर कति प्रतिशत रहेको थियो ? *(उपभोक्ताबाट उठनु पर्ने कुल रकमको प्रतिशत)*	बास्तविक उठेको पानी महशुल: __ ___ % कुल उठनु पर्ने रकमको	
WF6	खापायोजनामा संचालन तथा संभार कोष रहेको छ?	छ..... 1 छैन..... 2	
WF7	यो खापायोजनाको संचालन तथा संभार कोषमा हाल जम्मा कति रकम मौज्दात छ? **नोट** : *संचालन तथा संभार कोषमा बिगत वर्षहरुदेखि जम्मा हुदै हालसम्मको कुल मौज्दात रकम ।*	— — — — — — हजाररुपैया	

प्रश्न नं	प्रश्न	ज्वाफ	Skipping
WF14	उक्त उठेको रकमबाट बिगत १२ महिनामा योजना मर्मत कार्यमा मात्र कति रकम खर्च भएको थियो? (उपभोक्ता घरधुरीबाट उठाईएको रकमको मर्मतमा खर्च) नोट: *गतबर्षको संरचना तथा पाईपलाइनको मर्मत, नयाँ भल्भ तथा फिटिङ्ग फेर्ने आदि मर्मत खर्च मात्र हिसाब गर्ने । कर्मचारीको तलब कार्यालय खर्च आदि नजोड्ने । मर्मत कार्यमा खर्च गरेको नगद रकम मात्र जेड्ने ।*	——— ——— ——— ——— हजार रुपैया (गत एक वर्षमा)	
WF17	बर्तमान पानी महशुलको आम्दानीले संचालन, संभार, मर्मत आदि सबै खर्चलाई पर्याप्त पुग्छ?	पुग्छ…… 1 पुग्दैन…... 2	

खण्ड-B7: योजनाको दिगो प्राविधिक व्यवस्थापन

प्रश्ननं	प्रश्न	ज्वाफ	Skipping
WT1	तपाईको खापायोजनामा दक्ष**VMW/s** छन्?	छन……..…… 1 छैनन् …… 2	
WT3	के खापाउसले मर्मत गर्ने कुनै दक्ष प्राविधिक (Highly skilled VMW or Technician) व्यक्ति चिनेको छ? नोट:*दक्ष प्राविधिक (जसले संरचना पाईपलाईन र फिटिङ्गहरुका मर्मत गर्ने कामको अगुवाई गर्न सक्छ)*	आवश्यक मर्मतकार्यहरु गर्न हालकै VMW सक्षम छन्.... 1 VMW बाहेक अरु पनि छन् जसलाई मर्मत कार्य गर्न प्रयोग गर्दै आएका छौ…….... 2 व्यक्तिगत रुपमा चिनेको छैन तर आवश्यक पर्दा कहां पाईन्छ थाहा छ (VDC, DDC, WSSDO, FEDWASUN, NGO)..... 3 कोहि चिनेको छैन…..... 8	
WT4	के खापाउसले कुनै सर्भे, डिजाईन, ठुला मर्मत र पुनर्निर्माण कार्य गर्नओभरसीयर/ईन्जिनियरप्राविधिकहरु चिनेको छ? नोट : *ईन्जिनियर वा वरिष्ट ओभरसियर जसले खापायोजनाको पुनर्निर्माण वा ठुला मर्मत कार्यको लागि सर्भे तथा डिजाईन गर्न सक्छन् ।*	उक्त कार्य गर्न हालकै VMW सक्षम छन्…… 1 VMW बाहेक अर्को पनि छन् जसलाई उक्त कार्य गर्न प्रयोग गर्दै आएका छौ…... 2 व्यक्तिगतरुपमा थाहा छैन तर आवश्यक पर्दा कहां पाईन्छ थाहा छ (VDC, DDC, WSSDO, FEDWASUN, NGO)….. 3 कोहि चिनेको छैन…..... 8	
WT7	के खापाउससंग योजना मर्मतको लागि पर्याप्त फिटिङ्ग र औजार छन्? ***(रेकर्ड तथा स्टोर हेर्नु)***	कुनै पनि औजार छैन…….. 1 औजारहरु पर्याप्त छैन……. 2 औजारहरु पर्याप्त छ……. 3	

खण्ड-B8: खापाउसको शुशासन एवं सामाजिक जवाफदेहीता

सि नं	प्रश्न	ज्वाफ	Skipping
WA2	खापाउस कार्य समितिको छनौट कसरी गर्ने गर्नु भएको छ?	आमभेलाले सर्वसम्मतिबाट…….... 1 आमभेलाले मतदानबाट……..... 2 धाराहरुका प्रतिनिधि द्वारा…..... 3 गाउँका ठुलाठालु व्यक्तिहरुद्वारा... 4 अन्य (उल्लेख गर्ने): _____ 6	

सि नं	प्रश्न	ज्वाफ	Skipping
WA3	खापाउसका मूख्य जिम्मेवार पदहरु (अध्यक्ष, उपाध्यक्ष, सचिव, कोषाध्यक्ष) कसरी बाँडफाड गरिन्छ?	आमभेलाले सर्वसम्मतिबाट..... 01 आमभेलाले मतदानबाट..... 02 धाराहरुको प्रतिनिधिद्वारा..... 03 समितिसदस्यहरु विच मतदानद्धारा..... 04 ईच्छा जाहेर गर्ने सकृय सदस्यहरु मध्येबाट छानिएको... 05 समिति भन्दा बाहिरका व्यक्तिको निर्णय अनुसार... 06 सहयोगि निकायले छानेको..... 07 अन्य (उल्लेख गर्ने): _____ 96	
WA4	खापाउसकोबैठकमा निर्णयहरु कसरी गरिन्छ?	सबै सदस्यहरु बीच गहन छलफल गरि..... 1 अध्यक्षले भने बमोजिम..... 2 प्रभावशाली सदस्यहरुले भने अनुसार..... 3 अन्य (उल्लेख गर्ने): _____ 6	
WA9	खापाउसले सार्बजनिक लेखापरीक्षण प्रणालीलाई कार्यान्वयन गरेको छ?	छ ..... 1 छैन 2	

खण्ड-B9: वातावरण, जलवायु परिवर्तन र न्यूनिकरण

प्रश्ननं	प्रश्न	ज्वाफ	Skipping
WE1	खापाउस संग योजनाका संरचनाहरुलाई प्राकृतिक प्रकोपबाट हुने संभाव्य क्षति न्यूनिकरण गर्ने रणनिती के छ? (बहुउत्तर)	जनचेतना जगाउने कार्यकम..... A वृक्षारोपण गरेर..... B खानेपानी प्रणालिका संरचना संरक्षण गरेर..... C संरचनाहरुमा पानीको सुरक्षित निकास बनाएर..... D उपभोक्ताहरुले संचालन तथा मर्मत कोष वा अन्य रकम आफैबाट उठाएर..... E खापाउसको वित्तिय संथाहरुसंग ऋण लिने पहुँच छ (जस्तै सहकारी, आदि)..... F अन्य(खुलाउने): _____ X1 _____ X2	
WE2	खापाउसले पानीको स्रोतमा पानी घट्न सक्ने समस्याको न्यूनिकरण गर्न के कस्ता गतिविधिगरेको छ?	मूहान क्षेत्रमा जलाधार संरक्षण..... 1 जनचेतना मुलक कार्यकम..... 2 अन्यस्रोतसंरक्षण कार्य (खुलाउने): _____ 6	

विगत दश वर्षमा घटेका एक वा एक भन्दा बढी प्राकृतिक प्रकोपहरुको कारणले के खापाउसलाई खापायोजनाको संचालनमा समस्या भएको छ? मुल्यांकन प्रस्नावलि:

प्रश्ननं	प्रश्न	ज्वाफ	Skipping
WE9	विगत दश बर्ष भित्र योजना संचालनमा पानी प्रदुषणका कारण (*व्याक्टेरिया, भाईरस, रसायन*) कुनै समस्या उत्पन्न भएको थियो? नोट: *यदि थिए भने कति पटक भएका थिए सोध्ने ।* *यदि उत्तर दिन नसकेमा उदाहरणको रुपमा WE10 का उत्तर विकल्पहरु मध्येका केहि घटना भएको छ कि सोध्ने ।*	थियो, 5 पटक भन्दा बढि..... 1 थियो, 4 देखि 5 सम्म..... 2 थियो, 2 देखि 3 सम्म..... 3 थियो, 1 पटक मात्र ..... 4 क्षति पुगेको छैन..... 5	

प्रश्ननं	प्रश्न	ज्वाफ	Skipping
WE17	विगत दश बर्षमा खापाउसले प्रकोप न्यूनिकरण गर्नका लागि यी मध्ये उत्तम उपायको रुपमा कुन कुन विकल्पहरु अवलम्वन गरेको थियो? **(बहुउत्तर)**	आन्तरिक श्रोतसाधन परिचालन गरी सफल उपाय अवलम्वन गरेको..... A बाह्य सहयोग लिई सफल उपाय अवलम्वन गरेको..... B आन्तरिक श्रोतसाधन जुटाउन नसकेकोले प्रयास असफल भएको (दक्षता, कोष, औजार ,इत्यादि)..... C बाह्य निकायमा अनुरोध गरेतापनि श्रोतसाधन जुटाउन नसकेकोले प्रयास असफल भएको..... D आवश्यक नपरेकोले केहि पहल नगरेको..... E अन्य(खुलाउने): _____ X1	
WE22	प्राकृतिक प्रकोपबाट योजना संचालनमा पर्नसक्ने असर न्यूनिकरण तथा वचावटका लागि खापाउसको बिद्यमान पूर्वतयारी के छ?	सोचेका छैनौं..... 1 यो प्रकृयामा छ..... 2 योजना तयार गरेका छौं..... 3 आंशिक कार्यान्वयन गरेका छौं..... 4 पूर्णरुपमा कार्यान्वयन गरेका छौं..... 5	

खण्ड-B10: खापाउसद्धारा योजनाको मुल्यांकन

प्रश्ननं.	प्रश्न	ज्वाफ	Skipping
WS5	खापाउसले हालको खापायोजना संचालनको अवस्थालाई कसरि मूल्यांकन गरेको छ? नोट : ***पुर्ण संचालित*** **-** *पूर्णरुपमा संचालनमा रहेको र मर्मत गर्न नपर्ने ।* ***सामान्य मर्मत*** **-** *खापाउसले वाह्य प्राविधिक तथा आर्थिक सहयोग बिना नै आफैले मर्मत गर्न सक्ने ।* ***ठुलो मर्मत*** **-** *खापाउसले दक्ष प्राविधिक (खापासटे) को सहयोग बिना आफैले मर्मत गर्न नसक्ने र वाह्य आर्थिक सहयोग समेत आवस्यक पर्नसक्ने ।* ***पुनर्स्थापन*** *- खापाउसलाई योजनाको सेवास्तर सुधार्न वाह्य प्राविधिक (इन्जीनियर) तथा आर्थिक दुवै सहयोग चाहिने ।*	पूर्णरुपमा संचालन भएको..... 1 सामान्य मर्मतको आवश्यकता..... 2 ठुलो मर्मतको आवश्यकता..... 3 पुनर्स्थापनको आवश्यकता..... 4 संचालनमा छैन (सेवा वन्द रहेको)..... 5	
WS6	यदि तपाईको खापायोजना पुर्णरुपमा संचालन छैन भने, के कस्ता समस्या छन्? **(बहुउत्तर)** (*यदि खापायोजना संचालन वा मर्मतमा समस्या छ भने कस्तो समस्या छ सोध्ने*)	मुहानमा पानीको मात्रा प्रयाप्त नभएकोले (पानीको मात्रामा समस्या)..... A योजना क्षेत्रमा घरधुरीसंख्या बढेकोले..... B उपभोक्ताहरुले निजी धारा माग गरेकोले..... C पानीको गुणस्तर मुहानमा नराम्रो भएकोले..... D पानीको गुणस्तर मुहानमा राम्रो भएको तर धारामा गुणस्तर राम्रो नभएको..... E अन्य(खुलाउने): _____ X1	

समाप्त

Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation Project (NAPA WASH), Nepal

फिनल्याण्ड सरकारको सहयोगमा बनेका ग्रामीण खानेपानी योजनाहरुको दिगोपना सम्बन्धी अध्ययन

जिल्ला: नवलपरासी

घरधुरी स्तरिय अध्ययन

खण्ड-D1: सामान्य जानकारी

HH2	गाविसको नाम:	_____
HH3	योजनाको नामः	_____
HH8	अन्तरवार्ता मितिः	__ __ / __ __ / 2015

खण्ड-D3: पारिवारिक विशेषता

जिल्ला ID:	☐☐
गाविस ID:	☐☐
खापायोजनाको ID:	☐☐
घर ID:	☐☐

प्रश्ननं	प्रश्न	ज्वाफ	Skipping
HC1	घरमुलिको नाम:	_____	
HC2	अन्तरवार्ता दिनेको नाम:	_____	
HC20	सरसफाई र स्वच्छता संबन्धमा तपाईको समुदायमा कुन समुह वा समिति जिम्मेवार छ?	खापाउस ..... 1 बडा स्तरीय स्वच्छता तथा सरसफाई समिति.... 2 समुदाय स्तरमा कुनै पनि समुह जिम्मेवार छैनन्..... 3 अन्य भए (खुलाउने): _____ 6 थाहा छैन..... 8	

खण्ड-D4: घरपरिवार स्तरमा खानेपानीको सुविधा

सि नं	प्रश्न	जवाफ	Skipping
HL1	तपाईको घरमा खापायोजनाको धारा निजि जडान छ कि समुदायिक धारा प्रयोग गर्नुहुन्छ?	निजि धारा..... 1 सामुदायिक धारा..... 2	

सि नं	प्रश्न	जवाफ	Skipping
HL2	**निजि जडान भए, तपाईको घरमा खानेपानी भर्ने धारा घरभित्र नै राखिएको छ कि घर बाहिर आगन कम्पाउन्डमा राखिएको छ?** *खानेपानी भर्ने धारा घरभित्र नै राखिएको छ कि घर बाहिर आगनमा गाग्री भरेर भित्र लाने गरिएको छ सोध्ने । खानेपानीको गाग्री भर्ने धारा कहां राखिएको स्पष्ट गरि गोलो लगाउने ।*	**घरभित्र छ**..... 1 **आगन/कम्पाउन्डमा छ** 2	
HL3	**यदि सामुदायिक धारा प्रयोग गर्नुहुन्छ भने, उक्त धारा घरबाट कति टाढा छ? (मिटरमा लेख्ने)** *आफै हिडेर पाईला गनेर नाप्ने (**1 कदम = 0.6 मिटर**) यदि 100 कदम छ भने = 0.6 * 100 = 60 मिटर ।*	___ ___ ___ **मिटर**	
HL4	**यदि सामुदायिक धारा प्रयोग गर्नुहुन्छ भने, सामान्यतः उक्त धाराबाट घरमा एक पटक पानी ल्याउन कति समय लाग्छ?** *एक पटक पानी ल्याउन लाग्ने समय (जान, पालो पर्खन, २० लिटरको भाँडो/गाग्रीमा पानी भर्न र फर्कन लाग्ने समय) मिनेटमा लेख्ने ।*	___ ___ ___ **मिनेट**	
HL5	**यदि सामुदायिक धारा प्रयोग गर्नुहुन्छ भने, तपाईले प्रयोग गरिरहेको धारामा जम्मा कति घरपरिवारले पानी खानुहुन्छ?** *उक्त सामुदायिक धारा कति घरपरिवारको लागि हो स्पष्ट गर्ने ।*	___ ___ **घर सख्या**	
HL6	**तपाईले प्रयोग गरिरहेको धारामा वर्षको कति महिना पानी आउछ?** *(यस वर्ष पानी संचालन नभएको अवधि हिसाब गरेर लेख्ने)*	___ ___ **महिना प्रति बर्ष**	
HL7	**तपाईले प्रयोग गरिरहेको धारामा दिनको कति घण्टा पानी आउँछ** ?	___ ___ **घण्टा प्रति दिन**	
HL8	**तपाईले प्रयोग गरिरहेको धारामा अहिले पानी आइरहेको छ?**	**छ**..... 1 **छैन**..... 2	
HL9	**धारामा पानीको बहाव (water flow) कति छ, नाप लिने** *(धारामा आफै गई २००० मिलिलीटरको मापन जार र स्टपवाच प्रयोग गरि धारा पुरा खोलेर पानी कति मिलिलीटर भर्न कति सेकेन्ड लागयो नाप लिने । जारमा १५०० देखि २००० मिलिलीटर पानी भरेर नाप लिने)*	__ __ __ __ **मिलिलीटर** __ __ __ **सेकेन्ड**	

सि नं	प्रश्न	जवाफ	Skipping
HL10	<u>बर्षायाममा</u> तपाईको धारामा आउने पानीको गुणस्तर कस्तो छ? *Ref: Ask the Quality of water* ***in the tapstand.*** *"Good Quality of water" mean acceptable by the household from their perception on* ***taste, smell and appearance*** *(appearance colour, turbidity etc). Ask whether always good, most of the time good, etc.* *Improved/unimproved sources: Possibility of contamination in the source will be taken from type of sources asked in the WUSC interview. HH interview will assess quality of water in their tap. "The highest level of service on quality of water (level-5)" will be defined by the use of improved source and always good quality in the tap in both wet and dry seasons.*	कहिल्यै राम्रो गुणस्तरको पानी आउदैन…..... 1 कहिलेकाहि राम्रो गुणस्तरको पानी आउछ…… 2 प्राय राम्रो गुणस्तरको पानी आउछ…… 3 धेरैजसो समय राम्रो गुणस्तरको पानी आउछ….. 4 सधै राम्रो गुणस्तरको पानी आउछ…… 5	
HL11	<u>सुख्खा याममा</u> तपाईको धारामा आउने पानीको गुणस्तर कस्तो छ?	कहिल्यै राम्रो गुणस्तरको पानी आउदैन…..... 1 कहिलेकाहि राम्रो गुणस्तरको पानी आउछ…… 2 प्राय राम्रो गुणस्तरको पानी आउछ…… 3 धेरैजसो समय राम्रो गुणस्तरको पानी आउछ….. 4 सधै राम्रो गुणस्तरको पानी आउछ…… 5	

खण्ड-D5: खापाउसको जवाफदेहिता बारे उपभोक्ताको मुल्यांकन

सि नं	प्रश्न	ज्वाफ	Skipping
HA1	गत बर्ष खापाउसको बार्षीक साधरण सभा भयो कि भएन? यदि भएमा उक्त साधरण सभामा उपभोक्ताहरुलाई खापाउसले योजनामा संकलित कोष र संचालन तथा संभार मा भएको खर्च रकम बारे जानकारी गराईएको थियो?	जानकारी गराइयो…… 1 जानकारी गराइएन…… 2 साधारण सभा भएन…… 3 थाहा छैन…… 8	
HA2	बार्षीक साधरण सभा भएको थियो भने तपाईको घरवाट कोहि सहभागि हुनु भएको थियो?	थियो…… 1 थिएन…… 2	
HA5	खापाउसले दिएको खानेपानीको सेवास्तरलाइ कसरी मुल्यङ्कन गर्नु हुन्छ अंक दिनुहोस्? *(सबै भन्दा राम्रो भएमा 5 रसबैभन्दा नराम्रो भएमा 1 अंकदिनुहोस)*	धेरै नराम्रो…… 1 नराम्रो…..... 2 सन्तोषजनक…… 3 राम्रो…..... 4 धेरै राम्रो…… 5 मलाई थाहा छैन… 8	
HA6	खापासउसको सहभागितात्मक निणर्य प्रकृयालाई कस्तो मुल्यङ्कन गर्नु हुन्छ अंक दिनुहोस्? *(सबै भन्दा राम्रो भएमा 5 रसबैभन्दा नराम्रो भएमा 1 अंकदिनुहोस)*	धेरै नराम्रो…..... 1 नराम्रो…..... 2 सन्तोषजनक…… 3 राम्रो…… 4 धेरै राम्रो…..... 5 मलाई थाहा छैन… 8	

सि नं	प्रश्न	ज्वाफ	Skipping
HA7	खापासउसको आर्थिक पारदर्शितालाई कस्तो मुल्यङ्कन गर्नु हुन्छ अंक दिनुहोस? *(सबै भन्दा राम्रो भएमा 5 रसवैभन्दा नराम्रो भएमा 1 अंकदिनुहोस)*	धेरै नराम्रो…..... 1 नराम्रो…..... 2 सन्तोषजनक…… 3 राम्रो…..... 4 धेरै राम्रो…… 5 मलाई थाहा छैन… 8	
HA10a	यदि तपाई हालको संचालन तथा संभार कार्यबाट संतुष्ट हुनुहुन्छ ?	संतुष्ट छु …..... 1 संतुष्ट छैन ….. 2	

खण्ड-D6: खानेपानी सुरक्षा सम्वन्धी आनिवानी

सि नं	प्रश्न	ज्वाफ	Skipping
HS2	तपाईको घरमा पानीलाई पिउन योग्य बनाउन सुद्धिकरणका उपाय अपनाउनु भएको छ?	अपनाएको छ..... 1 अपनाएको छैन..... 2 थाहा छैन..... 8	

खण्ड-D7: पानीको मुल्य

प्रश्ननं.	प्रश्न	ज्वाफ	Skipping
HW3	धारावाट खानेपानी सुविधा प्राप्त हुँदाका प्रमुख फाईदाहरु के के हुन्छ जस्तो लाग्दछ? *(विकल्पनभनीजवाफहरुमा गोलो लगाउने)* **(बहुउत्तर)**	आत्मसम्मान (गौरव)..... A स्वास्थ्यमा फाईदा..... B व्यक्तिगत सरसफाईमा फाईदा…… C चर्पी प्रयोग…… D घरको वातावरणीय स्वच्छता..... E तरकारी खेति..... F रेस्टुरेन्ट/अन्य व्यबसाय..... G पशुपालन..... H अन्य (खुलाउने): _____ X1	
HW6	तपाईको घरपरिवारले यो खापायोजना निर्माणमा योगदान गर्नु भएको थियो?	थियो…..... 1 थिएन …..... 2	
HW15	तपाईको परिवारले पानी महशुल समयमा नै तिर्ने गर्नु भएको छ?	छ..... 1 कहिलेकाँहि..... 2 छैन..... 3	
HW20	के तपाई पानी महशुल बढि तिर्न चाहनु हुन्छ? *(यदि बढि मशसुल तिरी अझ राम्रो सेवा बढाउन पाउने भएमा)*	चाहन्छु..... 1 चाहन्न..... 2 थाहा छैन..... 8	

समाप्त

Annex II: Finnish Funded Water Supply Schemes of Nawalparasi

Sr. No.	VDC/ Municipality	VDC wise Sr. No	Name of Water Supply Scheme	Ward no.	Served HHs	Geographical Location	Phase of Implement'n	Remarks
1	Benimanipur	1	Deusar WUSC	1	300	Iner Terai	1st	
2		2	Chiple Khola WUSC	2	220	Hill	1st	
3		3	Beteni WUSC	4	76	Iner Terai	1st	
4		4	Beteni WUSC	5	190	Iner Terai	2nd	
5		5	Dharadi WUSC	7	400	Hill	1st	
6		6	Paatkhare WUSC	8	80	Iner Terai	1st	
7	Bharatipur	1	Bharatipur WUSC	3,5,9	153	Hill	3rd	
8		2	Dharapaani WUSC	6,8	45	Hill	3rd	
9	Bulingtaar	1	Devchuli WUSC	7	79	Hill	3rd	
10		2	Bulingtaar WUSC	9	30	Hill	3rd	
11	Dandajheri	1	Dhabadi WUSC	4	34	Hill	2nd	
12	Dedgaun	1	Bhakhola WUSC	1	35	Hill	1st	
13		2	Bayerjhuti WUSC	3	15	Hill	1st	
14		3	Chituwakhola WUSC	3,4	115	Hill	1st	
15		4	Bandipure Charchare WUSC	4,6	62	Hill	1st	
16		5	Birahi WUSC	5	70	Hill	1st	
17		6	Pokhate WUSC	6	20	Hill	1st	
18		7	Bainda WUSC	6	10	Hill	2nd	
19		8	Prindi WUSC	7	20	Hill	1st	
20		9	Jaishi Majhuwa	7,8	155	Hill	1st	
21		10	Dhawad WUSC	9	50	Hill	2nd	
22		11	Padke WUSC	9	20	Hill	1st	
23		12	Khasipaani Pandhero WUSC	9	5	Hill	2nd	
24		13	Bhadaure WUSC	9	6	Hill	3rd	
25	Deurali	1	Gohaari WUSC	1	20	Hill	1st	
26		2	Pahirobash WUSC	1	40	Hill	2nd	
27		3	Beluwa WUSC	5	300	Iner Terai	1st	
28		4	Aanpe Kholsa WUSC	6	20	Iner Terai	1st	
29		5	Rumsi (Upper) WUSC	7	50	Hill	2nd	
30		6	Rumsi (Lower) WUSC	7	70	Hill	2nd	
31		7	Baseni WUSC	8	26	Hill	2nd	

32		8	Namjaakot WUSC	8	34	Hill	2nd	
33		9	Chapaha WUSC	9	50	Hill	2nd	
34		10	Gahakhola WUSC	9	30	Hill	2nd	
35	Devchuli Municipility	1	Bishal Tar WUSC	9	450	Hill	1st	
36		2	Kumsot WUSC	6	60	Hill	1st	
37		3	Devchuli WUSC	7	500	Hill	2nd	
38		4	Devchuli WUSC	8,9	450	Hill	2nd	
39		5	Munde WUSC	6	150	Hill	2nd	
40		6	Kirtipur WUSC	6	45	Hill	3rd	
41		7	Kirtipur WUSC	6	45	Hill	3rd	
42	Dhaubaadi	1	Chauraadhaap Kokhetol WUSC	7	49	Hill	3rd	
43	Gaindakot Municipality	1	Tatribaas WUSC	3	300	Tarai	3rd	
44		2	Deuraali WUSC	3	500	Tarai	3rd	
45		3	Mukundapur WUSC	11	2310	Tarai	1st	
46		4	Amarapuri WUSC	14,15,16,17	1410	Tarai	1st	
47		5	Gahataandi WUSC	14,15,16,17	200	Tarai	1st	
48		6	Taranagar WUSC	14,15,16,17	1417	Tarai	1st	
49	Hupsekot	1	Hupsekot WUSC	2,4,5	146	Hill	2nd	
50			Pipengi Goura WUSC	7,8	150	Hill	3rd	
51	Jaubaari	1	Gaagri Khola WUSC	9	105	Hill	3rd	
52		2	Kaanchi Paani WUSC	6	25	Hill	3rd	
53		3	Gaagri Khola WUSC	3	62	Hill	3rd	
54	Kotthar	1	Thaambeshi WUSC	5	84	Hill	3rd	
55		2	Kotthar aangkhola WUSC	2,3,7,	51	Hill	3rd	
56	Mainaghaat	1	Baankhola WUSC	1	33	Hill	3rd	
57		2	Jhurkhola WUSC	1	10	Hill	3rd	
58		3	Pipaltaar WUSC	1	3	Hill	3rd	
59		4	SimalDhaap WUSC	1	5	Hill	3rd	
60		5	Deurali Mainaghat WUSC	2,3,8	220	Hill	1st	
61		6	Pragatisil WUSC	4	110	Iner Terai	1st	
62		7	Kulugaura WUSC	5	90	Iner Terai	1st	
63		8	Dubakuna	9	90	Iner Terai	1st	
64	Mithukaram	1	Mithukaram WUSC	2,3,4,5,6,7,8,9	244	Hill	3rd	

65	Naram	1	Dharapaani WUSC	1	67	Hill	2nd	
66		2	Tirtire WUSC	2,3	76	Hill	2nd	
67		3	Ghojaardi WUSC	3	100	Hill	3rd	
68		4	Kiching Gaura WUSC	4	60	Hill	2nd	
69	Nayabelhaani	1	Nayabelhaani WUSC	5	364	Iner Terai	2nd	
70		2	Damar Dwara WUSC	6	240	Iner Terai	2nd	
71	Raankachuli	1	Raankachuli Dwari WUSC	1,8	75	Hill	2nd	
72		2	Lindi WUSc (A)	1	22	Hill	2nd	
73		3	Lindi WUSc (B)	1	64	Hill	2nd	
74		4	Chanaute WUSC	2	35	Hill	2nd	
75		5	Katle Khola WUSc	2	50	Hill	1st	
76		6	Katle Khola WUSc	3	5	Hill	1st	
77		7	Katle Khola WUSc	4	80	Hill	1st	
78		8	Maha Gaira WUSC	5	45	Hill	2nd	
79		9	Pepengi Khola WUSC	6	23	Hill	1st	
80		10	Koredi paani WUSC	7	25	Hill	1st	
81		11	Jaluke WUSC	7	19	Hill	3rd	
82		12	Anigram WUSC	7	29	Hill	3rd	
83		13	KoteGhaat WUSC	8	27	Hill	3rd	
84		14	Lohadandi WUSC	8	11	Hill	2nd	
85		15	Budaari WUSC	9	12	Hill	1st	
86		16	Damarkhola WUSC	9	20	Hill	1st	
87	Rakuwa	1	Amrit Dhara WUSC	1	123	Hill	2nd	
88		2	Bhalodi WUSC	3	35	Hill	2nd	
89		3	Baha Khola WUSC	4,5,6,7, 8,9,	500	Hill	2nd	
90		4	Chermakuna WUSC	7	10	Hill	2nd	
91		5	Madanswora WUSC	4	5	Hill	2nd	
92		6	Pipaltaari WUSC	4	10	Hill	2nd	
93		7	Dharadi WUSC	7,8	90	Hill	2nd	
94		8	Rogmaadi WUSC	9	50	Hill	2nd	
95		9	Beldanda WUSC	9	12	Hill	2nd	
96		10	Jugepaani WUSC	9	7	Hill	2nd	
97		11	Sirchaap WUSC	7	18	Hill	2nd	
98		12	Kuwaadi WUSC	4	5	Hill	2nd	

99	Raamnagar	1	Ramnagar WUSC	1,5,6	1000	Tarai	3rd	
100	Ratanpur	1	Ratanpur WUSC	1	60	Hill	2nd	
101		2	Aahaale WUSC	8	64	Hill	2nd	
102		3	Hurjeli WUSC	9	59	Hill	3rd	
103		4	Dashani WUSC	5	64	Hill	3rd	
104		5	Town Bhagar WUSC	6	105	Iner Terai	2nd	
105	Ruchang	1	Naari Bhangyang WUSC	2	40	Hill	2nd	
106		2	Khahare Khola WUSC	3	12	Hill	1st	
107		3	Falchar WUSC	3	17	Hill	1st	
108		4	Bhalkum WUSC	3	25	Hill	1st	
109		5	Prathan khola WUSC	3	4	Hill	1st	
110		6	Prathan khola WUSC	3	9	Hill	1st	
111		7	Aakhaldanda WUSC	3	15	Hill	1st	
112		8	Raate WUSC	5	42	Hill	1st	
113		9	Faadre WUSC	5	8	Hill	1st	
114		10	Raatekhola WUSC	6,7,8	150	Hill	2nd	
115		11	Thulo Pandhero WUSC	7	15	Hill	2nd	
116		12	Baardi Kholsa WUSC	9	17	Hill	1st	
117		13	Gupti Kuwa WUSC	9	30	Hill	1st	
118		14	Chisapaani WUSC	9	18	Hill	1st	
119		15	Bhaalukhola WUSC	1	59	Hill	1st	
120		16	Dipaasi Kuna WUSC	1	7	Hill	1st	
121	Sunwal Municipility	1	Bisasaye WUSC	6	1000	Tarai	1st	

Annex III: Pair Wise Comparison Questionnaire for Experts Judgement.

		A.1.1	A.2.1	A.2.2	A.3.1	A.4.1	B.1.1	B.1.2	B.2.1	B.2.2	A.3.1	B.3.2	C.1.1	C.1.2	C.1.3	C.2.1	C.3.1	C.3.2	C.3.3	C.4.1	C.4.2	C.4.3	C.5.1	D.1.1	D.2.1	D.3.1	D.4.1	E.1.1	E.1.2	E.2.1	E.2.2	E.2.3	E.3.1	E.3.2	E.3.3
	`	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC	Participation of users in scheme related activities	Users willingness to pay water tariff	Establishment of O&M fund & saving	Use of saving / surplus fund in repair and replacement	Financial transparency in fund mobilization	Sufficient tariff collection for O&M, repair and replacement	External financial support in O&M and major repair and replacement works	Existence and functioning of WUSC	Written statute and registration of WUSC in DWRC	Leadership quality and activeness of WUSC	Existence, functioning & Clarity of roles for operation and maintenance management.	WUSC selection system & practice of AGM	Decision making process of WUSC	Public hearing and public audit system of WUSC	Linkage of WUSC to FEDWASUN	Linkage with private entrepreneurship in service provision and management	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	External capacity building and follow-up support	Availability of Technical skills for all operation and maintenance work.	Availability of Tools and Fittings for all operation and maintenance work.	System appropriate for multiple application of water (MUS)	Scheme providing Basic Level of Water Supply service	Strategy of WUSC to combat CC and mitigate Natural Calamity	Measures taken to minimize threat in physical system of WS scheme	Strategy of WUSC to combat source depiction problem	Measures taken to combat threat of water source contamination	Identification and protection of alternative sources for emergency situation	Implementation of encouraging and reinforcing good hygiene practice	Measures taken to combat threat of water born disease	Proper management of excess water
A.1.1	Conflict in source / component location	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
A.2.1	Proportionate representation of cast / ethnicity in WUSC	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
A.2.2	Proportionate representation of man and women in WUSC	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
A.3.1	Satisfaction of users in service provided by WUSC	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
A.4.1	Participation of users in scheme related activities	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.1.1	Users willingness to pay water tariff	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.1.2	Establishment of O&M fund & saving	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.2.1	Use of saving / surplus fund in repair and replacement	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.2.2	Financial transparency in fund mobilization	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.3.1	Sufficient tariff collection for O&M, repair and replacement	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
B.3.2	External financial support in O&M and major repair and replacement works	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.1.1	Existence and functioning of WUSC	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.1.2	Written statute and registration of WUSC in DWRC	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.1.3	Leadership quality and activeness of WUSC	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.2.1	Existence, functioning & Clarity of roles for operation and maintenance management.	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.3.1	WUSC selection system & practice of AGM	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.3.2	Decision making process of WUSC	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.3.3	Public hearing and public audit system of WUSC	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.4.1	Linkage of WUSC to FEDWASUN	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.4.2	Linkage with private entrepreneurship in service provision and management	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.4.3	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
C.5.1	External capacity building and follow-up support	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
D.1.1	Availability of Technical skills for all operation and maintenance work.	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
D.2.1	Availability of Tools and Fittings for all operation and maintenance work.	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
D.3.1	System appropriate for multiple application of water (MUS)	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
D.4.1	Scheme providing Basic Level of Water Supply service	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.1.1	Strategy of WUSC to combat CC and mitigate Natural Calamity	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.1.2	Measures taken to minimize threat in physical system of WS scheme	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.2.1	Strategy of WUSC to combat source depiction problem	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.2.2	Measures taken to combat threat of water source contamination	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.2.3	Identification and protection of alternative sources for emergency situation	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑	←is=or<or>↑
E.3.1	Implementation of encouraging and reinforcing good hygiene practice	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑	←is=or<or>↑
E.3.2	Measures taken to combat threat of water born disease	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1	←is=or<or>↑
E.3.3	Proper management of excess water	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	Please Select	1

Annex IV: Responses from WUSC and HH level Respondent on Factors of Sustainability.

Sr.No	VDC Name	Name OfWS Scheme	Covered HHs	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC	Participation of users in scheme related activities	Users willingness to pay water tariff	Establishment of O&M fund & saving	Use of saving / surplus fund in repair and replacement	Financial transparency in fund mobilization	Sufficient tariff collection for O&M, repair and replacement	External financial support in O&M and major repair and replacement works	Existence and functioning of WUSC	Written statute and registration of WUSC in DWRC	Leadership quality and activeness of WUSC	Existence, functioning & Clarity of roles for operation and maintenance management.	WUSC selection system & practice of AGM	Decision making process of WUSC	Public hearing and public audit system of WUSC	Linkage of WUSC to FEDWASSN	Linkage with private entrepreneurship in service provision and management	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	External capacity building and follow-up support	Availability of Technical skills for all operation and maintenance work.	Availability of Tools and Fittings for all operation and maintenance work.	System appropriate for multiple application of water (MIS)	Scheme providing Basic Level of Water Supply service	Strategy of WUSC to combat CC and mitigate Natural Calamity	Measures taken to minimize threat in physical system of WS scheme	Strategy of WUSC to combat source depiction problem	Measures taken to combat threat of water source contamination	Identification and protection of alternative sources for emergency situation	Implementation of encouraging and reinforcing good hygiene practice	Measures taken to combat threat of water born disease	Proper management of excess water
1	Amarapuri	Amarapuri Water Supply and Sanitation Scheme	1760	No	No	Yes	Very Good	Very Good	Good	Yes	Yes	Very Good	Yes	Yes	Excellent	Yes	Excellent	Yes	Good	Excellent	Yes	Yes	No	Yes	Yes	Good	Excellent	No	Yes	In Process	Yes	Yes	Excellent	Yes	Yes	Poor	Yes
2		Kabatadi Water Supply and sanitation Scheme	225	No	No	No	Good	Good	Good	Yes	No	Poor	No	Yes	Poor	Yes	Poor	No	Poor	Poor	Yes	No	No	No	No	Very Good	Good	No	No	No	Yes	Yes	Poor	No	No	Poor	Yes
3	Bhimanapur	Chiple Khola Water Supply and Sanitation Scheme	210	No	Yes	No	Fair	Fair	Poor	No	No	Poor	No	No	Poor	No	Poor	Yes	Poor	Poor	No	No	No	No	Yes	Poor	Good	No	No	No	Yes	No	Poor	No	No	Poor	No
4		Betani Water Supply and sanitation Scheme	76	No	No	No	Fair	Fair	Poor	No	No	Poor	No	No	Poor	No	Poor	Yes	Good	Poor	No	No	No	No	Yes	Fair	Poor	No	No	No	Yes	No	Poor	No	No	Poor	No
5		Betani(Sital Tandi) Water Supply and sanitation Scheme	183	No	No	No	Good	Good	Good	Yes	No	Poor	No	No	Poor	No	Poor	No	Good	Poor	Yes	No	No	No	No	Good	Excellent	No	No	No	Yes	No	Poor	No	Yes	Poor	No
6	Bhuratipur	Bhuratipur water supply and Sanitation scheme	153	No	No	No	Good	Good	Very Good	Yes	No	Good	No	Yes	Poor	Yes	Poor	No	Good	Excellent	No	No	No	Yes	No	Fair	Good	No	No	No	No	No	Good	No	Yes	Poor	No
7	Bulingtar	Devchuli Water supply and sanitation Scheme	79	No	Yes	Yes	Very Good	Good	Very Good	Yes	No	Very Good	No	Yes	Good	Yes	Fair	No	Good	Excellent	No	Yes	No	Yes	No	Good	Good	No	Yes	No	Yes	Yes	Good	No	Yes	Poor	Yes
8	Dadajhora	Dhabadi Water Supply and Sanitation Scheme	34	No	Yes	No	Good	Good	Poor	Yes	No	Poor	No	Yes	Poor	Yes	Poor	Yes	Good	Excellent	No	No	No	No	Yes	Poor	Good	No	No	No	No	Yes	Good	No	No	Poor	No
9	Dodgaun	Chhuwa Khola Water Supply and Sanitation Scheme	108	No	Yes	Yes	Good	Very Good	Very Good	Yes	No	Good	No	No	Good	Yes	Poor	No	Very Good	Excellent	Yes	Yes	No	No	No	Good	Excellent	No	No	No	Yes	Yes	Good	No	Yes	Poor	No
10		Dhuwad Water Supply and sanitation scheme	52	No	No	Yes	Good	Very Good	Very Good	Yes	No	Very Good	Yes	No	Good	No	Poor	Yes	Very Good	Excellent	No	No	No	No	Yes	Very Good	Good	No	No	No	Yes	Yes	Poor	No	Yes	Fair	Yes
11		Doosmajhuwa Water Supply and Sanitation Scheme	155	No	Yes	No	Good	Good	Very Good	Yes	No	Good	Yes	Yes	Poor	No	Good	No	Good	Excellent	No	No	No	No	No	Very Good	Good	No	No	No	No	No	Poor	No	Yes	Poor	No
12		Bandipure Chhachhare Water Supply and Sanitation Scheme	66	No	No	Yes	Good	Very Good	Very Good	Yes	No	Very Good	Yes	No	Good	Yes	Fair	Yes	Very Good	Excellent	Yes	No	No	No	Yes	Good	Excellent	No	No	No	No	No	Excellent	Yes	Yes	Poor	No
13	Dwarali	Jampes Thadis khola water supply and sanitation scheme	63	No	Yes	Yes	Very Good	Good	Very Good	Yes	Yes	Very Good	Yes	No	Good	Yes	Poor	No	Fair	Excellent	Yes	No	No	No	No	Fair	Good	No	Yes	No	No	No	Poor	No	Yes	Very Good	No
14		chapaha Water supply and sanitation scheme	64	No	Yes	No	Fair	Good	Very Good	No	No	Poor	No	No	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Very Good	Good	No	No	No	No	No	Excellent	Yes	No	Fair	No
15	Devchuli	Bisalter Water Supply and Sanitation Scheme	450	No	No	No	Good	Very Good	Very Good	Yes	Yes	Fair	No	Yes	Excellent	Yes	Poor	No	Excellent	Excellent	Yes	No	No	No	No	Very Good	Good	No	No	In Process	Yes	Yes	Excellent	Yes	Yes	Poor	No
16		Devchuli A Water supply and sanitation Scheme	459	No	No	No	Very Good	Very Good	Very Good	Yes	Yes	Good	Yes	Yes	Excellent	Yes	Excellent	Yes	Excellent	Excellent	Yes	Yes	No	Yes	Yes	Very Good	Good	No	No	In Process	Yes	No	Excellent	Yes	No	Poor	No
17		Devchuli B Water supply and Sanitation Scheme	350	No	No	Yes	Excellent	Very Good	Very Good	Yes	Yes	Good	Yes	Yes	Excellent	Yes	Excellent	Yes	Excellent	Excellent	Yes	No	No	Yes	Yes	Very Good	Excellent	No	No	In Process	Yes	Yes	Excellent	Yes	Yes	Poor	Yes
18	Dhanbadi	Chaundibarp Kokhetol water supply and Sanitation scheme	49	No	Yes	Yes	Good	Very Good	Very Good	Yes	No	Good	No	Yes	Poor	Yes	Fair	No	Very Good	Excellent	Yes	Yes	No	Yes	Yes	Good	Good	No	No	No	Yes	Yes	Excellent	Yes	Yes	Poor	No
19	Gairidaloi	Tinbaas Water Supply and Sanitation Scheme	68	No	No	No	Very Good	Very Good	Very Good	Yes	Yes	Very Good	Yes	No	Poor	Yes	Very Good	No	Excellent	Excellent	No	No	No	No	No	Poor	Good	No	No	No	Yes	No	Poor	No	No	Poor	Yes
20	Hapsekot	Hapsekot-A Water supply and sanitation Scheme	146	No	No	No	Good	Good	Very Good	No	No	Good	No	Yes	Poor	No	Poor	Yes	Good	Excellent	No	No	No	Yes	Yes	Good	Good	No	Yes	No	Yes	Yes	Poor	No	Yes	Poor	No
21	Jasbuan	Jagri Khola water supply and Sanitation Scheme	109	No	No	Yes	Good	Fair	Very Good	No	No	Poor	No	Yes	Poor	Yes	Poor	Yes	Good	Excellent	No	No	No	No	Yes	Good	Good	No	No	No	No	Yes	Good	No	Yes	Poor	No
22	Korthar	Tham Besht Water Supply and Sanitation Scheme	87	No	Yes	No	Very Good	Good	Very Good	Yes	No	Poor	No	Yes	Poor	No	Fair	No	Good	Excellent	No	No	No	No	No	Good	Good	No	Yes	No	Yes	Yes	Good	No	No	Poor	No
23	Mamaghat	Dhurali-Mamaghaat water supply and sanitation Scheme	146	No	Yes	Yes	Good	Good	Very Good	Yes	No	Poor	No	Yes	Good	Yes	Poor	Yes	Good	Excellent	No	Yes	No	No	Yes	Good	Good	No	No	In Process	No	No	Poor	No	Yes	Poor	No
24		Dowakana water Supply and sanitation Scheme	125	No	No	Yes	Good	Good	Very Good	Yes	No	Good	No	Yes	Good	Yes	Poor	No	Good	Excellent	Yes	No	No	Yes	No	Good	Good	No	No	In Process	Yes	No	Excellent	Yes	Yes	Poor	Yes
25	Mithakarnam	Mukundpur Water Supply and Sanitation Scheme	244	No	No	No	Good	Good	Very Good	Yes	No	Good	No	Yes	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Very Good	Good	No	No	No	No	Yes	Good	No	No	Poor	No
26	Mukundapur	Narum water Supply and sanitation Scheme	2849	No	No	Yes	Very Good	Very Good	Good	Yes	Yes	Good	No	Yes	Excellent	Yes	Poor	Yes	Excellent	Excellent	Yes	Yes	No	Yes	Yes	Very Good	Excellent	No	No	In Process	Yes	Yes	Excellent	Yes	Yes	Fair	No
27	Narum	Narum water Supply and sanitation Scheme	50	No	No	No	Very Good	Good	Very Good	No	No	Very Good	No	No	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Good	Good	No	Yes	No	Yes	No	Excellent	Yes	Yes	Poor	No
28		Kheyarli Water supply and Sanitation Scheme	84	No	Yes	No	Good	Good	Very Good	Yes	No	Poor	No	No	Poor	Yes	Poor	Yes	Good	Excellent	No	No	No	Yes	Yes	Fair	Good	No	Yes	No	No	No	Poor	No	Yes	Poor	No
29	Nayabelhani	Nayabelhani Water supplu and Sanitation Scheme	269	No	No	No	Very Good	Very Good	Very Good	Yes	No	Very Good	No	Yes	Good	Yes	Fair	Yes	Very Good	Excellent	Yes	Yes	No	Yes	Yes	Very Good	Good	No	No	In Process	Yes	Yes	Good	No	Yes	Fair	Yes
30	Rakachuk	Ramkachuli-Diwan water supply and sanitation scheme	19	No	Yes	No	Poor	Fair	Poor	No	No	Poor	No	No	Poor	No	Poor	No	Poor	Poor	No	No	No	No	No	Poor	Poor	No	No	No	No	No	Poor	No	No	Poor	No
31		Kafle khola water supply and sanitation scheme	42	No	Yes	Yes	Good	Good	Poor	No	No	Poor	No	No	Poor	No	Poor	No	Good	Poor	No	No	No	No	No	Poor	Good	No	Yes	No	No	No	Poor	No	No	Poor	No
32	Sakuwa	Amrit Dhara Water Supply and Sanitation Scheme	125	No	No	Yes	Good	Very Good	Very Good	Yes	No	Fair	No	No	Excellent	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Good	Good	No	No	No	No	Yes	Excellent	Yes	Yes	Poor	No
33		BhitaKhola Water Supply and Sanitation Scheme	216	No	No	Yes	Good	Good	Very Good	No	No	Poor	No	Yes	Good	Yes	Poor	No	Good	Excellent	No	No	No	Yes	No	Good	Good	No	No	No	No	No	Poor	No	Yes	Poor	No
34	Ramnagar	Ramnagar Water Supply and Sanitation Scheme	1000	No	No	Yes	Good	Very Good	Good	Yes	Yes	Good	No	No	Excellent	Yes	Poor	No	Very Good	Excellent	Yes	No	No	No	No	Good	Excellent	No	No	No	Yes	Yes	Poor	No	Yes	Good	No
35	Ratanpur	Ratanpur Water Supply and Sanitation Scheme	60	No	Yes	No	Good	Good	Good	Yes	No	Poor	No	Yes	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Poor	Good	No	No	No	Yes	Yes	Poor	No	No	Poor	No
36		Bangar Water Supply and Sanitation Scheme	105	No	No	No	Fair	Good	Very Good	Yes	No	Poor	No	Yes	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Fair	Poor	No	No	No	Yes	No	Poor	No	No	Poor	No
37	Ruchang	Ratnpuani Water Supply and Sanitation Scheme	48	No	Yes	No	Good	Good	Very Good	Yes	No	Very Good	No	Yes	Poor	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Fair	Good	No	No	No	Yes	No	Excellent	Yes	Yes	Poor	No
38		Byaghaun Water Supply and sanitation Scheme	64	No	No	No	Very Good	Good	Very Good	Yes	No	Good	No	No	Good	Yes	Poor	No	Good	Excellent	No	No	No	No	No	Good	Good	No	No	No	Yes	Yes	Excellent	Yes	Yes	Poor	Yes
39		Ratokhola Water supply and Sanitation Scheme	126	No	No	Yes	Very Good	Good	Very Good	Yes	No	Fair	No	No	Poor	Yes	Poor	No	Good	Excellent	No	Yes	No	No	No	Fair	Good	No	Yes	No	No	No	Excellent	Yes	Yes	Poor	No
40	Sarwal	Bhetauhaya Water supply and Sanitation Scheme	1000	No	No	No	Good	Good	Poor	No	No	Poor	No	No	Poor	No	Poor	No	Poor	Poor	No	No	No	No	No	Good	Good	No	No	No	No	Yes	Poor	No	No	Fair	No

Annex V: Sustainability Assessment Framework with Experts Response and Factors Weight for Sustainability Measurement.

Goal	Criteria	Average weight of Criteria	Factors Code	Factors	Average weight of Factor	Sub Factor Code	Sub Factors	Average weight of Sub Factor	Remarks	Weights Assigned by Experts on Sustainability Factors of Community Managed Water Supply Scheme																Remarks
										E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	
Goal (Project Sustainability Assessment)	A. Social	0.15	A.1	Social Conflict	0.035	A.1.1	Conflict in source / component location	0.035	Sustainability Score = WUSC/Users Response Score x Weights of each Sustainability Factor Sustainability unlikely (SU) (<Lower Theshold Score), Sustainability possible (SP) (Between Lower and Upper Threshold Score) Sustainability likely (SL) (>Upper Theshold Score)	0.035	0.031	0.033	0.048	0.041	0.039	0.024	0.020	0.037	0.044	0.030	0.033	0.051	0.021	0.044	0.032	
			A.2	Social Inclusion & Equity	0.046	A.2.1	Proportionate representation of cast / ethnicity in WUSC	0.023		0.027	0.018	0.034	0.026	0.014	0.016	0.019	0.018	0.026	0.025	0.029	0.019	0.018	0.020	0.031	0.027	
						A.2.2	Proportionate representation of man and women in WUSC	0.023		0.032	0.019	0.033	0.024	0.020	0.021	0.018	0.017	0.030	0.025	0.032	0.018	0.018	0.020	0.022	0.025	
			A.3	User satisfaction/motivation	0.034	A.3.1	Satisfaction of users in service provided by WUSC	0.034		0.031	0.033	0.029	0.035	0.042	0.043	0.022	0.041	0.030	0.034	0.036	0.037	0.038	0.022	0.035	0.029	
			A.4	Community Participation	0.030	A.4.1	Participation of users in scheme related activities	0.030		0.027	0.029	0.031	0.033	0.031	0.031	0.022	0.042	0.029	0.039	0.028	0.028	0.039	0.020	0.030	0.028	
	B. Financial	0.18	B.1	Availability of Fund	0.062	B.1.1	Users willingness to pay water tariff	0.031		0.028	0.035	0.031	0.034	0.028	0.028	0.027	0.046	0.030	0.035	0.029	0.026	0.040	0.021	0.030	0.033	
						B.1.2	Establishment of O&M fund &saving	0.031		0.027	0.034	0.028	0.037	0.026	0.026	0.026	0.040	0.028	0.036	0.032	0.027	0.040	0.026	0.023	0.033	
			B.2	Use of Fund	0.063	B.2.1	Use of saving / surplus fund in repair and replacement	0.029		0.025	0.029	0.027	0.026	0.028	0.029	0.026	0.042	0.026	0.034	0.031	0.030	0.039	0.023	0.020	0.033	
						B.2.2	Financial transparency in fund mobilization	0.033		0.032	0.032	0.028	0.035	0.042	0.043	0.031	0.024	0.032	0.042	0.030	0.027	0.036	0.029	0.039	0.030	
			B.3	Financial durability	0.056	B.3.1	Sufficient tariff collection for O&M, repair and replacement	0.029		0.026	0.035	0.025	0.028	0.025	0.027	0.030	0.036	0.026	0.031	0.030	0.027	0.038	0.026	0.026	0.031	
						B.3.2	External financial support in O&M and major repair and replacement works	0.027		0.028	0.021	0.026	0.033	0.024	0.025	0.019	0.028	0.028	0.028	0.030	0.026	0.037	0.029	0.019	0.030	
	C. Institutional/ Management	0.32	C.1	Water Users and Sanitation Committee (WUSC)	0.097	C.1.1	Existence and functioning of WUSC	0.032		0.030	0.035	0.031	0.034	0.030	0.030	0.033	0.031	0.030	0.029	0.030	0.032	0.031	0.026	0.043	0.030	
						C.1.2	Written statute and registration of WUSC in DWRC	0.033		0.032	0.032	0.029	0.040	0.045	0.045	0.037	0.022	0.032	0.023	0.029	0.030	0.030	0.026	0.050	0.030	
						C.1.3	Leadership quality and activeness of WUSC	0.032		0.032	0.036	0.034	0.027	0.035	0.035	0.038	0.032	0.032	0.033	0.031	0.036	0.024	0.026	0.031	0.030	
			C.2	Operation Management System	0.029	C.2.1	Existence, functioning &Clarity of roles for operation and maintenance management.	0.029		0.028	0.033	0.026	0.030	0.027	0.027	0.029	0.032	0.029	0.028	0.031	0.031	0.028	0.024	0.031	0.029	
			C.3	Governance	0.090	C.3.1	WUSC selection system &practice of AGM	0.029		0.029	0.026	0.029	0.034	0.031	0.031	0.037	0.029	0.029	0.035	0.029	0.018	0.032	0.020	0.032	0.030	
						C.3.2	Decision making process of WUSC	0.029		0.027	0.036	0.027	0.027	0.026	0.026	0.030	0.018	0.028	0.029	0.027	0.035	0.034	0.023	0.035	0.030	
						C.3.3	Public hearing and public audit system of WUSC	0.032		0.029	0.020	0.028	0.038	0.036	0.036	0.038	0.037	0.029	0.037	0.026	0.024	0.039	0.026	0.038	0.030	
			C.4	Coordination and Linkage	0.076	C.4.1	Linkage of WUSC to FEDWASUN	0.024		0.026	0.021	0.033	0.027	0.018	0.018	0.023	0.019	0.026	0.020	0.032	0.024	0.028	0.028	0.016	0.031	
						C.4.2	Linkage with private entrepreneurship in service provision and management	0.025		0.038	0.019	0.025	0.016	0.021	0.021	0.017	0.033	0.040	0.019	0.033	0.027	0.024	0.024	0.019	0.031	
						C.4.3	Linkage with community and intermediate level actors; CBO,NGO, local government and other groups	0.026		0.041	0.020	0.026	0.030	0.022	0.022	0.019	0.030	0.040	0.021	0.029	0.027	0.020	0.026	0.023	0.020	
			C.5	External support	0.025	C.5.1	External capacity building and follow-up support	0.025		0.023	0.021	0.031	0.018	0.020	0.020	0.018	0.039	0.023	0.021	0.026	0.034	0.021	0.028	0.020	0.031	
	D. Technical/ Service	0.12	D.1	Technical Skill	0.034	D.1.1	Availability of Technical skills for all operation and maintenance work.	0.034		0.042	0.034	0.028	0.025	0.037	0.037	0.029	0.043	0.039	0.030	0.040	0.036	0.030	0.038	0.032	0.032	
			D.2	Tools and Fittings	0.032	D.2.1	Availability of Tools and Fittings for all operation and maintenance work.	0.032		0.027	0.033	0.028	0.023	0.035	0.035	0.026	0.046	0.027	0.033	0.027	0.034	0.036	0.041	0.029	0.031	
			D.3	Appropriate Technology	0.027	D.3.1	System appropriate for multiple application of water (MUS)	0.027		0.025	0.029	0.028	0.030	0.035	0.035	0.025	0.023	0.025	0.015	0.025	0.029	0.021	0.044	0.018	0.032	
			D.4	Functionality of System	0.031	D.4.1	Scheme providing Basic Level of Water Supply service	0.031		0.037	0.031	0.027	0.044	0.027	0.027	0.046	0.026	0.037	0.029	0.025	0.029	0.020	0.035	0.025	0.030	
	E. Environmental	0.23	E.1	CCA/DRR/WSP	0.058	E.1.1	Strategy of WUSC to combat CC and mitigate Natural Calamity	0.028		0.035	0.033	0.028	0.023	0.031	0.029	0.022	0.028	0.031	0.016	0.029	0.039	0.021	0.032	0.026	0.032	
						E.1.2	Measures taken to minimize threat in physical system of WS scheme	0.030		0.027	0.032	0.027	0.026	0.024	0.024	0.048	0.032	0.026	0.031	0.032	0.037	0.022	0.035	0.025	0.030	
			E.2	Water source conservation	0.090	E.2.1	Strategy of WUSC to combat source depiction problem	0.030		0.028	0.032	0.028	0.026	0.028	0.025	0.042	0.033	0.028	0.032	0.025	0.038	0.026	0.038	0.029	0.029	
						E.2.2	Measures taken to combat threat of water source contamination	0.031		0.026	0.033	0.033	0.026	0.032	0.032	0.045	0.023	0.025	0.037	0.030	0.035	0.023	0.037	0.031	0.030	
						E.2.3	Identification and protection of alternative sources for emergency situation	0.028		0.025	0.032	0.034	0.020	0.031	0.030	0.033	0.020	0.026	0.025	0.025	0.029	0.020	0.039	0.034	0.029	
			E.3	Water and Environmental Sanitation	0.084	E.3.1	Implementation of encouraging and reinforcing good hygiene practice	0.028		0.024	0.033	0.032	0.023	0.030	0.031	0.040	0.015	0.024	0.026	0.025	0.030	0.017	0.040	0.031	0.028	
						E.3.2	Measures taken to combat threat of water born disease	0.030		0.033	0.033	0.026	0.029	0.030	0.030	0.046	0.016	0.034	0.037	0.027	0.027	0.026	0.042	0.033	0.016	
						E.3.3	Proper management of excess water	0.026		0.017	0.029	0.039	0.025	0.025	0.023	0.019	0.017	0.018	0.023	0.030	0.022	0.031	0.043	0.030	0.028	

Annex VI: Sustainability Score and Sustainability Rating of Water Supply Schemes.

Sr.No	VDC Name	Name Of WS Scheme	Covered HHs	Conflict in source / component location	Proportionate representation of cast / ethnicity in WUSC	Proportionate representation of man and women in WUSC	Satisfaction of users in service provided by WUSC	Participation of users in scheme related activities	Users willingness to pay water tariff	Establishment of O&M fund & saving	Use of saving / surplus fund in repair and replacement	Financial transparency in fund mobilization	Sufficient tariff collection for O&M, repair and replacement	External financial support in O&M and major repair and replacement works	Existence and functioning of WUSC	Written statute and registration of WUSC in DWRC	Leadership quality and activeness of WUSC	Existence, functioning & Clarity of roles for operation and maintenance management.	WUSC selection system & practice of AGM	Decision making process of WUSC	Public hearing and public audit system of WUSC	Linkage of WUSC to FEDWASUN	Linkage with private entrepreneurship in service provision and management	Linkage with community and intermediate level actors; CBO,NGO, Local government and other groups	External capacity building and follow-up support	Availability of Technical skills for all operation and maintenance work.	Availability of Tools and Fittings for all operation and maintenance work.	System appropriate for multiple application of water (MUS)	Scheme providing Basic Level of Water Supply service	Strategy of WUSC to combat CC and mitigate Natural Calamity	Measures taken to minimize threat in physical system of WS scheme	Strategy of WUSC to combat source depiction problem	Measures taken to combat threat of water source contamination	Identification and protection of alternative sources for emergency situation	Implementation of encouraging and reinforcing good hygiene practice	Measures taken to combat threat of water born disease	Proper management of excess water	Sustainability Score	Sustainability Ranking
1	Amarapuri	Amarapuri Water Supply and Sanitation Scheme	1760	0.04	0.00	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.01	0.03	0.03	0.02	0.00	0.03	0.02	0.02	0.03	0.00	0.03	0.01	0.03	0.03	0.03	0.03	0.03	0.00	0.03	0.81	Sustainability Likely
2		Gahiratoli Water Supply and sanitation Scheme	225	0.04	0.00	0.00	0.02	0.02	0.02	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.03	0.33	Sustainability Possible
3	Benimanipur	Chiple Khola Water Supply and Sanitation Scheme	210	0.04	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.17	Sustainability Unlikely
4		Betani Water Supply and sanitation Scheme	76	0.04	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.16	Sustainability Unlikely
5		Betani(Sital Tandi) Water Supply and sanitation Scheme	183	0.04	0.00	0.00	0.02	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.27	Sustainability Unlikely
6	Bharatpur	Bharatpur water supply and Sanitation scheme	153	0.04	0.00	0.00	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.34	Sustainability Possible
7	Bulingtaar	Devchuli Water supply and sanitation Scheme	79	0.04	0.02	0.02	0.03	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.02	0.03	0.01	0.00	0.01	0.03	0.00	0.02	0.00	0.00	0.03	0.00	0.02	0.02	0.00	0.03	0.00	0.03	0.03	0.02	0.00	0.03	0.00	0.57	Sustainability Possible
8	Dadajheri	Dhabadi Water Supply and Sanitation Scheme	34	0.04	0.02	0.00	0.02	0.02	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.03	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.34	Sustainability Possible
9	Dedgaun	Chituwa Khola Water Supply and Sanitation Scheme	108	0.04	0.02	0.02	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.02	0.03	0.03	0.02	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.03	0.03	0.02	0.00	0.03	0.00	0.00	0.50	Sustainability Possible
10		Dhuwad Water Supply and sanitation scheme	52	0.04	0.00	0.02	0.02	0.02	0.02	0.03	0.00	0.02	0.03	0.00	0.02	0.00	0.00	0.03	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.03	0.01	0.03	0.49	Sustainability Possible
11		Jousimajhuwa Water Supply and Sanitation Scheme	155	0.04	0.02	0.00	0.02	0.02	0.02	0.03	0.00	0.02	0.03	0.03	0.00	0.00	0.02	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.35	Sustainability Possible
12		Bandipure Chharchhare Water Supply and Sanitation Scheme	66	0.04	0.00	0.02	0.02	0.02	0.02	0.03	0.00	0.02	0.03	0.00	0.02	0.03	0.01	0.03	0.02	0.03	0.03	0.03	0.00	0.00	0.00	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.54	Sustainability Possible
13	Deurali	Iumpes Thado kholsi water supply and sanitation scheme	63	0.04	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.00	0.02	0.03	0.00	0.00	0.01	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.48	Sustainability Possible
14		chapsha Water supply and sanitation scheme	64	0.04	0.02	0.00	0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.01	0.00	0.29	Sustainability Unlikely
15	Devchuli	Bealtar Water Supply and Sanitation Scheme	450	0.04	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.01	0.00	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.01	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.55	Sustainability Possible
16		Devchuli A Water supply and sanitation Scheme	459	0.04	0.00	0.00	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.00	0.03	0.02	0.03	0.02	0.00	0.00	0.01	0.03	0.03	0.03	0.03	0.00	0.00	0.00	0.71	Sustainability Likely
17		Devchuli B Water supply and Sanitation Scheme	350	0.04	0.00	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.03	0.02	0.03	0.03	0.00	0.00	0.01	0.03	0.03	0.03	0.03	0.03	0.00	0.03	0.78	Sustainability Likely
18	Dhaubadi	Dhaubadhaap Kokheto water supply and Sanitation scheme	49	0.04	0.02	0.02	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.00	0.03	0.01	0.00	0.02	0.03	0.03	0.02	0.00	0.03	0.02	0.02	0.02	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.60	Sustainability Possible
19	Gaindakot	Thibaas Water Supply and Sanitation Scheme	68	0.04	0.00	0.00	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.00	0.00	0.03	0.02	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.41	Sustainability Possible
20	Hupsekot	Hupsekot-A Water supply and sanitation Scheme	146	0.04	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.03	0.01	0.03	0.00	0.00	0.00	0.00	0.03	0.02	0.02	0.02	0.00	0.03	0.00	0.03	0.03	0.00	0.00	0.03	0.00	0.00	0.41	Sustainability Possible
21	Jaubaari	Gagri Khola water supply and Sanitation Scheme	109	0.04	0.00	0.02	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.03	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.03	0.00	0.00	0.37	Sustainability Possible
22	Kotthar	Tham Beshi Water Supply and Sanitation Scheme	87	0.04	0.02	0.00	0.03	0.02	0.02	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.03	0.00	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.37	Sustainability Possible
23	Mainaghat	Deurali-Mainaghaat water supply and sanitation Scheme	146	0.04	0.02	0.02	0.02	0.02	0.02	0.03	0.00	0.00	0.00	0.03	0.02	0.03	0.00	0.03	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.44	Sustainability Possible
24		Duwakana water Supply and sanitation Scheme	125	0.04	0.00	0.02	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.02	0.03	0.00	0.00	0.01	0.03	0.03	0.03	0.00	0.00	0.03	0.00	0.02	0.02	0.00	0.00	0.01	0.03	0.00	0.03	0.03	0.03	0.00	0.03	0.53	Sustainability Possible
25	Mithukaram	Mukundapur Water Supply and Sanitation Scheme	244	0.04	0.00	0.00	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.33	Sustainability Possible
26	Mukundapur	Naram water Supply and sanitation Scheme	2849	0.04	0.00	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.00	0.03	0.03	0.03	0.00	0.03	0.03	0.03	0.03	0.02	0.00	0.00	0.03	0.02	0.03	0.03	0.00	0.00	0.01	0.03	0.03	0.03	0.03	0.03	0.01	0.00	0.71	Sustainability Likely
27	Naram	Naram water Supply and sanitation Scheme	50	0.04	0.00	0.00	0.03	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.03	0.00	0.03	0.00	0.03	0.03	0.03	0.00	0.00	0.38	Sustainability Possible
28		Ghejardi Water supply and Sanitation Scheme	84	0.04	0.02	0.00	0.02	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.01	0.03	0.00	0.00	0.00	0.03	0.02	0.01	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.38	Sustainability Possible
29	Naypbelhan	Naypbelhani Water supply and Sanitation Scheme	269	0.04	0.00	0.00	0.03	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.02	0.03	0.01	0.03	0.02	0.03	0.03	0.02	0.00	0.00	0.03	0.02	0.03	0.02	0.00	0.00	0.01	0.03	0.03	0.02	0.00	0.03	0.01	0.03	0.63	Sustainability Possible
30	Rakachuli	Rankachuli-Dwari water supply and sanitation scheme	19	0.04	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	Sustainability Unlikely
31		Kafle Khola water supply and sanitation scheme	42	0.04	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	Sustainability Unlikely
32	Rakuwa	Amrit Dhara Water Supply and Sanitation Scheme	123	0.04	0.00	0.02	0.02	0.02	0.02	0.03	0.00	0.01	0.00	0.00	0.03	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.00	0.00	0.42	Sustainability Possible
33		Bahakhola Water Supply and Sanitation Scheme	216	0.04	0.00	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.03	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.32	Sustainability Possible
34	Ramnagar	Ramnagar Water Supply and Sanitation Scheme	1000	0.04	0.00	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.00	0.00	0.03	0.03	0.00	0.00	0.02	0.03	0.03	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.03	0.02	0.00	0.49	Sustainability Possible
35	Ratanpur	Ratanpur Water Supply and Sanitation Scheme	60	0.04	0.02	0.00	0.02	0.02	0.02	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.32	Sustainability Possible
36		Bangar Water Supply and Sanitation Scheme	105	0.04	0.00	0.00	0.01	0.02	0.02	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.26	Sustainability Unlikely
37	Ruchang	Ratnpaani Water Supply and Sanitation Scheme	48	0.04	0.02	0.00	0.02	0.02	0.02	0.03	0.00	0.02	0.00	0.03	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.03	0.00	0.03	0.03	0.03	0.00	0.00	0.41	Sustainability Possible
38		Byeghaan Water Supply and sanitation Scheme	64	0.04	0.00	0.00	0.03	0.02	0.02	0.03	0.00	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.00	0.03	0.45	Sustainability Possible
39		Ratakhola Water supply and Sanitation Scheme	126	0.04	0.00	0.02	0.03	0.02	0.02	0.03	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.03	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.41	Sustainability Possible
40	Sunwal	Bishashaya Water supply and Sanitation Scheme	1000	0.04	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.14	Sustainability Unlikely
Correlation Coefficient			(r)	0.0	-0.2	0.5	0.7	0.8	0.5	0.6	0.6	0.7	0.5	0.4	0.7	0.5	0.6	0.3	0.7	0.6	0.6	0.6	0.0	0.6	0.4	0.5	0.6	0.0	0.1	0.7	0.4	0.5	0.6	0.5	0.6	0.1	0.4	1.0	

Annex VII: Threshold Score Computation and WUSCs Perception on their Schemes Serviceability.

Sr. No	VDC Name	Name Of WS Scheme	Covered HHs	WUSC Response on Scheme Serviceability	Sustainability Score of scheme	Sustainability Rating	Fully Serviceable	Requires Minor Maintenance	Requires Major Maintenance	Requires Rehabilitation	Not Serviceable	Sustainability Rating			Remarks
							Response Code of WUSC								
							1	2	3	4	5	SU	SP	SL	
1	Amarapuri	Amarapuri Water Supply and Sanitation Scheme	1760	1	81%	Sustainability Likely	0.81							0.81	
2		Gahatadi Water Supply and sanitation Scheme	225	5	33%	Sustainability Possible					0.33	0.33			
3	Benimanipur	Chiple Khola Water Supply and Sanitation Scheme	210	3	17%	Sustainability Unlikely			0.17				0.17		
4		Betani Water Supply and sanitation Scheme	76	5	16%	Sustainability Unlikely					0.16	0.16			
5		Betani(Sital Tandi) Water Supply and sanitation Scheme	183	4	27%	Sustainability Unlikely				0.27		0.27			
6	Bharatipur	Bharatipur water supply and Sanitation scheme	153	3	34%	Sustainability Possible			0.34				0.34		
7	Bulingtaar	Devchuli Water supply and sanitation Scheme	79	2	57%	Sustainability Possible		0.57					0.57		
8	Dadajheri	Dhabadi Water Supply and Sanitation Scheme	34	2	34%	Sustainability Possible		0.34					0.34		
9	Dedgaun	Chituwa Khola Water Supply and Sanitation Scheme	108	2	50%	Sustainability Possible		0.50					0.50		
10		Dhuwad Water Supply and sanitation scheme	52	2	49%	Sustainability Possible		0.49					0.49		
11		Jousimajhuwa Water Supply and Sanitation Scheme	155	3	35%	Sustainability Possible			0.35				0.35		
12		Bandipure Chharchhare Water Supply and Sanitation Scheme	66	2	54%	Sustainability Possible		0.54					0.54		
13	Deurali	lumpes Thado kholsi water supply and sanitation scheme	63	2	48%	Sustainability Possible		0.48					0.48		
14		chapaha Water supply and sanitation scheme	64	3	29%	Sustainability Unlikely			0.29				0.29		
15	Devchuli	Bisaltar Water Supply and Sanitation Scheme	450	3	55%	Sustainability Possible			0.55				0.55		
16		Devchuli A Water supply and sanitation Scheme	459	1	71%	Sustainability Likely	0.71							0.71	
17		Devchuli B Water supply and Sanitation Scheme	350	1	78%	Sustainability Likely	0.78							0.78	
18	Dhaubadi	Chauradhaap Kokhetol water supply and Sanitation scheme	49	1	60%	Sustainability Possible	0.60							0.60	
19	Gaindakot	Ttribaas Water Supply and Sanitation Scheme	68	3	41%	Sustainability Possible			0.41				0.41		
20	Hupsekot	Hupsekot-A Water supply and sanitation Scheme	146	2	41%	Sustainability Possible		0.41					0.41		
21	Jaubaari	Gagri Khola water supply and Sanitation Scheme	109	2	37%	Sustainability Possible		0.37					0.37		
22	Kotthar	Tham Beshi Water Supply and Sanitation Scheme	87	3	37%	Sustainability Possible			0.37				0.37		
23	Mainaghat	Deurali-Mainaghaat water supply and sanitation Scheme	146	3	44%	Sustainability Possible			0.44				0.44		
24		Duwakana water Supply and sanitation Scheme	125	4	53%	Sustainability Possible				0.53		0.53			
25	Mithukaram	Mukundapur Water Supply and Sanitation Scheme	244	3	33%	Sustainability Possible			0.33				0.33		
26	Mukundapur	Naram water Supply and sanitation Scheme	2849	1	71%	Sustainability Likely	0.71							0.71	
27	Naram	Naram water Supply and sanitation Scheme	50	3	38%	Sustainability Possible			0.38				0.38		
28		Ghejardi Water supply and Sanitation Scheme	84	3	38%	Sustainability Possible			0.38				0.38		
29	Nayabelhani	Nayabelhani Water supply and Sanitation Scheme	269	1	63%	Sustainability Possible	0.63							0.63	
30	Rakachuli	Rankachuli-Dwari water supply and sanitation scheme	19	3	7%	Sustainability Unlikely			0.07				0.07		
31		Katle khola water supply and sanitation scheme	42	2	18%	Sustainability Unlikely		0.18					0.18		
32	Rakuwa	Amrit Dhara Water Supply and Sanitation Scheme	123	3	42%	Sustainability Possible			0.42				0.42		
33		BahaKhola Water Supply and Sanitation Scheme	216	4	32%	Sustainability Possible				0.32		0.32			
34	Ramnagar	Ramnagar Water Supply and Sanitation Scheme	1000	4	49%	Sustainability Possible				0.49		0.49			
35	Ratanpur	Ratanpur Water Supply and Sanitation Scheme	60	3	32%	Sustainability Possible			0.32				0.32		
36		Bangar Water Supply and Sanitation Scheme	105	5	26%	Sustainability Unlikely					0.26	0.26			
37	Ruchang	Ratopaani Water Supply and Sanitation Scheme	48	3	41%	Sustainability Possible			0.41				0.41		
38		Byaghaan Water Supply and sanitation Scheme	64	3	45%	Sustainability Possible			0.45				0.45		
39		Ratokhola Water supply and Sanitation Scheme	126	3	41%	Sustainability Possible			0.41				0.41		
40	Sunwal	Bishashaya Water supply and Sanitation Scheme	1000	5	14%	Sustainability Unlikely					0.14	0.14			
						Average Threshold Score	**70.58%**	**43.11%**	**35.78%**	**40.20%**	**22.14%**	**31.17%**	**38.32%**	**70.58%**	
						No of Schems	**6**	**9**	**17**	**4**	**4**	**8**	**26**	**6**	