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Status of the Building Blocks for Sustainable Water, Sanitation, and Hygiene (WASH) Systems in Nepal: A Review

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Abstract

The paper aims at reviewing the building blocks of sustainable water, sanitation, and hygiene (WASH) systems in the context of Nepal. The study consisted of a descriptive research design based on secondary data that were collected from different published documents. The review was made through descriptive comparison, percentages, graphs, and ratios to compare whether the country's status is in line with the global context. The study concludes that the proportion of the population having safely managed water services in Nepal (16 percent) is quite lower than the global average (73 percent). Moreover, the proportion of the population having safely managed sanitation services in Nepal (51 percent) is slightly lower than the global average (57 percent). Similarly, the proportion of the population having basic hygiene services in Nepal (64 percent) is lower than the global average (75 percent). Furthermore, the findings on the status of water, sanitation, and hygiene (WASH) systems are mixed in the context of Nepal. Some of them have good progress and some of them need to be accelerated to go a long way to achieve sustainable development goals (SDGs) by 2030. The study further concludes that institutionalization, policy and legislation, and accountability mechanisms at the federal level have been initiated while it is yet to materialize at the provincial and local levels. In the case

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of planning, only 10 percent of rural/municipalities completed their WASH plan. In terms of finance, there is not only a resource gap but also two-thirds of the total country's WASH budget has been allocated at the federal level. Action research should be prioritized to capture learning and awareness leading to adaptation and knowledge creation in the sector. The study can be extended by incorporating the citizens' views on WASH systems strengthening in the context of Nepal.

Keywords: Building blocks, Sustainable development goals (SDGs), WASH systems

Introduction

Access to water, sanitation, and hygiene (WASH) service is the foundation of a healthy and dignified life. Despite this, 2.2 billion people in the world are still deprived of access to safe drinking water while 3.5 billion people do not have access to safe sanitation facilities (WHO and UNICEF, 2023).

In the context of Nepal, there is only 16 percent and 91 percent of the population have access to safely managed and basic drinking water services respectively (WHO and UNICEF, 2023). However, Nepal's water sector is highly non-functional and obstructs regular access to safe drinking water for rural communities (Adhikari, 2019). In this connection, only 28 percent of these water supply projects are fully functional (NIMP, 2018). Therefore, it seems that about 72 percent of the projects need to be repaired, rehabilitated, and reconstructed.

Moreover, Nepal has become the second country in the world and the first country in South Asia to achieve significant progress in sanitation (WHO and UNICEF, 2023). Although such progress has been achieved in sanitation, there is still much more to be done. Nepal was officially declared an open direction-free zone on 30th September 2019. This means that since that day, 100 percent of Nepalese have had access to toilets. However, according to the 2021 census, five percent of households are still without toilets. Among them, 90 percent of the household members are openly defecated (CBS, 2021).

In addition, there are only 64 percent of the population have basic hygiene services having an availability of a handwashing facility on the premises with soap and water while the rest of the population has either limited hygiene services or no facility in the context of Nepal (WHO and UNICEF, 2023) However, it was found that all people have started washing their hands with soap and water due to the epidemic spread by the coronavirus. Conversely, as the effect and impact of coronavirus are decreasing, it is starting to be seen that this trend will not be continued.

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That is why, it is necessary to improve this situation and take a strong approach to achieve the sustainable development goals (SDGs) by 2030. In this connection, an improvement can be carried out by applying 'The Building Blocks of Sustainable WASH Systems' presented by the IRC WASH Systems Academy.

Figure 1: The Building Blocks of Sustainable WASH Systems presented by the IRC WASH Systems Academy.

WASH systems include all the social, technical, institutional, environmental, and financial factors, actors, motivations, and interactions that influence WASH service delivery in each context (Huston & Moriarty, 2018). IRC has developed a set of nine WASH systems building blocks that simplify a WASH system's complexity to manageable levels. The building blocks enable and support action while neither oversimplifying reality nor losing sight of the entire WASH system. Various actors and factors are playing an important role in strengthening the WASH system. WASH actors are the stakeholders (individuals or organizations) that directly or indirectly influence the WASH system. Similarly, determinants refer to non-human elements, aspects, or systems that directly or indirectly influence the functioning of a WASH system. The building blocks of the WASH system have been prepared by covering both the actors and the factors.

The enduring question arises of how the building blocks of sustainable WASH systems have played important to achieving SDGs in the context of developing counties like Nepal. Thus, the study deals with the building blocks such as institutions, policy and legislation, planning, finance, regulation and accountability, monitoring, infrastructure development and maintenance, water resource management, and learning and adaptation influencing SDGs by strengthening the WASH system in Nepal is of greater significance.

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Materials and Methods

The study consisted of a descriptive research design based on the nine building blocks of sustainable WASH systems presented by the IRC WASH Systems Academy. In the beginning, these building blocks namely institutions, policy and legislation, planning, finance, regulation and accountability, monitoring, infrastructure development and maintenance, water resource management, and learning and adaptation were described and compared to their status in the context of Nepal. In this connection, the secondary data including the status of WASH plan preparation of 753 rural/municipalities were collected from different published documents. The review was made through descriptive statistics such as percentages, ratios, and graphs to compare whether the status is in line with the global context. In this connection, a narrative comparison was made between the requirements of the building blocks and the current country status of Nepal in terms of WASH systems strengthening to achieve SDGs.

Results and Discussions

In this section, an attempt is made to review the building blocks of sustainable WASH systems in the context of developing countries like Nepal. The building blocks include institutions, policy and legislation, planning, finance, regulation and accountability, monitoring, infrastructure development and maintenance, water resource management, and learning and adaptation that are supported to achieve SDGs by strengthening the WASH system.

Institutions

The institutions involved in providing WASH services and their relationship and interactions are important building blocks of sustainable WASH systems. Key organizations include federal, provincial, and local governments, service providers, service authorities, regulators, and users. The WASH services should be provided by maintaining an effective balanced relationship among these institutions. They are (1) service authorities (or holders of regulatory power); (2) service providers; and (3) service users (Huston & Moriarty, 2018). In Nepal like other developing countries, the service of providing drinking water seems to be a priority while sanitation and hygiene services are a low priority.

All three tiers of government in Nepal have been establishing WASH units/institutions to achieve sustainable WASH services. In this connection, even though the Ministry of Water Supply has been formed separately at the federal level, this ministry is considered a low-priority ministry. In addition, the Department of Water Supply and Sewerage Management (DWSSM) has been facilitating implementation and policy formulation at the federal level.

Although there is no provision for a separate ministry under the provincial government, it is kept jointly with other ministries. The provincial-level policy is being formulated and implemented. However, effective coordination with the federal and local governments seems to be necessary during implementation.

As a regulator, the formation of the WASH unit under the local government is ongoing. It seems that WASH units have been formed in only very few rural/municipalities. Similarly, there is

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slow progress in policy formulation at the municipal level. Some rural/municipalities have resumed the process of registering users' committees and water sources. It seems that the regulatory role should be made effective by enhancing the capacity at the local level. At the same time, it seems that municipalities should develop institutional capacity by implementing WASH acts and procedures at the municipality level, formation of WASH units, staff management, and managing a database for data management of all projects built in the respective municipality. It has also been managing the budget for repair and maintenance once needed.

Users' committees or organizations as service providers should play a leading role in project management and its repair and maintenance. The building blocks indicate that the registration of the users' committee, separate office of the users' committee, caretakers, spare parts, operation and maintenance fund, capacity building of the users' committee and caretakers, tariff collection, and standard operation procedure (SOP) of the users' committee are important factors for the institutional development of the users' committee. Thus, the institutional development including coordination, roles and responsibilities, capacity, and sector mechanisms at the federal level has been initiated while it is yet to initiate at the provincial and local levels in Nepal.

Policy and legislation

Policy and legislation are important building blocks for strengthening the sustainable WASH system. It provides the legal basis for the promotion of WASH services. The building blocks include the mechanisms by which the government sets its vision for policy and the legal framework for its achievement (Huston & Moriarty, 2018). The formulation of policies and laws is done by the federal ministries as well as the provincial and local governments.

A policy is a written document of ideas or plans that provide a basis for making decisions. Once the policy is clearly defined, it can be translated into law for implementation. Similarly, WASH policy refers to a plan set by the government that sets goals, procedures, and guidelines for WASH services. But a policy is not legally binding. Therefore, a suitable law should be formulated to implement it. To achieve the SDGs, national policies should identify goals for improving WASH services and then guide institutional arrangements and strategies to achieve these goals. WASH policies highlight the priorities of this sector. It clarifies who needs to do what and when. They identify important policy decisions and how they should be implemented.

Legislation means the collection, drafting, and approval of laws for any country. It makes policies permanent and provides accountability. The law should be formulated based on the policy and a clear framework should be provided for the interaction of the stakeholders in the WASH sector. Laws may be different in every country. The role of policy and legislation is to create an enabling environment. It outlines the roles and responsibilities of all parties, specifying rights and standards for citizens and institutions.

The looming water scarcity coupled with serious negative environmental impacts currently being experienced compels water sector policymakers and professionals to rethink the way

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they manage water resources (Kayaga & Smout, 2019). By formulating policies and laws at the federal, provincial, and local levels, contributions can be made to achieve SDGs. It provides a clear blueprint for interaction among stakeholders including all three tiers of government and the implementation of policies. Local government agencies are an appropriate entry point for strengthening WASH systems. Because it is necessary to strengthen the ability of local levels to make and review good policies.

The Government of Nepal has formulated and implemented the Drinking Water and Sanitation Act, 2079 (2022). Water and Sanitation Regulations, 2079 (2022) has been drafted and is in the process of approval. Similarly, provincial, and local levels are in the process of formulating policies and laws.

Planning

The planning building block is the foundation for the implementation of policies to achieve universal access to sustainable services (Huston & Moriarty, 2018). Planning is an important building block for strengthening the WASH system. Plans should be implemented to provide sustainable WASH services. A budget should be planned and ensured for that. The plan is the basis for the implementation of policies to achieve universal access to sustainable services. Plans for sustainable WASH services should include goals, timelines, costs, and financing details.

Coordination among stakeholders is also necessary for plan formulation and implementation. The national plan should reflect both the national strategy and the actual situation across the country through annual plans and monitoring of WASH implementation. Local-level plans should match projects and activities to local needs. They should be realistic and synergizes with the provincial and national plans.

The different types of planning include strategic planning, annual planning, and project planning. A strategic plan includes long-term high-level goals under which clear pathways to achieving them are identified and incorporated. Strategic planning aligns future activities, budgets, personnel, and other stakeholders to achieve desired outcomes. Strategic planning can be prepared for 5 to 10 years institutionally and 10 to 30 years for the WASH sector. Strategic plans can be reviewed and revised through mid-term revision.

Annual plans translate the long-term goals set out in the strategic plan into 12-month plans. The format of the annual plan may vary from place to place. But it should be ensured that the annual budget covers planned activities and regular costs. The annual plan can be updated throughout the year, and a review of the previous year's plans and results provides learning and guidance for the next year's planning.

Project planning is usually time-bound and results-oriented. A plan to strengthen the WASH system for infrastructure development should plan and budget for new infrastructure, including mechanisms to identify, implement, and monitor it. Plans should be inclusive to ensure maintenance and comprehensive support. Therefore, the plan needs a realistic budget.

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The implementation phase should include coordinated and collaborated efforts involving government, non-governmental organizations, civil society, and the private sector. Successful implementation of the plan involves regular reviews, learning, and mechanisms for monitoring and accountability. Most countries have decentralized their services to provincial and local governments. Planning for sustainable services follows the general steps of the program cycle. The role of local government agencies is to ensure that everyone in their area has access to sustainable WASH services.

The WASH sector development plan (SDP) in Nepal is from 2016 to 2030 which is yet to approve. It has three stages (SEIU, 2016). The first phase (2016-2020) aims to provide universal access to basic WASH services and improved service level, and reconstruction to the people in Nepal. The second phase (2021-2025) includes improved service levels (medium/high) along with the functionality, and sustainability of WASH services. Similarly, the third phase (2026-2030) covers improved service levels and impact assessment. Improved drinking water services include safe drinking water with high-medium level services that maintain water quality according to national standards.

In this connection, a popular saying 'Failure to plan is planning to fail' is very relevant to indicate the importance of planning. So, planning is a very important building block of a sustainable WASH system. Therefore, social, financial, technical, institutional, and environmental aspects should be considered while planning. The beneficiaries should be involved while planning to increase their ownership.

The WASH Plan of each rural/municipality in the country should be prepared and implemented as per the provision made in NWASH. Similarly, the three tiers of government should implement WASH projects in rural areas of Nepal as per WASH Plan prepared in advance. The status of municipal WASH plan preparation has been mentioned in Figure 1.

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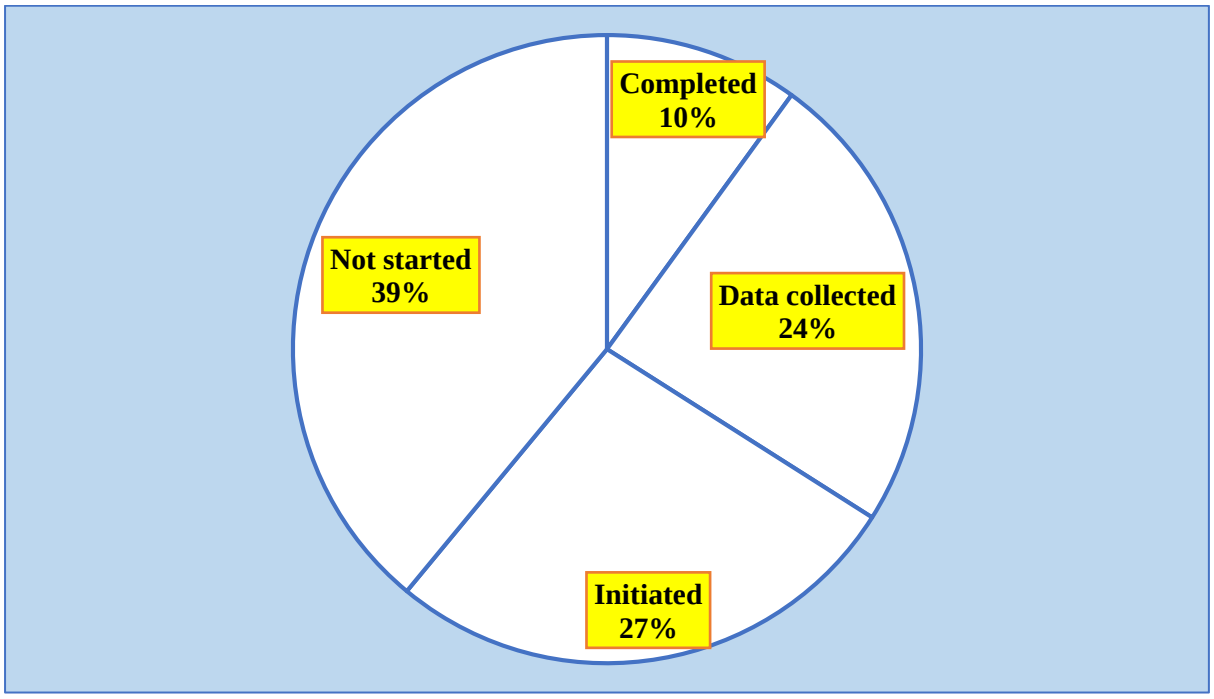

Figure 2: Status of municipal WASH plan preparation. Source: DWSSM 2023

Altogether, only 10 percent of the local levels have completed their WASH plans however we must wait for a while to see how it will be implemented. Likewise, 24 percent of municipalities collected data for the WASH plan. Moreover, 27 percent of municipalities initiated the process for the preparation of a WASH plan while 39 percent of municipalities were not started the process for the preparation of a WASH plan in the country.

At the local level, the allocation of budget for WASH has been a lower priority by the rural/municipalities. Likewise, the municipal plan has been formulated with the support of the consultants leading to challenges during its implementation at the local level including their ownership by the local governments. Accordingly, it would make more sense to complete the WASH projects within one or two years rather than investing small amounts over many consecutive years. In addition, the sectoral plan with a budget at the provincial and local levels is yet to be prepared but the WASH budget has been allocated by all three tiers of government every year.

Finance

Finance deals with all the costs necessary to provide sustainable WASH services and how they are met. Under which all costs and its entire life cycle costs should be covered to ensure the availability of sustainable WASH services. Sources of finance include fees, taxes, and transfers. Which is known as the 'Three Ts' (Huston & Moriarty, 2018). Fees, which are paid by users themselves for WASH services, are an important source of finance. Taxes collected by the local government are another source of finance. Similarly, grant money transferred from the federal government and donor agencies is also a major source of finance for sustainable WASH services.

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Regular costs of providing sustainable WASH services include operating and minor maintenance costs, maintenance, replacement, and expansion costs, monitoring and support to service providers, and regular post-construction costs.

Similarly, the types of costs include capital expenditure, capital maintenance expenditure, operation, and minor maintenance expenditure, expenditure on direct support, cost of capital, and indirect support.

Capital expenditure includes initial investment in construction, initial training for hygiene, and expansion costs. Capital maintenance costs include major repair or replacement costs and rehabilitation costs. Operating and minor maintenance expenses include fuel, personnel, chemicals, and regular maintenance expenses. Direct support includes costs incurred by the service authority (as a local government) in planning, coordinating, monitoring, implementing, and delivering. The cost of capital includes the cost of access to finance for building the system, such as interest rates on loans. Indirect support generally includes costs at the national level of the WASH sector, such as policy, sector planning and coordination, and capacity-building costs.

In terms of finance at the local level, the timely release of funds from the federal government needs to increase the utilization of the budget by the local governments. Since the low utilization of the program/development budget, the budget utilization particularly for the program/development budget needs to be enhanced by all three tiers of government in the context of Nepal.

The United Nations has estimated that it will cost $114 billion per year to provide WASH services all around the world by the year 2030 by implementing Sustainable Development Goal 6 (Huston & Moriarty, 2018). In the context of Nepal, it is estimated that 125 billion rupees per year will be needed for the WASH sector to achieve SDGs (WAN, 2023). For the financial year 2080/81, the Ministry of Water Supply received only a little over 28 billion. It clearly shows that there is a resource gap to achieve the goals. In addition, it seems that all three tiers of government need to coordinate when investing in the WASH sector in Nepal. Even after federalism, about two-thirds of the total budget has been allocated at the federal level (WAN, 2023) which should be reconsidered.

Regulation and accountability

Good policy and legislation are effective only if they are applied and enforced (Huston & Moriarty, 2018). Regulations and accountability cover formal regulatory mechanisms, enforcement processes, and other mechanisms to hold decision-makers, service providers, and users to account and ensure that the interests of each group of actors are respected.

As a human right, the government has the primary responsibility to ensure that all citizens have access to basic WASH services. While the state is ultimately responsible for sustainable WASH services for all its citizens, the government itself does not have to provide the services. The WASH services can be provided in a variety of ways. Accountability refers to the responsibility of the concerned authorities to take responsibility for their commitments and actions. For the

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WASH sector, accountability means holding governments and service providers accountable to SDG 6.

The service users can directly influence service providers because their relationship is a commercial one based on the exchange of services for payments. This is often referred to as a 'short route' to accountability. In the case of a long-term path to accountability, some of the country studies said that the networks of civil society organizations (CSOs) were more effective in holding their governments to account while a few of the studies showed that reporting by CSOs is an effective accountability mechanism.

Accountability mechanisms are considered effective if they are transparent, involve a diversity of stakeholders, and facilitate critical reflection on progress. However, accountability mechanisms per Sustainable Development Goal 6 are not available in many countries. A study conducted in 2017-18 in 25 countries led by CSOs revealed that accountability mechanisms for safely managed WASH services for SDG 6 are either absent or limited. This finding revealed that accountability is an important building block that all the stakeholders should take responsibility and accountability to achieve SDGs.

In the context of Nepal, it seems that accountability mechanisms, regulatory framework, and capacity are maintained at the federal level while the capacity of provincial and local governments needs to be developed for strengthening WASH systems to achieve SDGs through achieving the 15th periodic plan of Nepal.

Monitoring

Monitoring is the process of collecting, reviewing, and using the information periodically to proactively manage performance, maximize positive impacts, and minimize the risk of adverse impacts. It can be defined as a continuous assessment whose purpose is to provide all stakeholders with initial detailed information about progress or delays in ongoing evaluation. Monitoring conducted with the participation of the monitored party is called participatory monitoring. This kind of monitoring is effective as users take ownership.

Monitoring provides information needed to make effective informed decisions by governments, development partners, civil society, and other stakeholders to ensure the quality and sustainability of WASH services. Therefore, this building block covers the process of collecting, managing, and disseminating information required to manage and provide WASH services effectively.

Countries need to take leadership and ownership of the monitoring cycle for sustainable development. Country-led monitoring does not mean only one monitoring system. There can be many systems to monitor different aspects.

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Figure 3: NWASH Dashboard. Photo: Er. Sanjiv Kumar Thapa

Country-led monitoring processes refer to multi-stakeholder mechanisms for monitoring, evaluation, and learning led by governments rather than third parties (Huston & Moriarty, 2018). The monitoring based on the building blocks of the WASH system distinguishes between country-led monitoring and project (or program) monitoring. Country-led monitoring is systematic regular monitoring of services and service delivery. Project monitoring may involve external evaluators. They can provide interesting insights because they are fundamentally aligned with the interests of third parties within the timeframe. In the context of Nepal, monitoring conducted through NWASH can be considered country-led monitoring.

Under project monitoring, data is collected and analyzed to ensure the quality and sustainability of WASH services. Besides daily or weekly monitoring of the WASH system by the caretaker, the users' committee should monitor their project at least once a month or as per need. A questionnaire can be prepared for monitoring. Many projects can be made sustainable if a monitoring mechanism is prepared at the municipal level and regular monitoring is carried out. Municipal-level project monitoring can be done by collecting reports from the projects, direct field visits to the project, hello monitoring through mobile phones, and using sensors. Furthermore, monitoring by Municipal-level Project Advisory Committee (MPAC) can also be executed at the local level. Projects can be made sustainable by providing maintenance services according to the status of the project obtained from monitoring.

Considering the monitoring ladders, a combination of two or more innovative monitoring mechanisms along with on-site monitoring and monitoring by external parties will make more sense to keep the projects functional and sustainable. This finding is consistent with the finding of Yadav (2022).

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Infrastructure development and maintenance

The construction and maintenance of physical structures necessary to provide sustainable WASH services is one of the important building blocks. Infrastructure is the essential physical component that delivers the service. It comprises not only hardware but also the mechanisms and processes for developing new infrastructure and maintaining existing facilities (Huston & Moriarty, 2018). An important process of infrastructure development is changing the behavior of people to use the infrastructure.

Getting infrastructure right is a necessary starting point for safely managing WASH services. To operate it effectively, there should be a suitable choice of infrastructure. Construction should be organized according to appropriate quality standards. Knowledge and skills related to operation and maintenance should be transferred to the community.

New infrastructure is a capital investment. The capital investment cycle consists of the involvement of international donors, governments, manufacturers and private operators, and communities. Sustainable WASH systems also include infrastructure for waste collection, treatment, and reuse or to protect water supplies from contamination. Providing sustainable WASH services requires strong WASH systems in addition to running water and toilets. This means that human excreta must be stored, emptied, transported, treated, and safely reused or disposed of. Infrastructure for hygiene promotion is also an important element of strengthening the WASH system. It creates an environment that utilizes the full benefits of safely managed water supply and sanitation facilities, contributing to a healthier and more dignified life.

Many countries have clear processes for infrastructure development but inadequate systems to manage assets after construction. As a result of federalism and decentralization, the responsibility of property management is often given to local levels. But according to that, the availability of sufficient budget and capacity of human resources is not enhanced. Even after federalism, in Nepal, two-thirds of the budget is allocated to the federal level.

As per JMP 2023, the proportion of the population using improved and basic water supplies is given in Figure 4.

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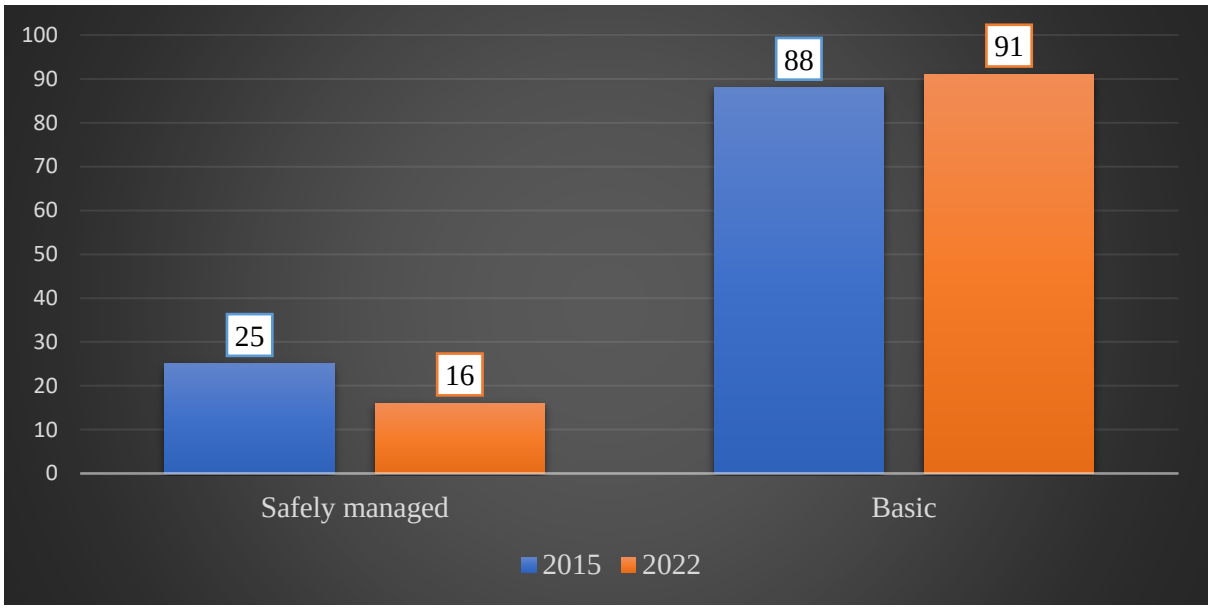

Figure 4: Proportion of the population using improved water supplies. Source: JMP 2023.

In the context of Nepal, the basic water services have increased from 88 percent in 2015 to 91 percent of the total population in 2022 while the safely managed water services have decreased from 25 percent in 2015 to 16 percent in 2022 of the total population. In addition, only 28 percent of these water supply projects are functioning well. Similarly, it seems that safe drinking water is being provided to only one out of six people by safely managed water systems. It is lower than the global average (73 percent) of safely managed water supply (WHO and UNICEF, 2023).

On the other hand, the proportion of the population using improved and basic sanitation facilities is given in Figure 5.

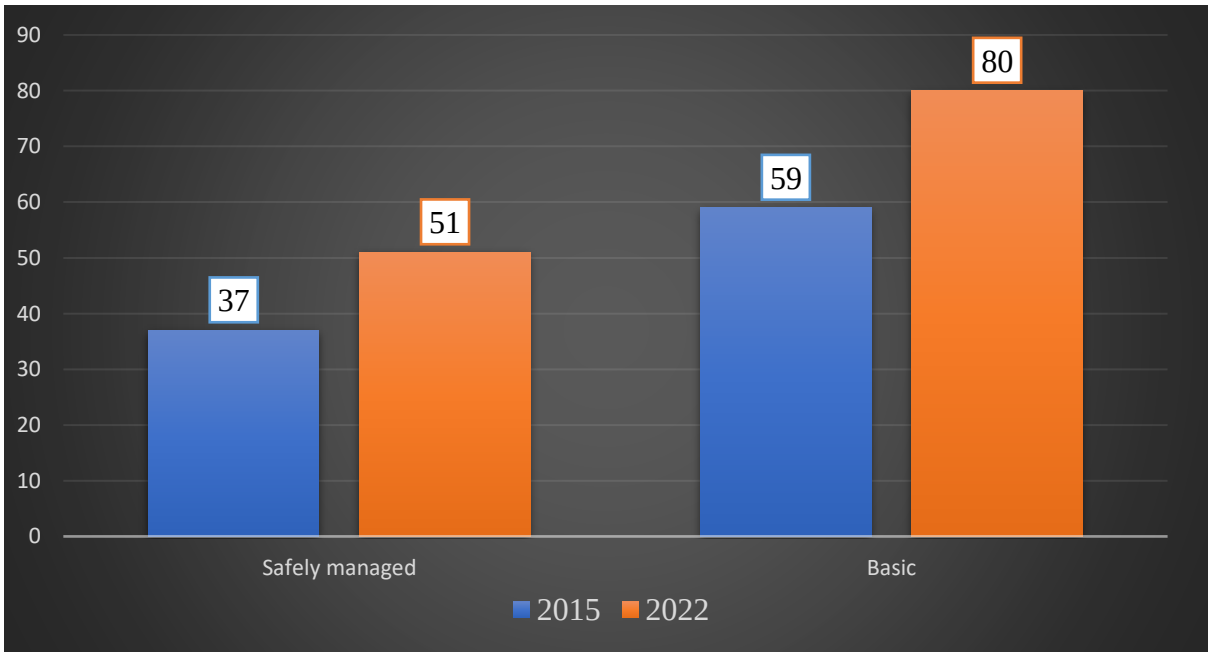

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Figure 5: Proportion of population using improved and basic sanitation facilities. Source: JMP 2023.

Basic sanitation services have increased from 59 percent in 2015 to 80 percent of the total population in 2022 while safely managed sanitation services have increased from 37 percent in 2015 to 51 percent in 2022 of the total population as per JMP 2023. The safely managed sanitation service (51 percent) of Nepal is slightly lower than the global average (57 percent). On the other hand, Nepal officially declared an open direction-free zone on 30th September 2019. This means that since that day, 100 percent of Nepalese have access to toilets. However, according to the 2021 census, five percent of households are still without toilets. Among them, 90 percent of the household members are openly defecated (CBS, 2021).

Furthermore, the proportion of the population who have basic hygiene services having an availability of a handwashing facility on the premises with soap and water is given in Figure 6.

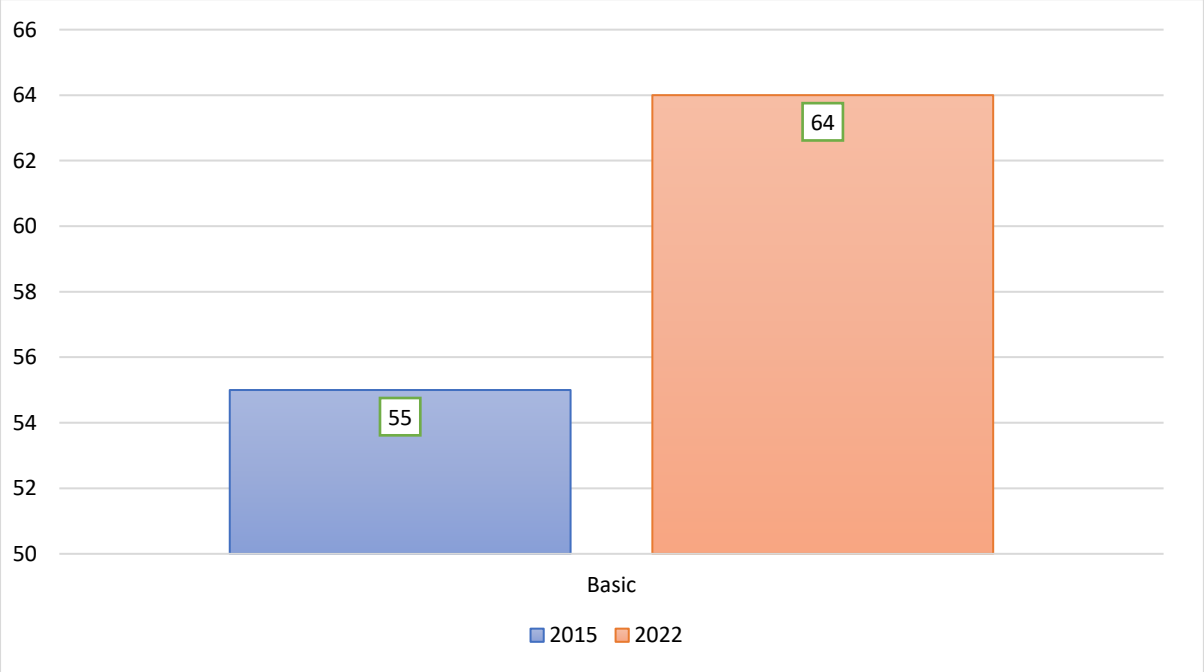

Figure 6: Proportion of the population has basic hygiene services. Source: JMP 2023.

The population has basic hygiene services having an availability of a handwashing facility on the premises with soap and water has increased from 55 percent in 2015 to 64 percent in 2022. However, the rest of the population has either limited hygiene services or no facilities in the context of Nepal. The basic hygiene service of Nepal (64 percent) is lower than the global average (75 percent) (WHO and UNICEF, 2023). With that, it can be concluded that infrastructure development should be sped up to achieve SDGs by 2030.

With that, it is found that everyone is interested in the construction of the WASH system. But it does not seem that attention should be paid after the construction. Attention after the construction of WASH systems to keep them functional leads to achieving SDGs by strengthening the WASH systems.

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Water resource management (WRM)

WRM is another important building block of sustainable WASH systems. It encompasses the concept of holistic WRM. This means creating fresh water and preserving it for future generations. WRM is sometimes called integrated water resource management (IWRM), which refers to the coordination and control of how water is distributed among various water-dependent sectors such as agriculture, fisheries, energy, and industry (Huston & Moriarty, 2018).

The natural environment is the foundation of water availability and sustainability because WASH services depend on an adequate supply of safe water. Since water comes from the natural environment, WRM is essential to protect the water supply and ensure that it will be available in the future. Conserving water supplies means containing, treating, or reusing human-made solid and liquid waste. Poor management of solid waste collection and management can lead to the accumulation of sewage systems and polluted surface water or groundwater. This can cause significant problems if the waste contains toxic substances or if nearby water sources are used for drinking water supply. Thus, WRM is linked to climate change, water security, water conservation, water governance, IWRM, and multi-use of water services (MUS).

Climate Change: The consequences of the global climate crisis are somehow linked to water. Climate change is increasing variability in the water cycle, reducing the predictability of water availability, affecting water quality, and threatening sustainable development. The increasing water demand simultaneously increases the need for energy-intensive activities such as water pumping, transportation, and treatment. Climate change is affecting the sustainability of WASH services. Disruption of WASH services has a major impact on the health, nutrition, education, and livelihoods of vulnerable populations, and impacts on disability and abuse. Meeting increasing water stress and future water demands means making difficult decisions about how to allocate water resources amid competing water uses.

Water Security: Water security is the reliable availability of water of acceptable quantity and quality for health, livelihoods, and production, coupled with acceptable levels of water-related risks.

Water Conservation: Water conservation is part of WRM which includes all policies, strategies, and activities. The goals of water conservation are to ensure the availability of water for future generations, where in any environment freshwater withdrawals from plants do not exceed their natural location.

Water Governance: Water governance is essential for good WRM. It refers to the political, social, economic, and administrative systems in place that influence the use and management of water. Essentially this means deciding who gets what water, when, and how, deciding who has rights to water and related services and their benefits, and ensuring that these decisions are made by the right people. In many areas, the water demand exceeds the supply. Effective

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governance of available water resources will be critical for achieving water security, fair distribution of water resources among users, and resolution of related disputes.

Integrated Water Resources Management (IWRM): IWRM is a process that promotes the coordination, development, and management of water, land, and related resources. It works to maximize economic and social welfare equitably without compromising environmental sustainability in critical ecosystems.

Multiple Use of Water Services (MUS): MUS is an approach to providing water-related services based on IWRM principles. It takes people's water needs as a starting point for water resource management and habitat decisions. The need for drinking water and the available water resources are looked at holistic approach. Cost-effective and sustainable investments can be made to provide sustainable WASH services.

Under integrated water resource management, various uses of water are covered, which conserve essential water for future generations by managing it safely. The construction of infrastructure without considering the environmental impact creates fertile ground for various types of disasters along with destruction. An example is the lack of irrigation and water scarcity due to the recent drought during July to August 2023 in Madhesh, the southern part of the country from east to west. Due to the extreme shortage of drinking water in Madhesh, it has been analyzed that the construction of roads and other structures around the Chure or Siwalik Range and the extracting materials such as sand, stones, gravel, etc. from the rivers without considering the environmental impact. The issue of Chure-Shivalik range degradation is the main factor leading to the present water scarcity in Madhesh (Sah, 2023). Similarly, due to the environmental impact caused by the unplanned construction of roads by dozers toward the mountains, attention should be paid to minimizing disasters like floods and landslides. Therefore, when constructing a structure that will have a long-term impact while conserving water for future generations, a decision should be taken to build such a structure or not only after a thorough analysis of its environmental, financial, and social impacts. If this is not done, certainly, there will not be a conducive enabling environment for future generations.

The alarming rate of water scarcity, coupled with widespread environmental degradation has brought into focus the need for planned action to manage water resources more effectively and sustainably (Kayaga & Smout, 2019). Thus, climate change can be tackled by maintaining water governance and ensuring water conservation and water security by adopting IWRM and MUS.

Learning and adaptation

Strengthening the WASH system is a regular process. Based on the learning gained, the WASH system can be strengthened by adopting innovative methods, i.e., adaptation (Huston & Moriarty, 2018). It is about developing the capacity to provide WASH services for all, forever, by continuously learning and adapting from experiences, changing circumstances, and demands.

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There should be a regular exchange of information with insights from many stakeholders including civil society. In the same way, we should learn from the analysis of the data and adapt it to a sustainable WASH system. Learning is not complete without using acquired knowledge which is known as adaptation. It should be used. Tasks should be implemented in different ways according to learning. Stakeholders can change policies and practices, address failures, and change the way things are done. In this way, learning feedback through adaptation can be continued. WASH systems are strengthened by continuous learning and adaptation.

The WASH system is 'open' to interact with its surroundings and other sectors such as agriculture, energy, industry, health care facilities, and schools. That interaction is affected by a changing environment. Group interaction is a great way to build strong living systems that learn and adapt. Achieving SDGs for WASH requires collective action as well as strong and resilient federal, provincial, and local WASH systems. Necessary changes can be made to advance innovation and strengthen WASH systems.

The knowledge gained from learning and experience should be incorporated while implementing the project. These foundational building blocks create an environment for regular exchange of information and provide flexibility to develop capacity by reusing learning. In addition, the momentum during the open defecation-free (ODF) declaration was enthusiastic and admirable. Thus, learning from that enthusiasm should be captured and adapted for post-ODF activities and strengthening the WASH systems. In this connection, action research should be prioritized to capture learning leading to adaptation and knowledge creation to the WASH sector.

There is a capacity gap at the rural/municipality level for review, research, and reflection to get insights leading to learning and adaptation for WASH systems strengthening by establishing a management information system (MIS) at the local level. In addition, the local government should prioritize conducting budget tracking leading to an increase in budget for the WASH sector.

Conclusions

The descriptive review has led to important conclusions. The institutionalization including coordination, clear roles and responsibilities, capacity, and sector mechanisms at the federal level has been initiated while it is yet to materialize at the provincial and local levels in the context of Nepal. Moreover, the federal government of Nepal has formulated the Drinking Water and Sanitation Act which is being implemented and its regulation has been drafted yet to approve while the policies and laws for provincial and local levels are yet formulated. Nepal's WASH sector development plan (SDP) for 2016 to 2030 was prepared yet to approve at the federal level. Since the WASH budget has been allocated by all three tiers of government every year, the sectoral plan with a budget at the provincial and local levels is yet to be prepared. Only 10 percent of municipalities completed their WASH plan. In terms of finance, there is a resource gap to achieve the SDGs. Even after federalism, about two-thirds of the total WASH budget has been allocated at the federal level which should be reallocated to maintain the spirit

of the prevailing constitution in Nepal. The accountability mechanisms including regulatory framework and capacity are maintained at the federal level which are accountable to SDGs while the capacity of provincial and local governments needs to be developed and maintained for strengthening WASH systems. A combination of two or more innovative monitoring mechanisms such as hello monitoring, sensors monitoring, toll-free monitoring including on-site monitoring as well as monitoring by external parties or country-led monitoring will make more sense to keep the projects functional and sustainable. In addition, it is found that everyone is interested in the construction of the WASH system, but less attention should be paid after the construction in the context of Nepal. Moreover, it can be concluded that infrastructure development should be sped up to achieve SDGs by 2030. To cope with climate change and maintain water governance, it should be ensured water conservation, and water security by adopting integrated water resource management (IWRM) and multiple uses of water services (MUS). The learning from the enthusiastic and admirable momentum during the ODF declaration can be captured and adapted for post-ODF activities and action research should be prioritized to capture learning leading to adaptation and knowledge creation in the sector. The study further concludes that the building blocks namely institutions, policy and legislation, planning, finance, regulation and accountability, monitoring, infrastructure development and maintenance, water resource management, and learning and adaptation have been playing an important role in strengthening WASH systems to achieve SDGs. Countries with a keen interest to improve the health and hygiene status of their citizens for dignified life should focus on these building blocks to strengthen their WASH systems to achieve SDGs. A collaborative and collective effort by the three tiers of government, development actors, and private sectors should be needed to accelerate to achieve SDGs. The study can be extended by incorporating the opinion and views of citizens of developing countries towards WASH systems strengthening and its contribution to achieving SDGs in future studies.

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