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WASH financing barriers in the global south a systematic review of trends, system bottlenecks and ways forward for Nepal

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Abstract

Despite commitments under Sustainable Development Goal (SDG) 6 safe water, sanitation and hygiene (WASH) progress seems slow in most countries where financing has surfaced up as a critical bottleneck. This systematic review incorporates current evidence on WASH financing gaps, barriers and potential solutions adopting a structured systematic review approach informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework for identifying, screening and synthesizing relevant literature. Global estimates suggest that WASH capital investment is more than three times the current investment and the bottlenecks are multidimensional, key barriers including ineffective governance mechanism and institutional fragmentation, limited fiscal space, low creditworthiness of service providers, inadequate cost recovery and data gaps. Evidence across the reviewed literature consistently identifies strengthening public finance, improving utility operators and their performance, achieving optimal balance between tariffs, taxes and transfers and other innovative financing mechanisms results improved financial effectiveness. The paper concludes, a coherent combination of system strengthening and innovative financing mechanisms is required as a single financing instrument is not sufficient to close the gap. For Nepal, the findings suggest that WASH financing bottlenecks should be analyzed across the WASH system on how financing is planned, allocated and executed.

Keywords: Cost recovery, Creditworthiness, Financing barriers, SDG 6, WASH financing.

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1. Introduction

Access to safe drinking water, sanitation and hygiene (WASH) contributes in improvement of human health, upliftment of social well-being and economic development. In 2010, the United Nations General Assembly acknowledged that the human rights to water and sanitation entitles everyone, without discrimination, to have access to sufficient, safe, secure, acceptable, physically accessible, socially and culturally acceptable and affordable WASH Services [1]. SDG 6 builds on this recognition by committing countries to achieve universal and safely managed WASH services by 2030.

Past midway to 2030, global tracking shows that the world is not on course to meet SDG 6. Joint WHO/UNICEF assessments [2] indicates that progress has been too slow as the implementation of national WASH policies and plans is constrained by inadequate human and financial resources. Many countries have established WASH policies and national plans aligned with SDG 6 but implementation of these plans is hindered by significant financing gaps and weak implementation capacity.

The majority of literatures converges on the view that financing is a central constraint to achieving universal WASH. Global SDG financing assessments highlight that the gap between the volume of investment required to achieve all SDGs and the resources currently mobilized are widening, especially for developing countries with limited fiscal space and high debt burdens [3]. In this context, WASH sector investments is relatively small share of public budgets and private investment and dedicated WASH investments is declining in many low and middle-income countries [4-7]. At the same time, several studies support that the financing challenge is not only about the aggregate volume of the investments and resources but also about how effectively those resources are allocated and used for maximizing the output. Systemic gaps and fragmentation in regulatory bodies being unable to undertake the required surveillance, low creditworthiness of service providers, insufficient attention of public sector to attract private finance, unwillingness of governments for policy amendment to create a more resilient funding mix with inclusion of public private partnership, microfinance, green bonds, technology transfer all contributes to limit both the quantity and the quality of WASH financing [2, 8-10].

This paper has three section each with different objectives. First, it highlights recent evidence to establish the existence of financing and investment gap in WASH with trends in investments. Second, it identifies and analyzes the major barriers to that are hindering the effective and adequate financing of both the public and private sector. Third, it reviews the potential solutions and financing mechanisms that can be used to address the current financing gap. The paper is a mixed set of global reports, reviews, policy documents and academic studies which covers global assessments, regional and country specific experiences.

2. Methodology

This paper uses a structured systematic review approach. WASH financing literature is diverse and includes public expenditure reviews, policy analysis, utility operational status, case studies, systematic reviews and institutional reports, hence, it does not conduct statistical analysis. The review is based on the eligibility criteria and a thematic synthesis for flagging recurring financing bottlenecks, current financing mechanisms and methodological recommendations of its solutions. The approach is informed by the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) framework for identifying, screening and synthesizing relevant studies.

The review is based on three sources: first, the existing review papers on WASH financing trends, barriers and ways forward; second, the supplementary literature matrix referenced with the WASH system building blocks; and third, additional recent global and Nepal-relevant institutional evidence from WHO/UNICEF JMP, GLAAS, UNICEF, OECD, World Bank, WaterAid and Sanitation and Water for All. Publications were selected based on their focus on WASH mainly in services in low- and middle-income countries or global contexts, addressing financing gaps, finance-related barriers or financing mechanisms and were published mainly after 2010. Foundational older sources were retained only where they remain widely used in sector debates, for example cost recovery and regulatory literature.

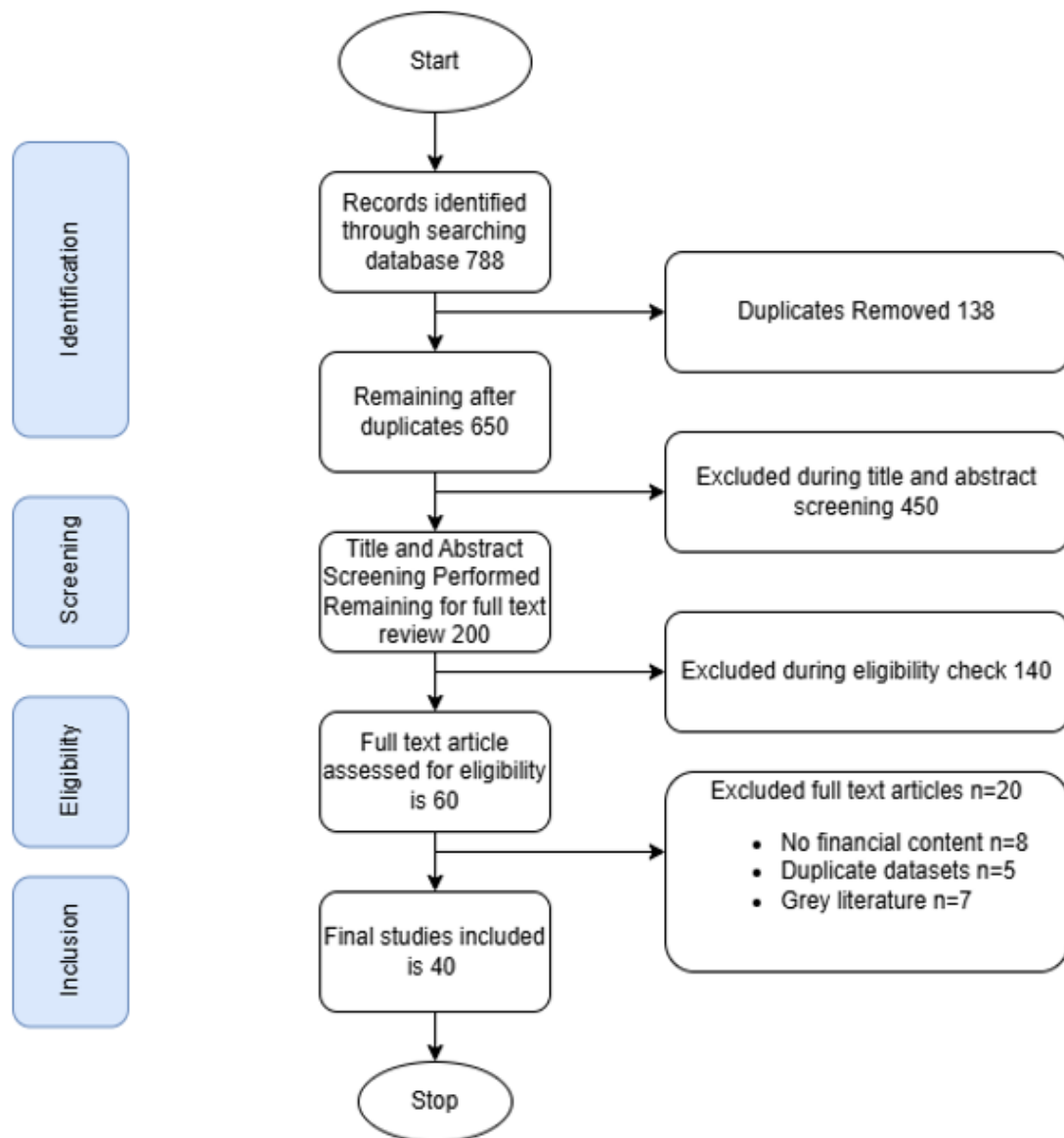


Figure 1.
Methodological Framework.

Table 1.
Review logic.

Review element	Application in this paper
Population / context	Global South, low- and middle-income countries, with attention to Nepal.
Core phenomenon	WASH financing gaps, financing flows, bottlenecks and financing mechanisms.
Analytical frame	WASH system building blocks and sustainable cost recovery.
Evidence type	Peer-reviewed studies, global reports, public finance reviews, policy guides and case studies.
Synthesis output	Themes, mechanisms and research gaps rather than pooled numerical estimates.

3. Global WASH Financing Trends and Gaps

3.1. Governance and Institutional Fragmentation

Weak governance and fragmented institutional arrangements are recurrent themes in the WASH financing literature. GLAAS 2025 reports that institutional roles and responsibilities for government and national institutions in the WASH sector are clearly not defined where sixty four percent of countries reported the overlapping roles and responsibilities for WASH in national ministries and institutions [11]. The lack of lead agencies or presence of too many lead agencies has often created obstacles in institutional coordination, communication, advocacy ultimately resulting in effective implementation. GLAAS 2019 and 2022 reports suggested that most countries have national WASH plans and policies but are constrained by inadequate human and financial resources and overlapping mandates of the national institutions. Regulatory bodies lack sufficient financial and human resources to undertake the surveillance and monitoring of implementation of national WASH plans and policies, majorly in rural areas [2, 8].

Low creditworthiness of WASH service providers is the result of institutional fragmentation, ineffective regulation and unclear sector vision. While the responsibilities and expenditure are spread across multiple ministries and agencies, it has resulted in difficulty in coordination and the relevant information to propose unified plans to align public, private and donor funds are missing [9]. Studies of rural water supply schemes in Kenya suggest that sector policy is a significant determinant of sustainability. Schemes implemented with strong policy frameworks with appropriate supportive regulations and clear roles of stakeholders tend to perform better over time [12].

A financing gap reflects choices about policy vision, service level, affordability, who pays and life cycle cost analysis. UNICEF describes WASH finance strategy development as a political and strategic process, not simply a technical costing exercise [13].

3.2. Limited Fiscal Space and Competing Priorities

Fiscal constraints represent another major barrier to scaling up WASH investment. Many developing countries face declining fiscal space due to slow economic growth, rising debt levels and changing creditor composition. Governments are compelled to allocate majority of their revenue to spend on the interest payment rather than focus on increasing allocations to social sectors and infrastructure, including WASH [3].

Investments in WASH can generate very high economic returns. For example, one study cited in the SWA handbook for ministers indicates that improving access to safe water and sanitation can contribute to an increase in GDP growth in poor countries from 0.1% to 3.7% per year suggesting every dollar invested in water and sanitation gives four-fold return. Despite such potential, WASH frequently suffers from the challenges of low investment and poor performance which ultimately undermines the confidence in sector's ability to effective service delivery which will eventually discourage further investments in a vicious cycle [14].

3.3. Low Creditworthiness and Operational Performance of Service Providers

Most of the WASH utilities and service providers are not considered creditworthy by commercial lenders. Commercial finance typically seeks borrowers with a clear legal mandate, a strong financial track record, positive net cash flow over multiple operational years, business-minded leadership, operational efficiency, robust asset management and a record of borrowing and repaying debts. However, many WASH service providers developing countries meet very few of these criteria [9].

Unacceptably low tariffs, lack of technical and managerial capacity and poor quality of infrastructure are the major reasons behind this which will eventually impact in cover operation and maintenance costs [15]. As a result, revenues are often insufficient to cover O&M, which makes utilities risky borrowers from lender's perspective [10]. Lack of creditworthiness, weak operational efficiency and limited reserves are identified as recurring barriers that prevent utilities and small providers from accessing finance [5].

3.4. Inadequate Cost Recovery and Tariff Design

An IRC paper on cost recovery in water and sanitation projects notes that in rural and peri-urban areas very few projects recover more than operation and maintenance costs and a portion of capital expenses, therefore, long run financial sustainability seems to be rare making WASH systems highly dependent on external funding like subsidies [16].

One reason is that tariffs are often set below cost for political or social reasons, sometimes with the intention of protecting poor households, but they benefit wealthier people who consume more water and are more likely to be connected to formal networks. The inefficiency cost, associated with high system losses and overstuffed workforce directly impacts on utility's overall efficiency. The report projects the global average full cost-recovery tariff would reduce by an estimated 14% of global average water tariff [17].

3.5. Weak Regulatory Oversight and Accountability

Weak regulatory framework creates disorientation in institutional roles, tariff-setting, service standards and performance monitoring and reduces the assurance of government to the donors, lenders and private investors. In many low- and middle-income countries, overlapping mandates and weak regulatory capacity have contributed to fragmented budgets, poor coordination and limited ability to track WASH expenditure against service outcomes [9, 17, 18].

3.6. Data, Information and Capacity Constraints

Several studies show that data and capacity gaps are cross-cutting issues. SACOSAN's 2018 report has stressed that insufficient data and limited evidence base for WASH financing has led to gaps in sector financing. Furthermore, weak technical capacity at different government levels leads to available budget is not fully used [19].

Significant gaps were identified in overall costing data and large gaps were identified in the systematic review of costing and financing of WASH in schools particularly for hygiene infrastructure (e.g., handwashing facilities, menstrual hygiene management) and for software activities like hygiene education, monitoring and evaluation, training, curriculum development and so on [20]. The data gaps make it challenging to assess needs, develop realistic plans and hence identified as a key barrier for integrating successful and sustainable WASH programs into school settings.

GLAAS reports suggest that many countries lack accurate and reliable systems for tracking WASH expenditures and linking them to service outcome due to overlapping roles or undefined roles among the sectoral ministries and institutions [11]. Without the availability of accurate and composite WASH government expenditure, the development of sector finance plan will be challenging which prevents progress from being monitored and managed [9].

3.7. Inequalities and Exclusion

UN-Water's human-rights factsheets emphasize that marginalized groups like women, children, refugees, indigenous peoples, people with disabilities and so on are often overlooked and sometimes face active discrimination from those planning and governing water and sanitation improvements and services [5]. A study from Bangladesh on barriers to WASH for persons with disabilities finds barriers such as lack of financial support for disability-friendly toilets as none of the participants on the study reported that they got any financial assistance for constructing disabled friendly toilet. Moreover, negligence in accessing improved WASH services, lack of awareness programs related to WASH services for people with disabilities and unaffordability of the sanitation facilities and services for the participants due to low income were discussed in the study [21]. Income inequality and access to other infrastructure were also the barriers according to the study. Unemployment, limited education and lack of access to awareness related to sanitation and hygiene were also the challenges related to the WASH service.

An analysis of panel data from 119 countries between 2004 and 2020 and find that higher income inequality is associated with reduced adoption of improved WASH facilities, the impact being greater in rural areas than in urban areas. They also suggest that financial inclusion can lessen these effects by encouraging WASH investments among both rural and urban populations although the impact varies by income group and region [22].

3.8. Nepal Reflects the Global Pattern: Commitments, Plans and Persistent Financing Constraints

The Nepal WASH Sector Development Plan 2016-2030 acknowledged the need to mobilize domestic resources, track sector finance, private sector engagement and improved sector financing [23]. Yet the same plan identified poorly tracked sector financing, dependence on donors, regional imbalance, low tariff generation by user committees, weak operational efficiency and a large gap between WASH financing needs and expenditure.

WaterAid Nepal states that despite strong government commitment to SDG-related targets, WASH financing falls drastically short, spending against allocated budget remains around 60 percent, dedicated WASH funding has declined, and the prospect of missing SDG 6 targets is significant without stronger collaboration and financing [6].

4. Financing Barriers as WASH System Bottlenecks

The reviewed literature identifies many barriers: weak governance, limited fiscal space, inadequate cost recovery, low creditworthiness, weak data, limited capacity, inequity and low private-sector participation. This paper groups them into six system bottlenecks to make them analytically useful for a Nepal case study.

4.1. Governance and Institutional Fragmentation

Weak governance and fragmented institutional arrangements are recurrent themes in the WASH financing literature. GLAAS 2025 reports that institutional roles and responsibilities for government and national institutions in the WASH sector are clearly not defined where sixty four percent of countries reported the overlapping roles and responsibilities for WASH in national institutions [11]. Lack of lead agency or presence of too many lead agencies has often created obstacles in institutional coordination, communication, advocacy ultimately resulting in effective implementation. GLAAS 2019 and 2022 reports suggested that most countries have national WASH plans and policies but are constrained by inadequate human and financial resources and overlapping mandates of the national institutions. Regulatory bodies lack sufficient financial and human resources to undertake the surveillance and monitoring of implementation of national WASH plans and policies, majorly in rural areas [2, 8].

Moreover, the low creditworthiness of WASH service providers is the result of institutional fragmentation, ineffective regulation and unclear sector vision. While the responsibilities and expenditure are spread across multiple ministries and agencies, it has resulted in difficulty in coordination and the relevant information to propose unified plan to align public, private and donor funds are missing [9]. Studies of rural water supply schemes in Kenya suggest that sector policy is a significant determinant of sustainability. Schemes implemented with strong policy frameworks with appropriate supportive regulations and clear roles of stakeholders tend to perform better over time [12]. Overlapping roles and fractured decentralization can disrupt funding flows and service delivery accountability [24]. These insights are directly relevant for Nepal, where local governments carry important WASH responsibilities but may have unequal technical, financial and managerial capacity

4.2. Limited Fiscal Space and Competing Priorities

The 2024 Financing for Sustainable Development Report indicates that many developing countries face declining fiscal space due to slow economic growth, rising debt levels and changing creditor composition. In these conditions, governments are compelled to allocate majority of their revenue to spend on the interest payment rather than focus on increasing allocations to social sectors and infrastructure, including WASH [3].

The SWA handbook for finance ministers shows that investments in WASH can generate very high economic returns. One study cited in the handbook indicates that improving access to safe water and sanitation can contribute to an increase in GDP growth in poor countries from 0.1% to 3.7% per year suggesting every dollar invested in water and sanitation gives four-fold return. Despite such potential, WASH frequently suffers from the challenges of low investment and poor performance which ultimately undermines the confidence in sector's ability to effective service delivery which will eventually discourage further investments in a vicious cycle [14].

4.3. Low Creditworthiness and Operational Performance of Service Providers

Commercial finance typically seeks borrowers with a clear legal mandate, a strong financial track record, positive net cash flow over multiple operational years, business-minded leadership, operational efficiency, robust asset management and a record of borrowing and repaying debts. However, many WASH service providers in developing countries meet very few of these criteria [9].

Common problems include high levels of non-revenue water from which utilities are being unable to maximize their income. Unacceptably low tariffs, lack of technical and managerial capacity and poor quality of infrastructure are the major reasons behind this which will eventually impact in cover operation and maintenance costs [15]. As a result, revenues are often insufficient to cover O&M, which makes utilities risky borrowers from lender's perspective [10]. Lack of creditworthiness, weak operational efficiency and limited reserves are identified as recurring barriers that prevent utilities and small providers from accessing finance [5].

Improving creditworthiness is therefore not simply a financial exercise. It requires stronger governance, better performance monitoring, asset management, realistic tariffs or subsidies, professional management and clearer accountability. Nepal's WASH Sector Development Plan identified low revenue generation by user committees, underpricing, low collection rates, non-revenue water and weak operational efficiency as financing challenges [23].

4.4. Sector Financing, Cost Recovery and Tariff Bottlenecks

WASH financing is often described through establishment of a balance between three types of revenues (Tariff, Tax and Transfer), since none of these 3Ts alone would be able to support the provision of WSS services. Thus, the optimal balance between these factors allows cost recovery in the sector and ensures its sustainability, which in turn attracts other forms of repayable financing such as loans, bonds and private investment Machete and Marques [25].

Carrard, et al. [26] suggests sustainable cost recovery should be built through the mix of three principles: an appropriate mix of tariffs, taxes and transfers, predictable public investment and tariff policies affordable to all.

Tariffs are often set below cost for political or social reasons, sometimes with the intention of protecting poor households, but they benefit wealthier people who consume more water and are more likely to be connected to formal networks [25]. The report also stresses that the inefficiency cost, associated with high system losses and overstuffed workforce directly impacts on utility's overall efficiency. A study suggested that the global average full cost-recovery tariff would reduce by an estimated 14% of global average water tariff [17].

4.5. Planning, Monitoring and Finance Data Gaps

Planning is the bridge between needs and finance. Governments can use these plans for investments as a key tool in mobilizing funds, budget appropriation, and engaging in investment negotiations with Multilateral Development Banks. Studies of urban sanitation planning argue that participatory and data-driven planning helps create a more bankable environment for investment [27]. UNICEF fiscal diagnostic work similarly emphasizes that effective planning, monitoring and review indicates a sector's ability to efficiently allocate resources and track the progress of investment spending which impact towards national targets, policy mandates and cost recovery [28].

Several studies show that data and capacity gaps are cross-cutting issues. SACOSAN's 2018 report has stressed that insufficient data and limited evidence base for WASH financing has led to gaps in sector financing. Furthermore, weak technical capacity at different government levels leads to available budget is not fully used [19].

Significant gaps were identified in overall costing data and large gaps were identified in the systematic review of costing and financing of WASH in schools particularly for hygiene infrastructure (e.g., handwashing facilities, menstrual hygiene management) and for software activities like hygiene education, monitoring and evaluation, training, curriculum development and so on McGinnis, et al. [20]. The data gaps make it challenging to assess needs, develop realistic plans and hence identified as a key barrier for integrating successful and sustainable WASH programs into school settings.

GLAAS reports suggest that many countries lack accurate and reliable systems for tracking WASH expenditures and linking them to service outcome due to overlapping roles or undefined roles among the sectoral ministries and institutions [11]. Without the availability of accurate and composite WASH government expenditure, the development of sector finance plan will be challenging which prevents progress from being monitored and managed [9]. Countries often have the data of service coverage better than finance, governance or human-resource. GLAAS 2025 notes that many countries monitor service coverage and infrastructure but fewer tracks finance and governance against baselines [11].

4.6. Inequalities and Exclusion

UN-Water's human-rights factsheets emphasize that marginalized groups like women, children, refugees, indigenous peoples, people with disabilities and so on are often overlooked and sometimes face active discrimination from those planning and governing water and sanitation improvements and services [5]. A study from Bangladesh on barriers to WASH for persons with disabilities finds barriers such as lack of financial support for disability-friendly toilets as none of the participants on the study reported that they got any financial assistance for constructing disabled friendly toilet. Moreover, negligence in accessing improved WASH services, lack of awareness programs related to WASH services for people with disabilities and unaffordability of the sanitation facilities and services for the participants due to low income were discussed in the study [21]. Income inequality and access to other infrastructure were also the barriers according to the study. Unemployment, limited education and lack of access to awareness related to sanitation and hygiene were also the challenges related to the WASH service.

Acheampong, et al. [22] analyze panel data from 119 countries between 2004 and 2020 and find that higher income inequality is associated with reduced adoption of improved WASH facilities, the impact being greater in rural areas than in urban areas. They also suggest that financial inclusion can lessen these effects by encouraging WASH investments among both rural and urban populations although the impact varies by income group and region.

Table 2.

Financing bottlenecks mapped to WASH system building blocks and Nepal thesis agenda.

Building block	Financing bottleneck	Evidence signal from literature
Policy and strategy	Unclear financing mandates, tariff rules, subsidy rules and private-sector conditions.	Policy and legal clarity improves investor confidence and reduces risks; finance gap depends on policy choices.
Institutional arrangements	Overlapping roles, weak coordination, unclear asset ownership and weak accountability.	GLAAS reports institutional overlap; Pories et al. link creditworthiness to clear mandates.
Sector financing	Insufficient domestic public finance, low budget execution, weak tracking, unsustainable 3T mix.	Public finance dominates water-sector spending; GLAAS shows persistent funding gaps and budget absorption problems.
Planning, monitoring and review	Costed plans not linked to realistic finance; data used for reporting more than budgeting.	Data-driven planning creates bankable environments; fewer countries track finance/governance inputs.
Regulation and accountability	Tariffs and service quality not jointly regulated; weak water quality and sanitation-chain oversight.	Regulation must balance social and financial objectives and link quality of service with cost.
Equity and resilience	Poorly targeted subsidies; climate and inclusion needs not financed across life-cycle costs.	JMP and GLAAS show persistent inequalities and limited financing measures for underserved groups.

5. Financing Mechanisms and What They Can and Cannot Solve

5.1. Strengthening Domestic Public Finance and Sector Systems

Strengthening public finance and sector system is the fundamental solution because public finance is and will remain the backbone of WASH investment. According to The SWA handbook for finance ministers, overcoming the barrier in WASH financing must be viewed in a broader horizon by proposing reforms through improvement of sector efficiency, governance and sector funding sources. The handbook proposes to increase the current national budget allocation for water and sanitation to 5% and 0.5%, respectively since it will have broader impact on the improvement of other sectors like public health, education and social benefits [14].

Since most countries have developed their WASH plan and strategies with the tentative costing which prioritize the implementation of activities based on need. However, most of the country's plans are underfunded with the actual data and information regarding the expenditures is notoriously hard to extract. In certain cases, tariff and out of pocket spending by users may be hard to report. On the other hand, low government spending may simply reflect insufficient public investment in the sector [5, 11].

5.2. Improving Utility Performance and Creditworthiness

Improvement in the operational and financial performance of service providers is essential to draw additional finance in the sector and ensure sustainability of the WASH services. The World Bank's utility turnaround framework suggests that utilities are already well-established entities with legal mandates, expertise and the potential to attract commercial finance. Many utilities in low- and middle-income countries like Brazil (SABESP, a state-owned company), Cambodia (Phnom Penh Water Supply Authority, a municipal-owned company) and the Philippines (Manila Water, a private company) are some of the world-class service providers due to their ability to leverage commercial finance [29]. Additionally, Maximizing Finance for Development framework estimates that only 17 percent of utilities in low- and middle-income countries cover their operation and maintenance costs and generate a cash surplus. The major reasons are improved bill collection rates reduction in labor costs and reduction in nonrevenue water (NRW) to 25 percent, 65 percent of percent of these utilities could generate a cash surplus.

USAID's technical brief suggests that development practitioners should account for the governance capacity of the specific and creditworthiness of service providers for assessing the potential to access different types of financing and plan for long-term reform [10]. Since focusing on only one or two foundational issues of systems-strengthening approach of the WASH sector is unlikely to bring any changes, the whole systematic changes are required to achieve creditworthiness. The government should be focused on developing appropriate financing strategies which prioritize public finance for marginalized areas with less commercial appeal via sector finance plans. Similarly, mandates and targets prioritizing financial and operational planning and efficiency should be set for service providers which can help a service provider become more credit-worthy and eventually convince private sector to attract and sustain more finance to invest into the business [9].

5.3. Optimizing Tariffs, Taxes and Transfers

Optimizing the mix of tariffs, taxes and transfers (the 3Ts) is another strategy in enhancing the investments in WASH. Several research and reports like Machete & Marques suggest that balance between tariffs, taxes and transfers is extremely important since none these 3Ts alone would be able to support the provision of WASH service delivery. Hence, the optimal balance between these allows cost recovery and ensures the sustainability which will eventually attracts other forms of financing such as loans, bonds and private investment [25].

A study of data of 68 countries found that between 2009 and 2020, 64 percent of the public expenditure in the water sector came from domestic sources i.e. tax revenue, utility tariffs and budgetary transfers. The report stresses that for smooth operation of WASH services, out of the three sources tariffs should be the most reliable and long term funding source for the service providers since budget support from tax can be less predictable in the long run and GLAAS, 2022 reports the decreasing pattern of external aid support in water and sanitation [4, 8].

5.4. Blended Finance and Private Capital Mobilization

Blended finance is frequently proposed to scale up WASH investment to mobilize additional capital. Blended finance can be a supportive instrument to mobilize commercial finance and strengthen the financing systems on which water-related investments rely. In general, blended finance should target to build local capital markets by working with local financiers. Blended finance neither focuses on fixing particular issues in the current business models nor it is about filling financing gap. It is a transitory market building tool that is designed to sustain the commercial investment in the long run in such a market where commercial investor are hesitant to invest yet by providing confidence and capacity. Development of well-targeted blended finance strategies can support water and sanitation utilities that are moving towards creditworthiness, for example improving their efficiency and financial sustainability [18].

The International Water Centre and the Blended Finance Taskforce similarly emphasize that when blended with public fundings, private capital can find investable opportunities across the WASH areas, from infrastructure to capacity building and skill development [30, 31]. These sources suggest several principles of blended finance. First, implementation of blended finance requires strong enabling environments including legislature and sound regulations. Second, it should be developed according to the country's specific blending principles.

5.5. Microfinance and Inclusive Financial Services

Household-level financing demands can be addressed by microfinance and other inclusive financing needs for WASH. To finance activities such as rainwater harvesting tanks, water connections, shallow wells, pumps, ventilated improved pit latrines, septic tanks, sanitation slabs and biogas toilets, microfinance institutions can provide small loans to households or entrepreneurs [32]. In Bangladesh, a pilot initiative was carried out jointly by the World Bank and the government of Bangladesh where the blending of an output-based aid (OBA) subsidy with microfinance loans to institutions helped support the business development of sanitation products and their reach to the poorer households [33].

A study shows that income inequality could be one of the major barriers of WASH adoption and practices in rural and urban residents. So, financial inclusion facilitates WASH adoption and practices, effect being more pronounced in rural areas than the urban [22].

5.6. Innovative Instruments: Results-Based Finance, Bonds and Impact Investing

Pay-for-success instruments such as Development Impact Bonds (DIBs) are being explored. A case study of India where, in 2018, the first sanitation impact bond was initiated. Starting with a pilot phase of EUR 5 million they aimed to raise EUR 100 million from institutional investors in three years to build 1.5 million toilets. The partners of this bond included Dutch institutional investors, Actiam, a Dutch impact investor, KMPG, Waste and Indian microfinances. Microfinances will repay investors, including a small a financial return provided by Dutch Water Sector [30]. Here, results-based financing method is incorporated. If the target of 1.5 million toilets is reached, the microfinance institutions will be rewarded with lower interest rates [18].

In Adama, Ethiopia; Agence Française de Développement (AFD) has financed a grant of 3 million euro which uses the Development Impact Bond, an innovative financial tool for a program to improve menstrual hygiene management. In Peru, Water.org has initiated another innovative financial tool called blue bond in which they collaborated with financial institutions and the national development bank. The result is it has generated USD 26.5 million in capital for water and sanitation expansion and improvements among households [11].

5.7. Public-Private Partnerships and Community-Based Approaches

Public-private partnerships (PPPs) and community-based models can help overcome capacity and financing constraints. A World Bank funded project piloted in Uttar Pradesh in 2002, where NGOs supported water-related activity through engineering services and capacity building by setting up Village Water and Sanitation Committees, was relaunched in 2018. Another example is water quality monitoring and national-level ranking of water quality monitoring laboratories. For this purpose, 104 Key Resource Centers were contracted and trained. However, funding had been the problem for implementation support agencies, mainly NGOs. So, a revolving fund from national funding agencies like NABARD could help support the NGOs. Moreover, the program also makes trained woman from the village responsible for regular operation and minor repair of utilities which eventually opens scope for women-led micro and small business too which could be funded by microfinance institutions [31].

A study suggests that private sector involvement in rural WASH service along with a strong community-based organizations which emphasize cost recovery will enhance sustainability [12].

5.8. Financing Strategies for Equity and Inclusion

Financing strategies must integrate equity and inclusion as explicit objectives. UN-Water suggests governments to adopt human-rights-based approaches (HRBA) to WASH since marginalized groups are often found to be overlooked [5]. The human right to sanitation urges everyone to have physical and affordable access to safe water and sanitation without discrimination [1].

Importance of financial assistance for constructing disable-friendly toilets in Bangladesh highlights the importance of targeted financing for disability inclusive WASH services [21]. Broader literature on financial inclusion suggests that financial inclusion significantly facilitates WASH adoption and practices [22].

6. Conclusion

WASH financing bottlenecks are substantial, persistent and multidimensional. Global estimates show that the sector is far from the financing scale required for SDG 6. Fragmented institutions, unclear mandates, weak planning and monitoring, incomplete expenditure data, low-budget absorption, inadequate cost recovery, poor service provider performance, limited regulation, capacity gaps and inequitable subsidies all have significant impact in WASH Financing. Financing mechanisms like 3Ts, blended finance, PPPs, microfinance, bonds and results-based finance have roles to play but only a single mechanism cannot significantly impact more than basic system strengthening.

Nepal should focus on financing bottlenecks as it is observed in the full WASH system and across different levels of government. Mostly, to explain how finance is planned, allocated, spent, recovered and accounted for and how these processes affect service sustainability and inclusion. Closing the WASH financing gap requires not only more budget but also clearer institutions, better data, budgets, viable service providers, cost recovery and stronger accountability to people who remain underserved.

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