

**Sustainability of water services:
A review of international development programme
approaches to rural water access in Nepal**

Alex Hazelgrove-Planel

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ACRONYMS

ACF – Action Contre la Faim

ASWA – Access to Sanitation and Water for All

CBM – Community Based Management

DCA – DanChurchAid

DFID – UK Government Department for International Development

DWSS – Government of Nepal Department of Water Supply and Sewerage

EQ – Earthquake

FEDWASUN – Federation of Drinking Water and Sanitation Users Nepal

GoN - Government of Nepal

GWT – Gurkha Welfare Trust

HH – Household

IDWSSD – International Drinking Water Supply and Sanitation Decade

INGO – International Non-Governmental Organisation

IRC – International Water and Sanitation Centre

M&E – Monitoring and Evaluation

MDG – Millennium Development Goal

MM – Mott MacDonald

NGO – Non-Governmental Organisation

O&M – Operation and Maintenance

ODA – Official Development Assistance

PPP – Public Private Partnership

RWSP – Rural Water and Sanitation Programme

SCR – Sustainable Cost Recovery

SDG – Sustainable Development Goal

UNICEF – United Nations Children’s Fund

VDC – Village Development Committee

VMW – Village Maintenance Worker

WASH – Water, Sanitation and Hygiene

WUSC – Water User and Sanitation Committee

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1 INTRODUCTION

DFID has supported several iterations of WASH programmes in Nepal and continues to have a varied portfolio of active programmes in the sector. Each programme has its own rationale and emphasis, from reconstruction following the 2015 earthquake to supporting the UK's global contribution to international targets for access to water, sanitation and hygiene. All are intended to contribute in some way to sustainable development, as enshrined in the SDGs.

Sustainability has been a consistent preoccupation and a driver of key policy shifts in the rural water sector of international development. It is also an enduring problem that, despite grappling with for decades, the sector has yet to satisfactorily address. A growing body of evidence has laid bare the failings and weaknesses of application and approach of contemporary Community Based Management. Some concerns are not recent, others have emerged more strongly with newer data. It is widely held that around 40% of rural water systems are non-functional at any one time (RWSN, 2010), a failure rate that would be in-excusable for most public services. While on the other side of the same coin, 60% of services may be functional and even sustainable (Rautanen and White, 2018), the difference between success and failure is complex and the root causes of either hard to diagnose. The only consensus is on the need for improvement across the sector.

Three years into the SDG timeframe, the WASH sector is still exploring what sustainability means, what it might look like and how to go about achieving it. This study has used a case study of 4 DFID funded WASH programmes in Nepal to examine current practice and consider the extent to which it is supportive of sustainable access to water services.

Applying the framework to assess the case study programmes, this study finds that none of the programmes are providing sustainable water services, but emerging good practice was observed on which more sustainable approaches can be built. Durable infrastructure and thorough community mobilisation provide communities with a fair chance of weathering a crisis. Examples of the opposite were also observed, undermining resilience and greatly increasing the likelihood of failure of water services. However, 'business as usual' is not enough to ensure sustainable water access. Community capacity is variable and some problems will inevitably exceed communities' capacity to respond. There are systemic gaps in support available to address such issues and ensure access is maintained.

To be sustainable, programme approaches need to establish systems and capacity appropriate and sufficient to ensure indefinite continuation of access to water services. A mindset change is needed to achieve this: it is not a question of if but when water systems will fail and require repair. Programme approaches need to embrace this certainty and do much more to support communities and others to be ready to respond.

Nepal is a newly federalised state, which has created over 700 new local government bodies empowered and resourced to invest in local development and infrastructure, including WASH. While DFID has hesitated to engage significantly in WASH sector governance to date, a key recommendation of this report is that it does so, to influence and support new policy processes governing WASH access.

This study advocates for a shift in the primary focus of donor programmes from the provision of access through construction or rehabilitation of infrastructure, to the maintenance of access through institutional support. A balance of both should be retained but, as the former was borne of the MDG's race to achieve results, transitioning to the latter will be essential to securing the SDGs universal access.

2 FRAMEWORK

2.1 13 CRITERIA

To conceptualise sustainability of water access and facilitate review of the case study programmes, the framework in Table 1 was derived from the literature. The framework's 13 criteria provide an indication of what development programmes could do to ensure they deliver sustainable services in Nepal.

The majority of the framework's criteria are derived from Lockwood and Smits (Lockwood and Smits, 2011) and the broader body of related work of the Triple-S and WASH Cost programmes by IRC. Lockwood and Smits' 10 criteria framework for sustainable water programmes have been supplemented with a further 3 criteria as a result of early observations from the field, and to remedy the omission by Lockwood and Smits of initiatives to manage water resources and quality. The addition of the latter replicates Lockwood and Smits' own revisions to the framework in their work for a World Bank multi-country study of the enabling environment for sustainability of water services, where the 10 criteria were condensed into 4 and a fifth added to consider water resource management and security (World Bank, 2017). The World Bank's framework was not adopted for this study, despite the appeal of brevity and overlaps between several of the original 10 criteria, as the original framework was targeted at development programmes and thus more relevant.

Criteria 1 and 2 were added to the framework following early field observations. The assumption that water projects ensure functionality of all schemes constructed is unfortunately erroneous. As already noted, a regrettably substantial proportion of water schemes fail within 12 months of completion (Carter and Ross, 2016; Tincani et al., 2015). The same being observed in some of the case study programmes in Nepal, criteria 1 and 2 were added to capture programme performance against what are essentially the prerequisites for a water scheme' sustainability.

The framework has been adapted to the context of Nepal's water sector but remains ambitious in proposing measures that go beyond the current context. The level of ambition is intended to be consistent with that which has been identified as necessary for the achievement of the SDGs – a step change in funding and a new or renewed focus on institutional strengthening “to ensure that capital investments translate into effective service delivery” (Hutton and Varughese, 2016).

2.2 SCORING

The framework is an assessment tool that seeks to combine assessment of evidence gathered from both literature review of programme documentation and field-based observations. Where there are conflicts or exceptions to the policy, precedence in assessment is given to field observations of practice.

To provide a reference for comparison, the 13 criteria are graded on a scale of 1 to 5 with a qualitative definition of each point on the scale. The score categories outlined below are derived from the combination of the following general principles: the extent of service delivery or implementation focussed approach, influence beyond the programme's internal case load, engagement with Government (or other institutions with similar roles), the balance of dependency on 3Ts sources of finance (Lockwood and Smits, 2011; OECD, 2011).

High scores (4-5/5): Programme approaches that score highly in the framework provide strong support for sustainability, reaching beyond the limits of the programme's case-load of water schemes to shape the water sector in Nepal. These approaches support government or independent systems and institutions that work in a coordinated manner to provide indefinite sustainability of services and schemes. Financially the systems and institutions supported by the programmes should be predominantly dependent on taxes and tariffs and a diminishing proportion of transfers or ODA funding.

Medium scores (3/5): Programme approaches given medium scores seek to support sustainable services but are limited in their ability to provide indefinite sustainability by an internal focus and/or lack the facility or scope to engage and shape the wider sector. These approaches might implement a systems-based approach, supporting services and institutions, but might create programme specific facilities and institutions whose scope is limited to the programme's timeframe and case load of schemes, rather than supporting government or other independent institutions that would have a reach beyond the programme's case load. The systems and services supported by these programme approaches would tend to a significant financial dependence on transfers or ODA funding, would not endure much beyond the life of programme funding, but should feature a meaningful contribution from taxes and tariffs.

Low scores (1-2/5): Programme approaches that feature little focus on sustainability and/or perpetuate the status quo of CBM based approaches in Nepal are scored lowest. These approaches will have little to no focus on institutional support or developing a service-oriented model. They will likely tend to focus on the delivery of water access and its associated benefits, but without serious engagement or planning for how access will be maintained. If these programmes engage with outside institutions, they will tend to focus only on delivery of access rather than any broader reform or capacity building. The programmes and the systems or institutions they support will be highly ODA dependent with minimal or low financial support from either tariffs or taxes.

2.3 LIMITATIONS OF THE FRAMEWORK

The framework presents a number of limitations. Firstly, it is narrowly focused on appraising sustainability and does not seek to present or support an absolute assessment of the overall impact or worth of the case study programmes. Neither does the framework consider approaches to sustainable access to sanitation or hygiene, equal or greater foci of all the case study programmes.

The number of criteria is such that it can claim neither virtue of conciseness nor comprehensiveness. There is also some overlap between criteria definitions or the proposed measures to satisfy them.

In seeking to represent key criteria for sustainability, criteria 1, 2 and 13 each cover broad areas of technical expertise to which entire frameworks could be dedicated and that are not easily represented within a framework that seeks a holistic appreciation. Each criterion is from a contested field with a plurality of opinions and approaches that the framework cannot comprehensively engage with. Instead, the framework seeks to focus on those critical outputs of the deep, complex and context dependent processes that are covered by each criterion, isolating the features that

are particularly relevant to sustainability, that make the difference or tend to be associated with sustainable approaches. In criteria 2's case, the author acknowledges a bias towards the equal participation of women in decision making as a desirable feature in its own right, but recognises that consensus on the benefits to sustainability of women's engagement in community systems is yet to be reached (Das, 2014; Foster, 2013; Nixon and Owusu, 2017). There is however a strong body of evidence that ownership of schemes is important to sustainability (Marks et al., 2013; Marks and Davis, 2012; Yacoob, 1990), that the involvement of women is important to their sense of ownership (Kelly et al., 2017; Nixon and Owusu, 2017) and that the institutions created to support water schemes need to be adapted to the context and community they represent (Cleaver, 2015; Haapala et al., 2016; Whaley and Cleaver, 2017).

Table 1: Framework of criteria for sustainable rural water programmes in Nepal

Criteria for sustainability		Scoring scale and definition					References
#	Title	1/5	2/5	3/5	4/5	5/5	
1	Durable water infrastructure	Programme approach provides infrastructure that, by design or construction, fails to provide basic water access, e.g. failing to satisfy present water demand in quantity (<20lpcd) and quality.	Programme approach provides infrastructure that provides basic water access or, through flaws in design or construction, is unable to provide consistent safely managed access. E.g. Seasonal variances cause variability of supply volume that compromises per capita access, or contamination of water.	Programme approach provides infrastructure designed and constructed to consistently satisfy current water demand to safely managed standards but is BOTH: a) Not constructed to sufficiently high-quality standards (materials and techniques) to last (15+ years); AND b) provides insufficient supply capacity to satisfy water demand over the long term (15+ years).	Programme approach provides infrastructure designed and constructed to consistently satisfy current water demand to safely managed standards but is compromised by <u>one</u> of either: a) Not constructed to sufficiently high-quality standards (materials and techniques) to last (15+ years); OR b) provides insufficient supply capacity to satisfy water demand over the long term (15+ years).	Programme approach provides infrastructure that is designed to satisfy current and future demand to safely managed standards over 15+ years and built to high quality standards (materials and techniques), enabling it to last.	(JMP, 2017)

2	Community Mobilisation	<p>Community user committee training support perfunctory or incomplete E.g. committee membership/constitution unclear, decisions on tariff un-resolved, maintenance worker un-identified/training not performed.</p>	<p>Community user committee formed, trained and supported to take key decisions on scheme operation, maintenance and tariff/charges. User committee membership is unrepresentative of community ethnic and gender composition. User committee registered under Water Resource Act 2049. Maintenance worker(s) identified and trained.</p>	<p>Community user committee formed, trained and supported to take key decisions on scheme operation, maintenance and tariff/charges. User committee membership is inclusive of women and people from Janajati/Dalit caste and other ethnic groups but does not reflect fair participation of women (50:50) or caste/ethnic groups (proportional). User committee registered under Water Resource Act 2049. Maintenance worker(s) identified and trained.</p>	<p>Community user committee formed, trained and supported to take key decisions on scheme operation, maintenance and tariff/charges. User committee membership and 'executive' posts are inclusive of women (equally represented), people from Janajati/Dalit caste and other ethnic groups (proportionally represented). User committee registered under Water Resource Act 2049. Maintenance worker(s) identified and trained. Engagement/participation of local authorities at key points in community mobilisation.</p>
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3	Professionalisation of community management	Programme implements Community Management approaches based on voluntary principles, without clear contracting arrangements.	Programme establishes community accountability system to support user committee to monitor and respond to user satisfaction. Capacity building includes training on business planning and service delivery.	Programme establishes community accountability system to support user committee to monitor and respond to user satisfaction. Programme encourages contract arrangements for service related functions, e.g. maintenance worker. Programme provides on-going training and capacity building for service delivery/business functions.	Programme approach separates responsibilities for Service provision and Oversight, including contracting of service provision functions - including planning (e.g. financial and O&M planning). Oversight provided either by local authorities (e.g. ward) or User Committee shorn of direct service provision responsibility. Ongoing training and capacity support to business/service provision functions.
4	Recognition and promotion of alternative service provider options	Community Management is the programme's sole supported mechanism for water scheme operation & management.	Programme includes test case/pilot management options beyond CBM options, e.g. private sector supported O&M or local cooperative/agglomerations of User Committees.	Programme approach promotes or commonly implements 1 or 2 particular management options beyond CBM, where appropriate (e.g. according to service level, technology and type of settlement).	Programme supports and implements a range of water scheme operation and management mechanisms, differentiated by service levels, technology and types of settlement.
5	Monitoring service delivery and sustainability	Programme M&E systems track population with access to water delivered.	Programme M&E systems monitor infrastructure functionality post-construction.	Programme M&E systems track post construction infrastructure functionality, level of services delivered and performance of service providers.	Programme supports or integrates into 3rd party M&E systems that track post construction infrastructure functionality, level of services delivered and performance of service providers against

					national norms.
6	Harmonisation and coordination	Programme approach manuals/policies conflict with national policies and are not supported by any attempt at forming a consensus either with government or other programmes/actors.	Programme approach conforms to National sectoral policy.	Programme approach is harmonised with sectoral policy and implementation manuals - bar exceptions required to maintain flexibility and space for innovation.	Programme plays an active part in shaping local level sector policy. Implementation approach is harmonised with sectoral policy and implementation manuals, that are flexible and provide space for innovation.
7	Support to service providers	Programme provides no facility for post construction support to user committees.	Limited post construction support and monitoring of community management bodies (<1 year).	Programme monitors functionality of community management systems and provides post-construction support to supplement communities' capacity to repair schemes (1 < 3 years).	Programme provides or ensures 3rd party monitoring of scheme operators' functionality and provides post-construction support to supplement communities' capacity to repair schemes (3 < 5 years).
8	Capacity support to local government	Programme provides minimal/no support to local authorities during implementation.	Programme provides ad-hoc support to local authorities during implementation, but none to post construction follow up.	Structured support to local authorities during implementation and post construction, limited to particular functions.	Comprehensive capacity support provided to local authorities covering all key functions of the rural water supply life cycle.

9	Learning and adaptive management	Programme approach has no/minimal knowledge management or learning capacity.	Programme publishes and makes publicly available its key reports, reviews and evaluations.	Programme aims to document learning and resources a lesson learning function, making products available to the sector (e.g. website for published reports and briefs).	Programme includes a sector learning facility and funding, generating material from its own work and convening stakeholders to facilitate peer to peer sharing.
10	Asset management	Programme asset planning restricted to implementation of new schemes and/or rehabilitation of existing schemes.	Programme supports asset management processes that cover <u>some</u> of the following key processes: a) systematic planning of asset renewal, rehabilitation and repair, b) survey and monitoring of asset inventories, c) financial planning and forecasting for asset life-cycle, and d) clear definition of ownership of assets.	Programme supports asset management processes that cover <u>all</u> the following key processes: a) systematic planning of asset renewal, rehabilitation and repair, b) survey and monitoring of asset inventories, c) financial planning and forecasting for asset life-cycle, and d) clear definition of ownership of assets.	Programme supports 3rd party asset management processes that cover <u>all</u> the following key processes: a) systematic planning of asset renewal, rehabilitation and repair, b) survey and monitoring of asset inventories, c) financial planning and forecasting for asset life-cycle, and d) clear definition of ownership of assets.
11	Regulation of rural services and service providers	Programme provides oversight of community management committees during mobilisation and construction.	Programme extends oversight of community management to post-construction period.	Programme sets internal standards for service provider and service provided. Systematic monitoring and assessment against standards incorporated into post-construction support.	Programme supports local authorities to develop and conduct monitoring of service providers performance and quality of service provided to users. Emphasis on accountability and highlighting areas for improvement, rather than punitive measures.

12	Financing to cover all life-cycle costs	Programme financial planning of assets restricted to CapEx and OpEx (e.g. Community tariffs cover costs of supply and maintenance worker salary only).	Programme financial planning incorporates some/ad-hoc provision for CapManEx, but with minimal planning or appreciation of required works or cost, e.g. % of monthly tariff deposited into a rainy-day O&M fund (in addition to VMW salary), but not linked to any planning of required maintenance costs.	Programme approach supports communities to produce business and financial plans addressing CapManEx requirements and costs over the full scheme life, e.g. such that tariffs are set according to CapManEx plan requirements.	Programme approach includes own financial framework defining and resourcing CapManEx, ExpDS and ExpIDS. Ideally linking in local authorities/3rd parties through agreements/contracts defining clear roles and responsibilities.
13	Water resources management and security	Programme provides for minimal/no surveying of local water resources and quality prior to construction.	Programme at minimum surveys wet and dry season water yields and quality of candidate water sources and/or supports Water Safety Planning by community committees.	Programme provides ongoing survey of water resources and quality (beyond springs in use), supports community water safety planning that is expanded to consider broader community resources and uses.	Programme supports coordination between rural stakeholders and local authorities, ongoing monitoring of local water resources by local authority in their area, catchment protection measures and water safety planning coordinated or involving by local authorities.

3 METHODOLOGY

3.1 RESEARCH QUESTION

This study seeks to understand *the extent to which contemporary approaches to providing access to water in international development are sustainable*. The study uses a case study approach, reviewing 4 programmes in Nepal.

Quantitative studies have to date to determined general failure and functionality rates of water points and the risk factors involved. These have tended to be multi-context/country statistical studies, revealing broad trends and possible systemic weaknesses (Klug et al., 2018). However, these quantitative methods are hampered by weaknesses and inconsistencies highlighted earlier. Specifically, the inability of these approaches to elucidate the narrative or interaction of factors ultimately resulting in success or failure undermines the effectiveness of their application to specific programmes.

Qualitative studies have more fruitfully explored the complex relationships between community, infrastructure and functionality in detail, illuminating the causal links and scenarios that lead to failure and success.

Motivated by a desire to shorten the feedback loop of academic research and repay the organisations providing the case studies for their support to this work, this study's analysis is primarily focused on observations and practical recommendations for the case study programmes.

3.2 APPROACH

This study is primarily qualitative and includes a combination of desk and field based primary and secondary research.

Secondary research:

- Literature review of approaches to sustainability of water services in relevant contexts, prioritising rural settings.
- Literature review of case study programmes in Nepal, focussing on approaches to delivery and monitoring, and results achieved.

Primary research:

- Interviews and meetings with beneficiary communities to understand the characteristics, strengths and vulnerabilities of: existing water infrastructure, water services and providers, water service governance and community capacity.
- Interviews and meetings with stakeholders including: implementing agencies, donors, private sector utilities/actors and government (national and local).

3.2.1 Field work

Field work consisted of interviews with key stakeholders and community visits.

Inspection of water schemes

To verify programme processes and their implementation, built water scheme infrastructure was inspected as part of community visits. The inspections were not comprehensive but, where possible, sought to include examples of all elements of the scheme such as: taps, spring/stream captures, reservoirs, transmission & distribution mains, etc.

Interviews

Semi-structured group interviews were conducted with members of the WUSC and users from the wider community in each village visited. The interviews were held in Nepali, local dialects/languages and English, with translation provided by staff of the relevant delivery organisation. Each interview began with introductions and an explanation of the motivations, interests, intended outputs and recipients of the study. Verbal consent was sought to continue the interview and confirmed during the interview in relation to potentially sensitive matters (DiCicco-Bloom and Crabtree, 2006). The following key question areas were used to capture the communities' experience of their programmes in areas relevant to the framework:

- Membership and functionality of the user committee
- Users' access to water, past and present
- Water resources, quality and quantity
- Water tariff and the O&M fund
- Interaction with government, pre and post construction
- Maintenance and repair responsibilities and capacity

Initial questioning in each area was open, followed up with more targeted questions to surface particular answers. Efforts were made in follow up questions, direct and indirect, to cross-check answers and query salient or controversial points. Given the potential vested interests of translators (facilitating interviews of the communities

they or their employer has worked with), cross-checking was also used to mitigate for bias or flaws in translation.

Interviews with sector professionals and stakeholders were conducted in English, also following a semi-structured approach and with a similar introduction followed by verbal consent to proceed.

3.2.2 Verification of findings

To support the study and foster an open, positive and collaborative approach, all observations from the field and findings were shared with DFID and the programme delivery partners for verification. Results and recommendations from this dissertation were shared in the form of a separate report, with the objective of supporting the evolution of the programmes towards more sustainable implementation.

3.3 CASE STUDY

3.3.1 Nepal rural water context

Nepal achieved its MDG objective (GLAAS, 2014) and nationwide basic water access in 2016 was estimated at 87% (SEIU, 2016a). Rural access to safely managed water stands much lower, at 25% in 2015 (JMP, 2015). Figure 1 displays water access levels in Nepal by district.

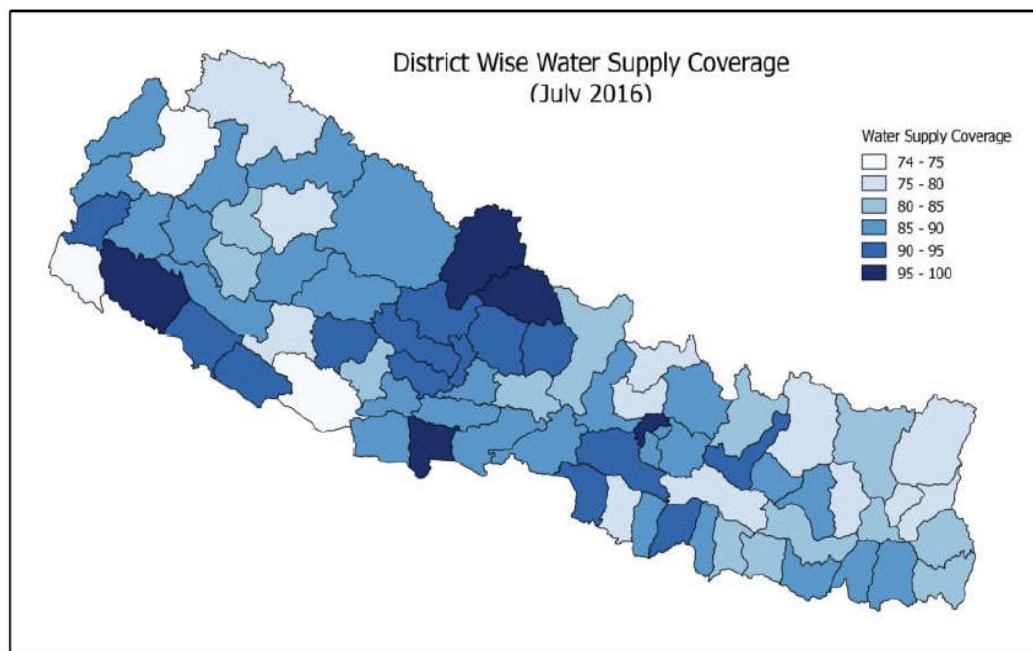


Figure 1: Water access coverage in Nepal.
Source: (SEIU, 2016a)

While acknowledging significant progress made to increase basic access to water in Nepal, a multi-country sustainability assessment of rural water service delivery models by the World Bank scored Nepal 14 out of 40, highlighting particular weaknesses in asset management, monitoring and regulation: Figure 2 (World Bank, 2017).

	Institutional capacity	Financing	Asset management	Water resources management	Monitoring and regulation	Score
Sector level	3	3	2	3	3	14
Community-based management	3	3	2	4	2	14

Figure 2: Sustainability assessment of rural water service delivery in Nepal.
Source: (World Bank, 2017)

The World Bank’s assessment of Nepal found significant institutional fragmentation and capacity shortfalls in the sector, gaps in monitoring and post construction support – including poor execution of the mandated budget for O&M, little support to tariff setting, almost non-existent asset management, little planning and poor definition of responsibilities for maintenance, high levels of seasonal system intermittence, limited hydrological monitoring, no sector wide M&E, ill-defined

oversight of CBM user committees and variable monitoring of infrastructure works (World Bank, 2017).

Overview of Nepal's Water Policy

Nepal's constitution recognises access to safe water as a right of its people (SEIU, 2016b). It has been government policy since 2004 to implement water schemes under the CBM approach, targeting access for vulnerable people, requiring registration of WUSCs, participation of women and vulnerable groups in decision making, a community contribution to the construction of schemes (minimum 20% of cost), full coverage of routine O&M and the costs minor repairs by the community and some financial assistance from local government for significant or major repair (MoPPW, 2004).

In 2016 the Sector Efficiency Improvement Unit (SEIU) within the Ministry of Water Supply and Sanitation published an ambitious Sector Development Plan (SDP) for 2016-2030. The SDP provides a road-map for how Nepal could achieve its SDG WASH targets, tackling 3 major challenges in as many phases. The first phase (2016-20) covers universal access to basic WASH, the second phase (2021-2025) initiates access upgrades to improved levels and increases sustainability while the third phase (2026-2030) completes access upgrades and introduces impact assessment. The SDP intends to introduce systematic post-construction support to WUSC managed schemes, water resource management, monitoring of service quality, increased inclusion and reform the sector's governance (SEIU, 2016b).

The SDP recognises the challenge of achieving even universal basic water access. The SDP's definition of improved access (medium and high service levels) is analogous to the SDGs "Safely Managed" standard (JMP, 2017; SEIU, 2016b, p. 66) multiplying the scale of the challenge, not least due to the tripling of cost (Hutton and Varughese, 2016) and the already apparent gaps in the SDP budget – illustrated in Figure 3 (SEIU, 2016b).

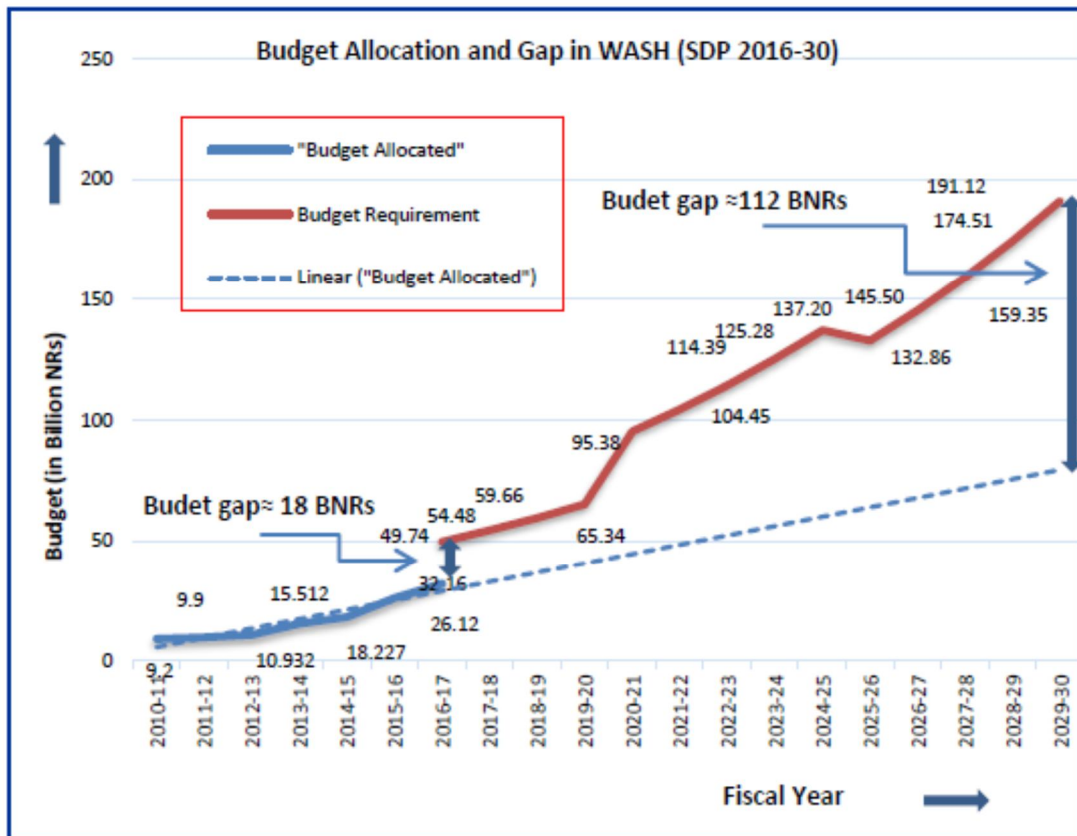


Figure 3: Nepal WASH SDP budget.
Source: (SEIU, 2016b)

Federalisation

Nepal’s recent constitutional change towards federalism has entailed significant change to the water sector’s governance, human resources and financing. Nepal is transitioning from a highly centralised system to an antithetical decentralised system. The responsibility for planning and construction of the majority of rural water schemes (among other infrastructure) has been granted to 761 largely new, elected local government bodies: rural and urban municipalities or *Gaunpalikas* and *Nagapalikas*, respectively (Poudel, 2018; Shrestha, 2018). Proposed federalised and transitional WASH roles and responsibilities at the various levels of levels of GoN are displayed in Figure 4.

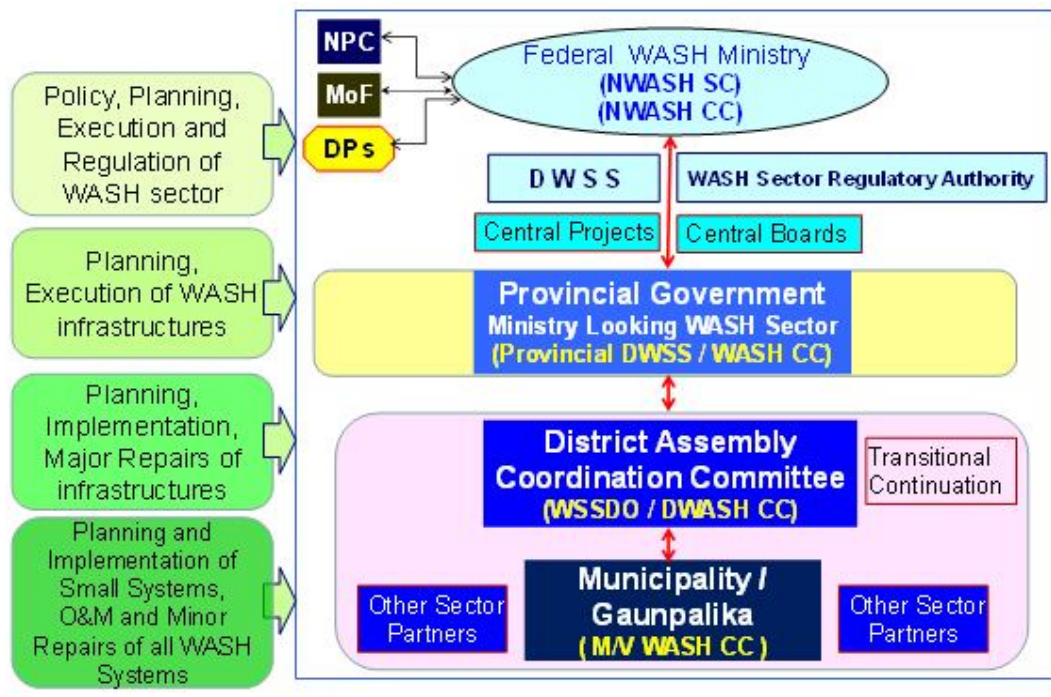


Figure 4: Nepal WASH sector roles and responsibilities as envisaged in 2016.
Source: (SEIU, 2016b)

A significant positive of the change is increased accountability and reduced ‘distance’ between needs, responsibility and resources. Critics of the change cite the inequality between municipalities and lack of resources, human and financial. The combination of a significant gap in human resources overlapping with new resources and responsibilities creates significant risk. While the existing pool of technical staff will be redistributed from central government ministries and their district offices, they are not numerous enough to fill the new gap in capacity in local government. There is therefore a compelling political imperative, opportunity and significant need for support to these new institutions (Poudel, 2018).

3.3.2 The case study programmes

Four UK funded WASH programmes in Nepal were selected to form the case study for this programme. All 4 programmes were managed by DFID, either by the DFID Country Office or DFID’s central WASH policy team. An overview of the programmes is provided in Table 2.

Table 2: Overview of case study programmes

Programme Title	Rural Water and Sanitation Programme (RWSP)	Accelerating Sanitation and Water for All (ASWA)	Quick Wins	Purnima
Implementing Agencies	Gurkha Welfare Trust	UNICEF, GoN	Oxfam, CARE, ACF	Mott MacDonald
Start	2012 (1989)	2012	2016	2017
End	2020	2020	2017	2021
Budget	£18.6m	£5m (of £43m)	£8m	£10m (of £40m)
Donor	DFID Nepal	DFID HQ	DFID Nepal	DFID Nepal
Focus	WASH	WASH (mostly sanitation)	Reconstruction (Water and trails)	Reconstruction (Water and trails)
Implementation	Direct delivery	Govt. systems	Direct delivery	Direct delivery

3.3.2.1 Rural Water and Sanitation Programme (RWSP)

Currently in its fifth phase, the Gurkha Welfare Trust's (GWT) programme has been active in Nepal for nearly 30 years. Originally focused on the communities of ex-serving Gurkhas, phase 5 has seen the programme broaden its scope to poorer areas and more inclusive targeting (DFID Nepal, 2012). Phase 5 of RWSP started in 2012 with a budget of £3m over 3 years but has since been extended several times with additional funding, including in response to the 2015 EQ, to an overall total of £18.6m over 8 years.

3.3.2.2 Accelerating Sanitation and Water for All (ASWA)

ASWA is a multi-country programme, delivered by UNICEF and funded by DFID's HQ WASH team. A key motivation for DFID's support was the programme's ability to provide access to water and sanitation to a large number of people globally, supporting the UK's contribution to achieving MDG water access targets (DFID, 2013). At the time of review, phase 1 of ASWA was reaching its conclusion and a second phase of the programme was in inception, also covering Nepal. Key differences between phase 1 and 2 are a geographic shift to operation in the Terai region of Nepal (Province 2) and a greater focus on access to sanitation than water.

3.3.2.3 Quick Wins

Intended as a short-term rapid response to the 2015 EQ, Quick Wins is a collection of projects agreed between DFID Nepal and INGOs principally covering water access and foot trail infrastructure (DFID Nepal, 2017). Initially planned to last 11 months, the programme was extended to 16 months, with an emphasis on increasing the sustainability of interventions. The programme targeted recipients on the basis of needs, supporting a balance of rehabilitation of damaged water schemes as well as construction of new schemes.

3.3.2.4 Purnima

Meaning 'full moon' in Nepali, Purnima is DFID's main post-2015 EQ reconstruction initiative (DFID Nepal, 2016). Following on from Quick Wins and with the continued participation of some of the same INGOs as sub-contractors, the programme is delivered by Mott MacDonald (MM) and also includes a major component for water and foot trail infrastructure. At the time of review, the programme had recently completed its inception phase and was about to begin full implementation. As with Quick wins, Purnima supports a combination of rehabilitation of damaged schemes and construction of new schemes.

4 RESULTS

4.1 OVERVIEW OF CASE STUDY VILLAGES

A summary of information on the 10 villages visited is displayed in Table 8.

4.2 REVIEW OF PROGRAMMES

A summary of all programme criteria scores and overall average per programme are displayed in

Table 3.

Table 3: Overview of programme sustainability scores

Criteria for sustainability		Programmes reviewed			
	Title	RWSP	ASWA	Quick Wins	Purnima
1	Durable water infrastructure	5	3	1	5
2	Community Mobilisation	3	3	2	3
3	Professionalisation of community management	1	1	1	1
4	Recognition and promotion of alternative service provider options	2	1	1	2
5	Monitoring service delivery and sustainability	2	1	1	2
6	Harmonisation and coordination	3	3	2	3
7	Support to service providers	3	2	1	3
8	Capacity support to local government	2	2	1	4
9	Learning and adaptive management	2	2	1	2
10	Asset management	1	1	1	2
11	Regulation of rural services and service providers	2	1	1	2
12	Financing to cover all life-cycle costs	2	1	2	3
13	Water resources management and security	3	2	1	3
Average score:		2.38	1.77	1.23	2.69

4.2.1 RWSP

Table 4 displays the rationale and score per criteria for RWSP.

Table 4: Sustainability rating of RWSP

Criteria for sustainability		Programme: RWSP	
	Title	Rationale	Rating
1	Durable water infrastructure	Infrastructure is well surveyed, designed and constructed robustly with suitable protection. Safe and robust metered HH connections some of the best observed. 20-year design life.	5
2	Community Mobilisation	Strong representation of Junatai/Dalits (>50% in both WUSC and executive positions) but weaker representation of women (<50%, particularly in executive positions). VDC/Palika sign tripartite agreement with GWT and WUSC.	3
3	Professionalisation of community management	No alternative to CBM considered, separation of powers or monitoring of service & performance.	1
4	Recognition and promotion of alternative service provider options	CBM only model.	1
5	Monitoring service delivery and sustainability	Direct monitoring by GWT for 3 years post construction. WUSC self-monitoring of functionality to GWT every year thereafter. Recent effort to conduct functionality survey (snapshot) of previously supported schemes - but does not include service delivered or user satisfaction.	2
6	Harmonisation and coordination	Mostly aligned, bar exceptions that improve on National policy, and has influenced govt policy, e.g. shaping 1 house 1 tap policy.	3
7	Support to service providers	Post construction support for up to 3 years. Tripartite agreement outlines roles and responsibilities of service provider (the community), govt and GWT. GWT has maintained programme areas and relationships in delivery areas over time, allowing it to return to damaged schemes - e.g. post 2015 EQ	3
8	Capacity support to local government	Minimal support to local govt. More planned from 2017/18. To date, some collaboration on planning but missed opportunities for capacity building.	2
9	Learning and adaptive management	Climate and sustainability reports produced. Emphasis on justifying programme rather than shaping the sector or sharing lessons more widely.	2
10	Asset management	Inventory maintained of assets constructed/rehabilitated by the programme (functionality report). No support to local govt to maintain similar records or any move beyond CapEx.	1
11	Regulation of rural services and service providers	Post construction includes self-monitoring and oversight of user committee function.	2
12	Financing to cover all life-cycle costs	Tariffs tend to exceed cost of VMW salary, providing minimal but regular deposits to O&M fund. Highest observed community contribution to construction.	2

13	Water resources management and security	Selected source monitored over 6 months (minimum), covering wet and dry season yields. Records of test bores maintained.	3
Average score:			2.31

4.2.2 ASWA

Table 5 displays the rationale and score per criteria for ASWA.

Table 5: Sustainability rating of ASWA

Criteria for sustainability		Programme: ASWA	
	Title	Rationale	Rating
1	Durable water infrastructure	Infrastructure is designed at low cost to provide greatest access. Observations from field include poor protection of HH Taps, meters and distribution mains, de-prioritisation of protection works in response to funding shortages. Works unlikely to last 15 + years.	3
2	Community Mobilisation	<30% representation of women on WUSC and single woman in an executive position. VMW trained. Local govt engaged in scheme and governance.	3
3	Professionalisation of community management	No alternative to CBM considered, separation of powers or monitoring of service & performance.	1
4	Recognition and promotion of alternative service provider options	CBM only model.	1
5	Monitoring service delivery and sustainability	Monitoring continues for 1-year post construction	2
6	Harmonisation and coordination	Works through govt systems and is linked to sector leadership through UNICEF's chair of WASH sector role	3
7	Support to service providers	Minimal structured support. E.g. in 2017 UNICEF funded Pokhara Regional DWSS office to conduct post construction support to circa 30 schemes, of total case load of 600. Change in programme areas from ASWA 1 to ASWA 2 will leave communities and local govt un-supported.	2
8	Capacity support to local government	Works through local government and provides capacity building. Evaluation notes efforts to support scale up WASH in Nepal at National level, but also issues in absence of targeting of support at key gaps (WYG International Limited, 2017).	2
9	Learning and adaptive management	Programme has included Operational Research but the Evaluation notes that there was "no evidence of the emerging findings being used to inform programme strategies in the nine ASWA countries" (WYG International Limited, 2017).	1
10	Asset management	Programme dependent on Government's asset management, focused on constructing new or rehabilitating old schemes.	1

11	Regulation of rural services and service providers	Oversight during construction and community mobilisation. Little to no provision for oversight beyond construction.	1
12	Financing to cover all life-cycle costs	Tariff intended to cover VMW salary and WUSC office rent. Balance of O&M fund held over from construction but not added to through tariff.	1
13	Water resources management and security	Minimal surveying and monitoring of sources. Dependent on community experience.	2
Average score:			1.77

4.2.3 Quick wins

Table 6 displays the rationale and score per criteria for Quick wins.

Table 6: Sustainability rating of Quick wins

Criteria for sustainability		Programme: Quick wins	
	Title	Rationale	Rating
1	Durable water infrastructure	Only 1 of the 5 schemes visited provides access likely qualified as safely managed. Some of the remainder might not qualify as basic access. Variable infrastructure quality across agencies. In best cases, distribution, transmission and storage infrastructure is robustly constructed. Connections commonly left to HH so present a high variability of quality/durability within communities. Some questionable system design decisions over scheme capacities, use of electric pumps and source.	1
2	Community Mobilisation	High variability in mobilisation. At best, 50:50 balance of women on WUSC and proportional representation of Dalit/Janajati people but compromised by only 1 woman in an executive post and commonly the treasurer. At worst, programme ended before WUSC had decided tariff, identified or trained a VMW and WUSC composed entirely of Brahmin caste.	2
3	Professionalisation of community management	No alternative to CBM considered, separation of powers or monitoring of service & performance.	1
4	Recognition and promotion of alternative service provider options	CBM only model.	1
5	Monitoring service delivery and sustainability	No facility for monitoring post-construction.	1
6	Harmonisation and coordination	Collaborated with govt to identify villages and numerous examples of joint funded schemes with GoN. ON the other hand, not all schemes provide HH connections - per national policy.	2

7	Support to service providers	No facility for post-construction support, although INGOs providing some ad-hoc engagement to finalise scheme completion. GoN assumed to take on responsibility for support to service providers/communities but with no agreement or support to do so.	1
8	Capacity support to local government	No support provided to GoN capacity, nationally or locally, bar incidental learning from collaboration on specific projects.	1
9	Learning and adaptive management	Programmes have documented their work, including extra reports, e.g. end-line studies. These are shared with the donor.	1
10	Asset management	No asset planning supported, beyond collaboration with GoN over choice of schemes to support.	1
11	Regulation of rural services and service providers	No structured post-construction oversight. Some ad-hoc support from NGOs.	1
12	Financing to cover all life-cycle costs	All villages collect a tariff intended to cover supply and VMW salary costs. Variability in whether any regular surplus is deposited into the O&M fund. Some villages have sought insurance for their schemes.	2
13	Water resources management and security	Some poor examples of schemes with inadequate capacity in design and that have seen significant flow reductions in sources after construction - suggesting inadequate surveying.	1
Average score:			1.23

4.2.4 Purnima

Scores and their rationale for Purnima are displayed in Table 7.

Table 7: Sustainability rating of Purnima

Criteria for sustainability		Programme: Purnima	
	Title	Rationale	Rating
1	Durable water infrastructure	Infrastructure designed around 20yr design life and local population growth estimates. Safe and robust HH connections observed.	5
2	Community Mobilisation	Mandatory 30% membership of women in WUSC and executive positions although lower than this was observed (3 women of 14 members). Mandatory participation in WUSC, but no target, for Janajati/Dalit and other disadvantaged groups.	3
3	Professionalisation of community management	No alternative to CBM considered, separation of powers or monitoring of service & performance. WUSC is supported to conduct business planning.	1
4	Recognition and promotion of alternative service provider options	Pilot scheme in development, intended to trial private sector O&M of schemes under PPP with local govt.	2
5	Monitoring service delivery and sustainability	Functionality monitoring for 2 years post-construction.	2
6	Harmonisation and coordination	Programme adheres to GoN HH connection policy but enables exceptions under certain circumstances, driven by context and community needs/preference.	3
7	Support to service providers	Post construction support for 2 years. Involving local govt in community water safety planning intended to strengthen support and linkages between local govt and communities.	3
8	Capacity support to local government	Provides Technical Assistance on infrastructure planning, management and supervision, monitoring and database management to local government.	4
9	Learning and adaptive management	Potential to use programme as platform for sharing experience across agencies.	2
10	Asset management	Asset management, including O&M/CapManEx plan intended as component of water safety planning.	2
11	Regulation of rural services and service providers	Post construction includes self-monitoring and oversight of user committee function.	2
12	Financing to cover all life-cycle costs	Manual states O&M/CapManEx planning will determine tariff level. Technical Assistance to advocate for local Govt to respect National policy and allocate 20% of CapEx budget to CapManEx.	3
13	Water resources management and security	Manual calls for wet/dry season source monitoring, ensuring lowest flow in dry season is sufficient. Source selection after consideration of alternatives on basis of several factors, incl. usages, environmental issues, water rights/competition of use. Water safety planning included.	3
Average score:			2.69

5 CONCLUSIONS

5.1 GENERAL OBSERVATIONS

The programmes reviewed demonstrate emerging good practice for sustainability but overall do not match up to the ambition of the SDGs to provide sustainable water services. Good practice observed included:

- Design and construction of durable infrastructure, when quality and durability are targeted.
- Thorough community mobilisation and capacity building, providing communities with a degree of autonomous resilience to crises.
- Harmonisation and coordination with government and the sector, with increasing ambition to support a shift towards greater sustainability.
- High rates of tariff payment in communities with metered HH connections and traceable paper-based payment records.
- Long running programmes in the same geographic areas allowed agencies to provide de facto long-term post construction support. Building strong networks with communities and local government through successive phases of funding created linkages such that communities knew who to turn to for assistance and provided the means for the rehabilitation of schemes.

Poor practice undermined communities' resilience and greatly increased the likelihood of failure of water services. Examples observed include:

- Unprotected infrastructure (reservoirs, pipes, taps), vulnerable to contamination, damage or vandalism.
- Schemes designed to supply insufficient per capita capacity.
- Insufficient surveying of sources, where source capacity had degraded since construction.
- Schemes with high/unaffordable operational costs, where alternative technology would be cheaper.
- Incomplete or rushed community engagement, leaving community training and key decisions unfinished.
- Community mobilisation that does not ensure equal or proportionate participation of women and disadvantaged groups.
- Changes in geographic area of operation without any continuation of support leaves communities unsupported.

Further common areas of weakness against the framework that are broadly consistent with the World Bank's assessment of the status quo in Nepal's water sector include:

- Preponderance of voluntary CBM approach and lack of alternative methods or professionalisation of CBM. This is consistent with policy in Nepal but there is still space to explore alternatives and professionalise.
- Absence of monitoring and regulation of services and service providers.
- Limited provision for post-construction support to communities, i.e. not matching the design life of infrastructure.
- Absence of capacity support to government (or other institutions) to provide post-construction support.

- Weak or absent support to asset management and life-cycle costing.
- Absence of support to government for water resource and quality management.

5.2 THE PROGRAMMES

5.2.1 RWSP

RWSP arguably reflects the best in traditional CBM based approaches in Nepal, which imposes certain limitations on its ability to work closely with government (Tillet and Burr, 2017) and hence support more systemic change. The programme is however in transition and seeks to adapt its approach towards greater sustainability. Several studies commissioned by the programme (e.g. reports on Functional status and Impact of climate change on water sources) have helped identify gaps in its traditional approach, leading to development of a stronger component of support to local government that will shortly be introduced.

5.2.2 ASWA

ASWA has completed its delivery phase and is winding up operations. Conceived during the MDG period, the programme was intended to maximise the number of people it could provide access to water to. Without passing judgement on the programme's quality or wider performance, the focus on maximising reach is likely to have been detrimental to sustainability of access. Coupled with weaknesses in GoN planning and oversight of construction, it is easier to understand how the programme has not scored higher in sustainability of the infrastructure it provides. Conversely, that ASWA has not scored better in support to local government, through which the programme delivered its effect, may be surprising but is due to the near total absence of post-construction support provided to local government.

5.2.3 Quick wins

Conceived as a short-term intervention to provide rapid EQ reconstruction support while a longer-term programme (Purnima) was established, Quick wins has a severe handicap to its ability to deliver sustainable services. Given these limitations, it is understandable that the programme did not seek to deviate from the model of CBM advocated in GoN policy. That issues with sustainability were raised and efforts made to address them within the limitations of a short programme is creditable. However, the observed failings in both infrastructure and community mobilisation are glaring. Partial justification may lie in the emphasis on:

- Expediency and maximising the programme's number of beneficiaries.
- Rehabilitation of schemes that provided a compromised level of service (e.g. insufficient hours of operation, per capita provision).
- Integration with pre-existing GoN infrastructure designs and prior mobilisation work.

5.2.4 Purnima

Most exceptions to common findings relate to the Purnima programme, designed after the World Bank study and with sustainability in mind. Given this ambition, expectations of a higher score for Purnima may be disappointed, although this likely reflects two factors. Firstly that the framework is very ambitious for the current context in Nepal and requires third-party/government institutions that may not exist to be supported to take on key responsibilities; Secondly that Purnima's approach is to

iterate on existing practice in order to satisfy key indicators for delivering access to water (among others), rather than more systematic change of the sector – which might jeopardise achievement of access results required by the donor.

5.3 DETAILED OBSERVATIONS

5.3.1 Infrastructure

Good and bad examples of water infrastructure were observed. Robust metered HH connections with a well-conceived, constructed and protected inflow, transmission and distribution system built to last should require less maintenance and repair during their design life. This in turn should mean lower demand for maintenance and repair, labour, parts and service costs to provide them or tariffs/taxes to pay for them. This places less strain on community and government resources and gives the best foundation for sustainability.

Circa half of schemes visited would not qualify as the SDGs safely managed standard due to inconstant access, communal connections or seasonal contamination.

Leaving HH connections to the discretion and means of HHs is expedient in that it facilitates greater and cheaper initial access to water. HH's can spend within their means but this means poorer HHs will generally install cheaper and lower quality tap stands. However, this comes at the cost of increased vulnerability of infrastructure and therefore access, and in consequence a potentially greater loss of access to water over time among low income HHs.

GoN practice of de-prioritising protection works in order to mobilise enough capital to complete works within a shorter time is understandable and likely preferred by the community. However, unless the protection works are completed soon, risks of undermining sustainability in the long run are increased due to a greater risk of damage or contamination.

Pumped storage systems observed were electrified and grid powered. Not only did grid connection impose months of delay to operation after nominal completion of the infrastructure, it entailed a high cost of operation. Compared to gravity schemes, the continuity, cost and complexity of grid-connected systems were an additional burden to WUSCs and required external support for any maintenance. Other programmes in Nepal (notably RWSSP-WN) are exploring the use of solar powered pumps as an alternative. Solar powered pumps may not be applicable or preferable in all contexts, but their major advantage is in minimal operating costs. The draw-backs, higher installation costs and rarer technical skills for maintenance are problematic but could be partly mitigated through structured post-construction support. The same could help maintenance of grid-powered schemes, but would not address operating costs or power supply interruptions.

5.3.2 Community mobilisation

Two of the villages visited have benefited from successive phases of external WASH interventions over up to 15 years. Discussing the history of their WUSCs, both of which were reformed several times, surfaced some familiar themes from the literature of what helps keep a WUSC active (Adank et al., 2016; Foster, 2013): dynamic leadership, regular meetings and good communication, as well as common perils: key people moving away, 'retiring' or dying, frequency and meeting

attendance declining, competing time pressures and change in the community itself – for example inward migration. If these experiences are representative, it is normal for the WUSC to require periodic reconstitution and that this might require external instigation if the broader community has also become apathetic.

Gender equity and representation of vulnerable groups, including Janajati/Dalit people is a challenge for most development programmes in Nepal. All the reviewed programmes had some degree of ambition towards equity between genders and inclusion of vulnerable groups in decision making, including tracking these as targets for reporting to DFID. However, ambition and success in achieving this objective ranged considerably.

Some programmes had an arguably tokenistic approach where 30% membership in the WUSC and one woman in an executive WUSC position (usually the treasurer) was deemed an acceptable minimum. The programmes aiming for gender equality (e.g. RWSP) achieved better participation but still found it difficult to ensure women had equal participation in executive WUSC positions.

Participation of Janajati/Dalits and other vulnerable groups tended to be more successful where it was targeted, which not all programmes did. However, Janajati/Dalit people were rarely in the higher executive positions in the WUSCs and were very commonly VMWs – arguably conforming to existing social demarcation or roles and responsibilities.

Securing women's equitable participation will remain a significant challenge. Women may have good reasons not to seek extra responsibilities that take more time out of their day. Inclusion through quotas do not ensure equitable treatment either: women were often spoken over by men during community interviews or their views and concerns over access to water minimised or discredited and in one case a woman who was WUSC treasurer couldn't or wouldn't discuss details of the fund without the presence of the male WUSC chair.

5.3.3 Tariffs

Tariffs are commonly set at a level sufficient to cover known recurring costs (OpEx), e.g. VMW's salary and electricity for pump operation. Some were calculated to include a small proportion of payment into the O&M fund (CapManEx).

A key positive consequence of metered HH connections, where implemented, was apparently universal and regular payment of tariffs. The communities' systems were well established and helped avoid the issue of low tariff collection rates affecting other contexts (Foster, 2017).

Annual per capita gravity scheme tariffs ranged between 0.72-1.44 USD and pumped storage tariffs were 7.2 USD, for 10,000L. Compared with the recurrent expenditure of small piped schemes found in a study of life-cycle costs (3.47-8.7 USD, adjusted for inflation from 2010 values), the observed tariffs for gravity schemes in Nepal are much lower and pumped storage schemes are comparable (Burr and Fonseca, 2013). The comparison of tariff and recurrent costs is not perfect, but as most tariffs were set to cover costs alone and assuming the tariff is indeed sufficient, they can be considered a rough proxy.

Although their tariffs are an order of magnitude higher than gravity fed schemes, it was not clear that pumped storage scheme tariffs were unaffordable. The cost was a

concern for the relevant communities, including as a potential brake on continuous operation of certain schemes, but high rates of payment were reported – suggesting it was generally affordable. One small community still confirming its tariff was particularly concerned but this could have been down to uncertainty of the actual cost of operation.

Some of the villages reported significant cash balances in their O&M funds and were exploring ways to utilise the capital as loans to the community. This appears a positive measure, providing sufficient capital is retained or accessible for its primary purpose of supporting the water scheme. It also suggests that the communities were not prepared for the eventuality of holding such a resource of capital and that they could be better assisted to plan for its use – meeting O&M costs, CapManEx and system upgrade or replacement.

This presents three observations:

- Water access in the observed communities of Nepal is relatively cheap.
- If the higher pumped storage tariffs are affordable, could higher tariffs be set for gravity schemes, providing greater resources for O&M and increase capacity?
- Tariff surpluses are under-utilised. Are opportunities being missed to help communities plan for system upgrades or replacement?

5.3.4 Financial and Asset planning

None of the communities visited were supported to produce business plans that addressed either financial or asset management. On the basis of interview with the Pokhara DWSS Regional Office, Government's near exclusive attention is on schemes currently under construction (CapEx). The most advanced asset management practice observed was restricted to limited planning of CapManEx and entailed a schedule of recurrent work for the VMW (e.g. clearing and maintaining source capture site).

With tariffs commonly only enough to cover recurring costs (OpEx), e.g. VMW salary and operation (power for pumps), the most advanced financial planning was in the villages that budgeted for a proportion of their monthly tariff to pass straight into the O&M fund.

Purnima intends to support communities to develop Water Safety Plans that should provide CapManEx planning and address "long term repairs and upgrading" (Mott MacDonald and Oxfam, 2017, p. 20). Even in the short term, much more can be done to support the WUSCs to prepare contingency plans and link them with extra capacity, be it neighbouring WUSCs, FEDWASUN, private suppliers, skilled technicians or (with appropriate support) government.

5.3.5 Post construction support

Training of VMWs is most programmes' solution to maintenance and repairs. VMW capacity may be sufficient for small issues and mitigating risks of some larger issues (e.g. damage or contamination of source through mis-use, overgrowth or vandalism). But when the VMW's capacity to repair a fault is exceeded, the WUSC is left exposed.

Post construction support by the programmes reviewed varies from a minimum of 1 year to a maximum of 3. This is much better than nothing but in practice analogous only to a Defects Liability Period (PPPIRC, 2016), where the programme (as

contractor) assures the donor and beneficiaries that the infrastructure it builds will be functional after completion.

The longest period of post construction support in Nepal is 5 years, provided by the Finnish RWSSP-WN programme (Rautanen, 2018). For programme approaches that do not support or create an external, independent or government facility for indeterminate support, this may be the functional maximum for donor programmes limited by funding cycles.

Too many assumptions are made about government's willingness and ability to take on responsibility for schemes after the limited post construction period ends. While Purnima intends to engage and lobby local government to provide it, there was no support to post construction capacity from the observed programmes when reviewed.

5.3.6 Water resources management

RWSP's monitoring of sources and Purnima's proposed Water Safety Planning were the best examples of current practice in the reviewed programmes, but still fall far short of the broader work required to provide comprehensive surveys and monitoring or bring disparate stakeholders together to agree uses or create protection measures. This is an area where the legitimacy of government calls for its engagement to manage resources and their usage.

5.3.7 Support to government

Federalism and necessity constitute two powerful push and pull factors for greater work with government. Rational choices were made not to engage more closely prior to federalism, for example in DFID's Business Case for RWSP (DFID Nepal, 2012) but the need for capacity building in new local governments and the opportunity presented to help shape policy change the calculus.

That said, which part of government should programmes support? With Federalism new and the old district structures yet to be dismantled, it's not clear where capacity will be needed or best placed in the long run. For example, SEIU in the DWSS proposes that DWSS District WaSH Offices are repurposed as Water Supply and Sanitation Service Support Centres providing technical assistance to WUSCs on O&M (SEIU, 2016b). Or should programmes support the local government structures, Palikas and wards? Further analysis is needed as the situation unfolds, although current legislation grants local government both budget and responsibility.

5.4 RECOMMENDATIONS

If sustainability is the endurance of access, then to take it seriously, programmes need to accept that 'business as usual' is not enough to ensure sustainable water access. It is not a question of if but when water systems will fail and require repair – a mindset change that needs to be embraced.

Sustainability of rural water access depends on an interlocking system of institutions and infrastructure, where everything should be built to last, supported through fail-safes and balancing corrective measures provided by other parts of the system. It is however not a highly tuned, mechanical system. It is probably too complex and context dependent to be helpfully modelled. Rather, sustainability will emerge from human centred, flexible and adaptable systems that follow heuristic approaches, which recognise the complexity and fallibility of each component of the system and have built-in back-up support. Sustainability is democratic, thus political and thus involves government. International agencies that persist in the perception that sustainability is purely technical and shy away from engaging with government will struggle.

To provide a solid foundation for sustainability, programmes need to consistently deliver high quality resilient infrastructure and mobilise communities to manage their schemes. Critics of CBM approaches often unjustly blame the methodology for weak or partial implementation. Doing CBM properly, to suit the community in its context, should be the first focus of implementing agencies.

External, indefinite post construction support to user committees is vital, be it from local government, associations of user committees, permanent NGO capacity or private sector-based approaches. Time and again it is called for in the literature, even as a key precursor of CBM, but rarely has it materialised. Project work at community level needs to be accompanied by systematic and sincere attempts to strengthen institutional frameworks and the support they provide to the same communities and other service providers.

More can be made of existing resources to prepare contingencies for problems with water supply. Programmes should support communities to plan for the worse, by:

- Better understanding costs and requirements of different repairs.
- Preparing contingency or response plans that the committee can turn to in crisis.
- Budgeting and setting the water tariff to ensure appropriate resources are available to cover planned contingencies – or quantify when the WUSC will need external help.
- Establishing links with skilled labour & suppliers.
- Providing oversight of user committees, reviewing quality of service, user satisfaction.
- Water resource mapping, monitoring, continued quality testing.

Finally, there are three broader implications raised by this study:

1. Donors need to change their behaviour and the incentives they create to foster sustainability. Current assumptions that access once gained will be retained are flawed and misleading. The perception that programmes end with their funding and the assumed prerogative to make strategic shifts (e.g. in geographic areas of coverage), undermine sustainability by truncating support. Programmes must

establish systems to ensure and support indefinite continuation of water access. This study advocates for a shift in the primary focus of donor programmes from the provision of access through construction or rehabilitation of infrastructure, to the maintenance of access through institutional support. A balance of both should be retained but, as the former was borne of the MDG's race to achieve results, transitioning to the latter will be essential to securing the SDGs universal access.

2. There is an opportunity and political imperative to work closely with local government in Nepal. Programmes should help communities voice their needs and government to respond proactively. While some alternatives are possible, programmes cannot wholly avoid government, unless they find an alternative long-term backstop for community capacity or with a similar mandate to manage common goods.
3. There is a tension in programme focus between sustainability and maximising access. Providing sustainable services will cost more per person than unsustainable services, limiting the number of people that programmes can reach. Focussing on maintaining access may also appear to entrench current access inequalities. The alternative to adopting sustainable approaches is to repeat interventions in the same communities. Governments and donors need to be mindful of this tension when defining and pursuing value for money, to avoid skewing their interventions away from achieving long-term sustainable impact.

6 LIMITATIONS AND FURTHER WORK

6.1 LIMITATIONS OF THE ASSESSMENT

The study presents a number of limitations. As noted earlier, this study has not assessed the programmes' approaches to WASH as a whole. Although expedient for its purposes, this undermines the practical value of its findings.

In assessing case study programmes at different stages in their life-cycles, for example while ASWA is winding up and Purnima starting out, consistency between assessment of the programmes has been hampered. This is predominantly due to imbalances in the availability of evidence, observed as well as literature. Comparing results from the field with aspirations and intended methodologies is unfair. Equally however, newer programmes should have had the benefit of evidence from previous programmes, providing they are empowered to absorb and reflect it.

Scoring programmes against the framework has its difficulties and compromises. Combining field observations with literature does not ensure parity of assessment. Measuring borderline cases and fitting them into the 5-point criteria scale was imperfect. Lastly, with a high variability in delivery outcomes, particularly with Quick wins, settling on a single score involved compromise at both ends of the spread of observed performance.

Lastly, the interview process introduced a multitude of biases and inconsistencies in the assessment of the case study programmes. The field work was covered by 3 different translators and the authors' approach to questioning evolved over the period. As the author and translators adjusted to each other, greater clarity and understanding was yielded from the interviews over time. This is perhaps the reality of qualitative field work but stands to be acknowledged.

6.2 FURTHER WORK

This study has proposed a framework and tested its practical application. A number of revisions and refinements to the framework can be envisaged and should be considered before any further application of it in the field. Reference to the sources used for each criterion should be a first port of call and could be used to expand or refine the definitions.

A key weakness of the framework and its observations of infrastructure is the lack of systematic review of design typologies and components. This could be remedied by greater emphasis and more time collating the characteristics of the systems. This would support comparison and lesson learning for the engineering that is fundamental to water access.

Expanding criterion 13 to water resources management (focussed on institutions and uses) and water quality management (focussed on the water provided by each schemes) should be considered, even though some overlap may persist between the two criteria.

All 13 criteria are currently considered equally important. This seemed appropriate for the first application of the framework but weighting of criteria, to adjust overall scores, could be considered as a means to amplify the importance of particular criteria over others.

Criteria 1 and 13 (concerning the availability of water resources) are arguably prerequisites of water access while criteria 2 to 12 reflect the arrangements for how water schemes are managed and supported. This division could be applied through weighting, to emphasise either how well programmes provide the basics, or how well they support management. Similarly, a focus on institutional working could be arranged by weighting towards those criteria that relate to working with government and the wider sector.

A final area of interest that the field work provided a tantalising glimpse of was a more in-depth exploration of communities' experiences of successive phases of programmes. Some of the villages visited had been beneficiaries of development programmes for decades. Capturing their experience and the evolution of WUSC dynamics, what worked and what didn't, could shed considerable light on how momentum can be preserved, and communities better supported over the long term.

REFERENCES

- Abrams, L., 2000. Understanding Sustainability of local water services [WWW Document]. The Water Page. URL <http://www.africanwater.org/sustainability.htm> (accessed 8.23.18).
- Adank, M., Kubabom, B., Atengdem, J., Duti, V., 2016. Monitoring rural water services for sound evidence-based planning and finance decision making: lessons from Ghana, in: ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL. Presented at the WEDC International Conference, Kumasi, Ghana, p. 6.
- Appleton, B., Evans, P., 1993. Community management today : the role of communities in the management of improved water supply systems. IRC, The Hague, The Netherlands.
- Barde, J.A., 2017. What Determines Access to Piped Water in Rural Areas? Evidence from Small-Scale Supply Systems in Rural Brazil. *World Development* 95, 88–110. <https://doi.org/10.1016/j.worlddev.2017.02.012>
- Behailu, B.M., Suominen, A., Katko, T.S., 2015. Evolution of Community-Managed Water Supply Projects From 1994 to the 2010s in Ethiopia. *Public Works Management & Policy* 20, 379–400. <https://doi.org/10.1177/1087724X15593955>
- Bonsor, H.C., Oates, N., Chilton, P.J., Carter, R.C., Casey, V., MacDonald, A.M., Calow, R., Alowo, R., Wilson, P., Tumutungire, M., 2015. A hidden crisis: strengthening the evidence base on the sustainability of rural groundwater supplies: results from a pilot study in Uganda (UPGro Catalyst Grant Report No. NE/L001969/1). Natural Environment Research Council (NERC), Swindon, Wiltshire, UK.
- Boulénouar, J., 2015. Capacity support to local governments. IRC: Building blocks for sustainability series.
- Boulénouar, J., 2013. Asset Management. IRC: Building blocks for sustainability series.
- Boulénouar, J., 2012. Learning and adaptive management. IRC: Building blocks for sustainability series.
- Boulénouar, J., Schweitzer, R., 2015. Infrastructure asset management for rural water supply. IRC.
- Briscoe, J., De Ferranti, D.M., 1988. Water for rural communities: helping people to help themselves. World Bank, Washington, D.C.
- Brundtland, G., 1987. Report of the World Commission on Environment and Development: Our Common Future (United Nations General Assembly document No. A/42/427).
- Burr, P., Fonseca, C., 2013. Applying a life-cycle costs approach to water. WASHCost Working Paper 94.

- Carter, R.C., Ross, I., 2016. Beyond 'functionality' of handpump-supplied rural water services in developing countries. *Waterlines* 35, 94–110. <https://doi.org/10.3362/1756-3488.2016.008>
- Chambers, R., 1983. *Rural Development: Putting the Last First*. Longman, Harlow, UK.
- Chowns, E., 2015. Is Community Management an Efficient and Effective Model of Public Service Delivery? Lessons from the Rural Water Supply Sector in Malawi. *Public Administration and Development* 35, 263–276. <https://doi.org/10.1002/pad.1737>
- Cleaver, F., 2015. In pursuit of arrangements that work: Bricolage, practical norms and everyday water governance, in: *Real Gov. and Pract. Norms in Sub-Saharan Afr.: The Game of the Rules*. Taylor and Francis Inc., pp. 207–227. <https://doi.org/10.4324/9781315723365>
- Consortium WASH RDC, 2015. *Manuel du Processus de 12 Etapes*. Consortium WASH RDC, Kinshasa, RDC.
- Das, P., 2014. Women's Participation in Community-Level Water Governance in Urban India: The Gap Between Motivation and Ability. *World Dev.* 64, 206–218. <https://doi.org/10.1016/j.worlddev.2014.05.025>
- DFID, 2013. *Business Case: Accelerating Sanitation, Hygiene and Water for All in Off-Track Countries (Business Case and Summary)*, 203571. Department for International Development (DFID), London.
- DFID Nepal, 2017. *Annual Review: Nepal Post Earthquake Reconstruction (Annual Review)*, 205138. Department for International Development (DFID), London.
- DFID Nepal, 2016. *Business Case: Post Earthquake Reconstruction in Nepal – Building Back Better (Business Case and Summary)*, 205138. Department for International Development (DFID), London.
- DFID Nepal, 2012. *Business Case: DFID Nepal support to Rural Water Supply, Sanitation and Hygiene (Business Case and Summary)*, 203187. Department for International Development (DFID), London.
- DiCicco-Bloom, B., Crabtree, B.F., 2006. The qualitative research interview. *Med. Educ.* 40, 314–321. <https://doi.org/10.1111/j.1365-2929.2006.02418.x>
- Écoles et Villages Assainis, 2017. *Atlas 2017: ACCÈS À L'EAU POTABLE, L'HYGIÈNE ET L'ASSAINISSEMENT POUR LES COMMUNAUTÉS RURALES ET PÉRIURBAINES DE LA RÉPUBLIQUE DÉMOCRATIQUE DU CONGO (Atlas No. 2017)*. Ministère de la Santé Publique (MSP) et Ministère de l'Enseignement Primaire, Secondaire et Professionnel (MEPSP), Kinshasa, RDC.
- Fonseca, C., Franceys, R., Batchelor, C., McIntyre, P., Klutse, A., Komives, K., Moriarty, P., Naafs, A., Pezon, C., Potter, A., Reddy, R., Snehaltha, M., 2011. *Briefing Note 1a Life-cycle costs approach* 40.
- Foster, T., 2017. A critical mass analysis of community-based financing of water services in rural Kenya. *Water Resour. Rural Dev.* 10, 1–13. <https://doi.org/10.1016/j.wrr.2017.04.003>

- Foster, T., 2013. Predictors of sustainability for community-managed handpumps in sub-saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda. *Environ. Sci. Technol.* 47, 12037–12046. <https://doi.org/10.1021/es402086n>
- Foster, T., Willetts, J., Lane, M., Thomson, P., Katuva, J., Hope, R., 2018. Risk factors associated with rural water supply failure: A 30-year retrospective study of handpumps on the south coast of Kenya. *Sci. Total Environ.* 626, 156–164. <https://doi.org/10.1016/j.scitotenv.2017.12.302>
- Gasparro, K.E., Walters, J.P., 2017. Revealing causal pathways to sustainable water service delivery using FsQCA. *J. Water Sanit. Hyg. Develop.* 7, 546–556. <https://doi.org/10.2166/washdev.2017.053>
- GLAAS, 2014. Country Highlights: Nepal. The Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS).
- Haapala, J., Rautanen, S.-L., White, P., Keskinen, M., Varis, O., 2016. Facilitating bricolage through more organic institutional designs? The case of water users' associations in rural Nepal. *Int. J. Common* 10, 1172–1201. <https://doi.org/10.18352/ijc.688>
- Harvey, P.A., Reed, R.A., 2007. Community-managed water supplies in Africa: sustainable or dispensable? *Community Dev J* 42, 365–378. <https://doi.org/10.1093/cdj/bsl001>
- Hope, R., 2015. Is community water management the community's choice? Implications for water and development policy in Africa. *Water Policy; Oxford* 17, 664–678. <http://dx.doi.org/10.2166/wp.2014.170>
- Hutchings, P., Carter, R.C., 2018. Editorial: Setting SDG ambitions in a realistic time-scale. *Waterlines* 37, 1–4. <https://doi.org/10.3362/1756-3488.2018.37-1ED>
- Hutchings, P., Franceys, R., Mekala, S., Smits, S., James, A.J., 2017. Revisiting the history, concepts and typologies of community management for rural drinking water supply in India. *International Journal of Water Resources Development* 33, 152–169. <https://doi.org/10.1080/07900627.2016.1145576>
- Hutton, G., Varughese, M., 2016. The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene (Technical Paper No. 103171). Water and Sanitation Program (WSP).
- JMP, 2017. Progress on Drinking Water, Sanitation and Hygiene: 2017 update and SDG baselines. Joint Monitoring Programme (JMP), World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), Geneva.
- JMP, 2015. JMP [WWW Document]. Washdata.org. URL <https://washdata.org/data#!/dashboard/new> (accessed 8.4.18).
- Jones, S., Longueville, S., 2016. Lessons learned from a consortium model for rural WASH: experiences of the DRC WASH Consortium, in: ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL. Presented at the 39th WEDC International Conference, Kumasi, Ghana, p. 8.

- Kativhu, T., Mazvimavi, D., Tevera, D., Nhapi, I., 2017. Factors influencing sustainability of communally-managed water facilities in rural areas of Zimbabwe. *Physics and Chemistry of the Earth, Parts A/B/C, Infrastructural Planning for Water Security in Eastern and Southern Africa* 100, 247–257. <https://doi.org/10.1016/j.pce.2017.04.009>
- Kelly, E., Lee, K., Shields, K.F., Cronk, R., Behnke, N., Klug, T., Bartram, J., 2017. The role of social capital and sense of ownership in rural community-managed water systems: Qualitative evidence from Ghana, Kenya, and Zambia. *J. Rural Stud.* 56, 156–166. <https://doi.org/10.1016/j.jrurstud.2017.08.021>
- Kelly, E., Shields, K.F., Cronk, R., Lee, K., Behnke, N., Klug, T., Bartram, J., 2018. Seasonality, water use and community management of water systems in rural settings: Qualitative evidence from Ghana, Kenya, and Zambia. *Science of The Total Environment* 628–629, 715–721. <https://doi.org/10.1016/j.scitotenv.2018.02.045>
- Kleemeier, E., 2000. The Impact of Participation on Sustainability: An Analysis of the Malawi Rural Piped Scheme Program. *World Development* 28, 929–944. [https://doi.org/10.1016/S0305-750X\(99\)00155-2](https://doi.org/10.1016/S0305-750X(99)00155-2)
- Kleemeier, E., Lockwood, H., 2015. Public-private partnerships for rural water services. IRC: Building blocks for sustainability series.
- Klug, T., Cronk, R., Shields, K.F., Bartram, J., 2018. A categorization of water system breakdowns: Evidence from Liberia, Nigeria, Tanzania, and Uganda. *Science of The Total Environment* 619–620, 1126–1132. <https://doi.org/10.1016/j.scitotenv.2017.11.183>
- Klug, T., Shields, K.F., Cronk, R., Kelly, E., Behnke, N., Lee, K., Bartram, J., 2017. Water system hardware and management rehabilitation: Qualitative evidence from Ghana, Kenya, and Zambia. *Int. J. Hyg. Environ. Health* 220, 531–538. <https://doi.org/10.1016/j.ijheh.2017.02.009>
- Liddle, E.S., Fenner, R., 2017. Water point failure in sub-Saharan Africa: The value of a systems thinking approach. *Waterlines* 36, 140–166. <https://doi.org/10.3362/1756-3488.16-00022>
- Lockwood, H., Le Gouais, A., 2015. Professionalising community- based management for rural water services. IRC: Building blocks for sustainability series 8.
- Lockwood, H., Le Gouais, A., 2014. Service delivery indicators and monitoring to improve sustainability of rural water supplies. IRC: Building blocks for sustainability series.
- Lockwood, H., Schouten, T., 2009. Triple-S Briefing: Providing Reliable Rural Water Services That Last. IRC.
- Lockwood, H., Smits, S., 2011. Supporting Rural Water Supply: Moving towards a Service Delivery Approach. Practical Action Publishing, Rugby, UK.
- Madrigal, R., Alpízar, F., Schlüter, A., 2011. Determinants of Performance of Community-Based Drinking Water Organizations. *World Development* 39, 1663–1675. <https://doi.org/10.1016/j.worlddev.2011.02.011>

- Marks, S.J., Davis, J., 2012. Does User Participation Lead to Sense of Ownership for Rural Water Systems? Evidence from Kenya. *World Development* 40, 1569–1576. <https://doi.org/10.1016/j.worlddev.2012.03.011>
- Marks, S.J., Onda, K., Davis, J., 2013. Does sense of ownership matter for rural water system sustainability? Evidence from Kenya. *J. Water Sanit. Hyg. Develop.* 3, 122–133. <https://doi.org/10.2166/washdev.2013.098>
- McIntyre, P., Smits, S., 2015. Direct support post-construction to rural water service providers. Building blocks for sustainability series 8.
- MoPPW, 2004. Rural Water and Sanitation National Policy 2004. Ministry of Physical Planning and Works (MoPPW), Kathmandu.
- Moriarty, P., Batchelor, C., Fonseca, C., Klutse, A., Naafs, A., Nyarko, K., Pezon, C., Potter, A., Reddy, R., Snehalatha, M., 2011. Ladders for assessing and costing water service delivery. WASHCost working paper, WASHCost working paper 24.
- Moriarty, P., Verdemato, T., 2010. Moriarty-2010-Report.pdf, in: Report of the International Symposium on Rural Water Services. Presented at the International Symposium on Rural Water Services, Kampala, Uganda.
- Mott MacDonald, Oxfam, 2017. Design Criteria and Procurement Principles for WASH Infrastructure. Mott MacDonald Limited, Cambridge, UK.
- MWE, 2017. Rural Water Supply and Sanitation Handbook for Extension Workers. Ministry of Water and Environment, Uganda.
- Nixon, R., Owusu, F., 2017. Choice, inclusion, and access to information: Understanding female farmers' participation in kyrgyzstan's water-user associations. *Sustainability* 9. <https://doi.org/10.3390/su9122346>
- OECD, 2011. Meeting the Challenge of Financing Water and Sanitation, OECD Studies on Water. OECD Publishing. <https://doi.org/10.1787/9789264120525-en>
- OXFAM, 2013. Oxfam Minimum Requirements for WASH Programmes (No. Version 2). OXFAM.
- OXFAM, 2009. Working with Community Committees. OXFAM.
- Poudel, B.R., 2018. Federalism here we come. *Kathmandu Post*.
- PPPIRC, 2016. Construction Contracts Checklist (No. Construction_Contracts_Checklist_EN). PPP in Infrastructure Resource Center for Contracts, Laws and Regulations (PPPIRC), World Bank Group, Washington, DC.
- Rautanen, S.-L., 2018. Step-by-Step Manual for Sustainable Community Managed Water Supply Services. Rural Water Supply and Sanitation Project in Western Nepal Phase II, Pokhara, Nepal.
- Rautanen, S.-L., White, P., 2018. Portrait of a successful small-town water service provider in Nepal's changing landscape. *Water Policy* 20, 84–99. <https://doi.org/10.2166/wp.2018.006>

- RWSN, 2010. Myths of the Rural Water Supply Sector (Perspectives No. 4), RWSN Executive Steering Committee. Rural Water Supply Network (RWSN), St Gallen, Switzerland.
- Sabogal, R.I., Medlin, E., Aquino, G., Gelting, R.J., 2013. Sustainability of water, sanitation and hygiene interventions in Central America. *Journal of Water, Sanitation and Hygiene for Development* 4, 89–99.
<https://doi.org/10.2166/washdev.2013.130>
- Sara, J., Katz, T., 1997. Making Rural Water Supply Sustainable: Recommendations from a Global Study. UNDP - World Bank Water and Sanitation Program, Washington, DC.
- Schouten, T., Moriarty, P., 2003. Community water, community management : from system to service in rural areas. ITDG Publishing, London.
- SEIU, 2016a. Water, Sanitation and Hygiene Sector Status Report 2016. Ministry of Water Supply and Sanitation, Sector Efficiency Improvement Unit (SEIU), Kathmandu.
- SEIU, 2016b. Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (2016 – 2030). Ministry of Water Supply and Sanitation, Sector Efficiency Improvement Unit (SEIU).
- Shrestha, P.M., 2018. Preps for setting fiscal roles for federal, provincial and local govts. Kathmandu Post.
- Smits, S., Verhoeven, J., Moriarty, P., Fonseca, C., Lockwood, H., 2011. Arrangements and cost of providing support to rural water service providers. IRC.
- Sutton, S., 2005. The sub-Saharan potential for household level water supply improvement, in: MAXIMIZING THE BENEFITS FROM WATER AND ENVIRONMENTAL SANITATION. Presented at the 31st WEDC International Conference, Kampala, Uganda, p. 8.
- Tillet, W., Burr, P., 2017. Gurkha Welfare Scheme: Water and sanitation programme (phase 5) - Mid-Term Review. HEART, Oxford, UK.
- Tincani, L., Ross, I., Zaman, R., Burr, P., Mujica, A., Ensink, J., Evans, B., 2015. Improving value for money and sustainability in WASH programmes. Oxford Policy Management.
- UN General Assembly, 2015. SDGs: Sustainable Development Knowledge Platform [WWW Document]. United Nations. URL
<https://sustainabledevelopment.un.org/sdgs> (accessed 3.20.18).
- UNCED, 1992. Agenda 21. Presented at the United Nations Conference on Environment & Development, Rio de Janeiro, Brazil.
- UNDP, 1990. Global consultation on safe water and sanitation for the 1990s: The New Delhi Statement. United Nations Development Programme (UNDP), New Delhi.
- UNICEF, 1999. Towards better programming: A Water Handbook, in: Technical Guidelines Series. United Nations Children's Fund (UNICEF), New York.

- United Nations, 2015. The Millennium Development Goals Report 2015. United Nations, New York.
- WaterAid, 2011. Sustainability framework.
- WELL (Ed.), 1998. Guidance manual on water supply and sanitation programmes. Department for International Development, London.
- Whaley, L., Cleaver, F., 2017. Can 'functionality' save the community management model of rural water supply? *Water Resources and Rural Development* 9, 56–66. <https://doi.org/10.1016/j.wrr.2017.04.001>
- WHO, 2017. Climate-resilient water safety plans: Managing health risks associated with climate variability and change. World Health Organization, Geneva.
- WHO, 1996. Community management of rural water supply and sanitation systems: Points for practitioners. World Health Organisation (WHO), Geneva.
- Williamson, J., 1990. Latin American Adjustment: How Much Has Happened? Institute for International Economics, Washington, DC.
- World Bank, 2017. Sustainability Assessment of Rural Water Service Delivery Models : Findings of a Multi-Country Review (Working Paper No. 119109). World Bank, Washington, DC.
- WYG International Limited, 2017. Accelerating Sanitation and Water for All: IPME Evaluation – Final Report (Evaluation), 203571. Department for International Development (DFID), London.
- Yacoob, M., 1990. Community self-financing of water supply and sanitation: What are the promises and pitfalls? *Health Policy Plann.* 5, 358–366. <https://doi.org/10.1093/heapol/5.4.358>

ANNEX A – SUMMARY DETAILS OF CASE STUDY VILLAGES

Table 8: Summary details of case study villages

#	Programme	Village	Organisation	District	HHs	Pop.	Source	Scheme type	Connections	Operation (months)	Supply (hrs)	Tariff (basic, NPR)	Tariff volume (L)
1	RWSP	Tamu	GWT	Lamjung	50	294	Spring	Gravity	HH	38	24	40	10,000
2	RWSP	Ghamrang	GWT	Lamjung	59	297	Spring	Gravity	HH	4	16	60	10,000
3	RWSP	Charagaon	GWT	Lamjung	105	569	Spring	Gravity	Communal	14*	24	**	**
4	ASWA	Karki ko Tagara	UNICEF	Kaski	185	925	Spring	Gravity	HH	14*	24	70	10,000
5	Quick wins	Fagim Tar	CARE & DCA	Dhading	32	160	Spring	Pumped storage	Communal	2	2	300***	10,000
6	Quick wins	Nayabazar	Care & UN Nepal	Gorka	69	2,097	Spring	Gravity	HH	10	24	30	10,000
7	Quick wins	Kotkali	OXFAM & Unesco	Gorka	??	??	Stream	Pumped storage	HH	6	4	300	10,000
8	Quick wins	Orle Pani Thulo	OXFAM & Unesco	Gorka	146	730	???	Pumped storage	HH	10	1	250	10,000
9	Quick wins	Majhitar	OXFAM & Focus Nepal	Dhading	34	186	Stream	Gravity	Communal	16	1	150	10,000
10	Purnima	Shadun	MM, OXFAM & Focus Nepal	Dhading	??	??	???	Gravity	HH	N/A	TBC	200***	20,000

* Both these villages had preceding schemes, operational for circa 10 years until damaged or insufficient for the growing community.

** No tariff raised due to the absence of metred connections, but a small annual contribution is made to the O&M fund by HHs.

*** As reported, but not finalised

7 ANNEX B: FIELD WORK NOTES AND TRANSCRIPTS OF INTERVIEWS WITH COMMUNITIES

See attached file.