Rural Water
Capacity Needs Assessment

August 2024

Global Water CENTER

CAWST

RWSN Member Organisation

Contents

Key Insights 3
Introduction 4
Findings 5
1. Difficult positions to fill 5
2. Key competency gaps in water supply technologies and water quality and safety 6
3. Barriers to a sustainable rural water workforce 9
4. Preferred learning methods and access to technology 10
5. Standardization of job titles 12
Recommendations 17
1. Focus on technicians, technologies, and water quality and safety 17
2. Practice holistic capacity development—with workforce focus 17
3. Use interactive capacity development approaches that employ a variety of learning methods 18
4. Use the rural water responsibilities in this study 18
5. Standardize 19
6. Further research 19
What's Next? 21
Our Approach 21
Center for Affordable Water and Sanitation Technology 21
Rural Water Supply Network 22
Annexes 24
Acknowledgements 24

THIS REPORT IS THE RESULT OF A COLLABORATION BETWEEN GLOBAL WATER CENTER, CAWST, AND THE RURAL WATER SUPPLY NETWORK (RWSN)

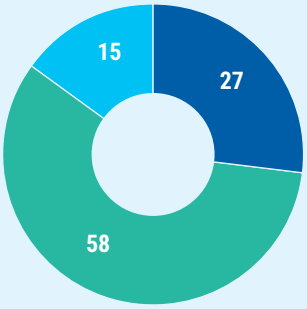
Key Insights

- The position of infrastructure/maintenance technician is hardest to fill
- Key competency gaps: water supply technologies (e.g., design, construct, install, and troubleshoot) and water quality (WQ) and safety (e.g., monitoring WQ and treatment)
- Women identify more distinct competency gaps compared to their male counterparts
- The rural water sector is short on jobs and lacks incentives to attract professionals
- Inadequate materials and insufficient personnel are the most frequently identified obstacles for effective job performance
- There is high reliance on peers or supervisors for issue resolution
- Almost all respondents have access to a cell phone, but half face limitations in data availability or are subject to high data costs
- There is a lack of standardization, with a large variety of job titles and responsibilities
- Key responsibilities to achieve safe access to rural water: technical support for operation and maintenance; community engagement and hygiene promotion; project management; monitoring and evaluation; and supervision of construction and operation and maintenance

Introduction

Global Water Center (GWC), Center for Affordable Water and Sanitation Technology (CAWST), and the Rural Water Supply Network (RWSN) conducted a Rural Water Capacity Needs Assessment. The assessment utilized a customized survey (ANNEX 1 Survey) to investigate capacity needs, qualitatively exploring: a) job category responsibilities and duties, and b) recent inquiries for assistance within the past six months.

The survey was branched into two directions. In one branch, people working in the day-to-day operations of getting water safely to the communities responded to a set of questions (including their job responsibilities, duties, and queries from their staff; preferred methods of solving issues; and access to technologies). The second branch combined two groups: those working in supporting roles (who support individuals, teams, and institutions that provide water to rural communities) and those who defined themselves as working in other parts of the rural water sector. The second branch answered queries about the teams they support, their preferred means to respond, competency gaps, and jobs they feel are most difficult to fill. In the remainder of this report, we will refer to these two branches of groups as those working in day-to-day roles and those in supporting/ other roles.



I work in other parts of the rural water sector.

I work in the day-to-day operations of getting water safely to rural communities. For example, supervisor, operator, technician, customer service, community outreach.

I support individuals, teams, and institutions that provide water to rural communities. For example, WASH Program Manager/ officer (Country level Office), WASH Advisor (multiple countries/ headquarters, Consultant).

Figure 1: Percentage of types of respondents (roles)

This report presents findings and recommendations based on the analysis of 280 (N 280[1]) completed responses (ANNEX 3 analysis process). Most of the respondents (73%) fit in the combined supporting/other role (Figure 1). The respondents working in day-to-day roles were divided into job categories; the majority representing engineers (47%), supervisors (26%), and community development workers (12%) (ANNEX 2–Demographics).

[1] N refers to the number of responses for that specific question. N is used likewise for the remainder of this report.

The study had the following limitations:

- Limited respondents who work in day-to-day operations with the job categories: water operators (N3), artisan (N1), customer relations (N4), and technicians (N7)
- A bias towards Africa: two-thirds of the respondents are from Africa (Sub-Saharan and North)
- <20% female representation

Findings

1. Difficult positions to fill

Skilled workers responsible for the physical upkeep, repair, and regular maintenance of WASH infrastructure, ensuring its functionality and longevity are hardest to find[2].

Figure 2: Percentage of jobs difficult to fill (N-166)

Other positions difficult to fill are water system technical managers who oversee technical aspects of water systems; rural WASH implementation engineers who design, implement, and manage WASH solutions; and WASH coordination specialists who are skilled in managing WASH projects from planning to execution.

[2] According to the respondents in supporting and other roles.

The key reasons for difficulty in filling these positions are lack of qualified staff, lack of experienced workers, and lack of willingness to work in rural areas (Figure 3). Other qualitatively identified reasons are job availability and lack of budget to create jobs. The rotation of jobs/promotion of talented staff is also a problem, particularly in the public sector.

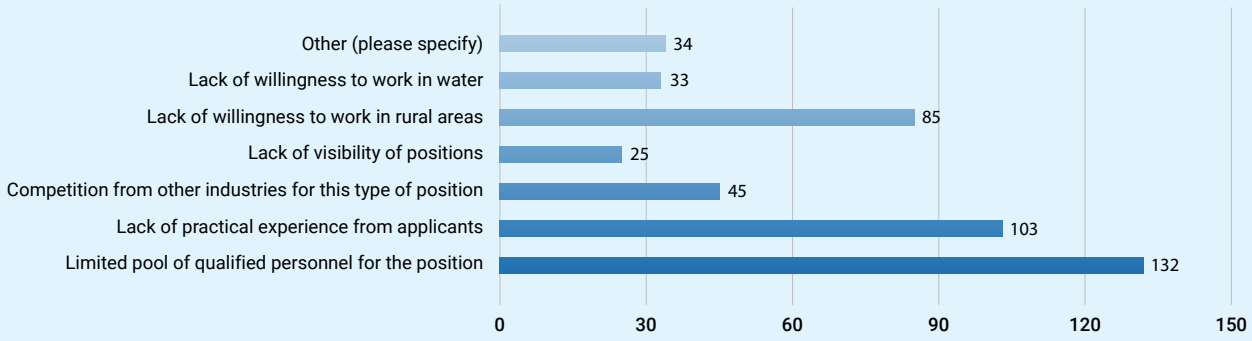


Figure 3: Reasons why it is difficult to fill rural water positions

2. Key competency gaps in water supply technologies and water quality and safety

Based on 210 combined responses (Figure 4) to the help questions over the past six months[3], and corroborated by the competency needs identified from those in supporting roles (ANNEX 4 missing competencies), two prominent competency gaps emerged:

- **Water Supply technologies**: This involves understanding available technologies and their suitability for specific contexts, geographies, and uses. It includes designing, installing, and maintaining various water supply technologies, such as pumps, pipes, and wells, and leveraging local resources to produce these technologies.
- **Water Quality and Safety**: This encompasses community knowledge on household water treatment and safe storage (HWTS), water quality monitoring and testing, water safety planning, and water treatment methods like chlorination.

Example questions[4] from the respondents in these areas include:

[3] From those working in day-to-day roles, those supervising others in day-to-day roles, as well as those in the supporting or other roles.

[4] ANNEX 5: More example help questions

Water Quality and Safety	Water Technologies
• What treatment method is effective for water with nitrate levels exceeding WHO standards? • How do you test water quality? • How do you dose chlorine in gravity-fed water systems?	• How do you design an extraction well and understand water movement in soil? • How do you install and connect pumps and pipes? What technology is most suitable for a specific case?

From the respondents who work in day-to-day roles, the majority fit into the engineer and supervisor job categories (N49 and N26). They predominantly inquired about water supply technologies (27% and 32% of their inquiries, respectively). Those in a supervisor job category also had a high number of queries related to water quality and safety.

There were too few responses from technicians (N7), masons/artisans (N1), and water operators (N3) to further distinguish this finding. The remainder of responses on which this finding is based are not attached to a job category[5]. This finding underscores the need to enhance the dataset for technicians and water operators.

Other key competency gaps identified through these help questions were in finance and funding and water system maintenance (Figure 4). Financial and funding queries pertain to questions over inadequate funding, budgeting issues, and financial gaps in projects. Water system maintenance captures questions related to the efficiency, repair, and leakage issues of pumps, motors, and pipelines. Figure 4 illustrates a solid set of other areas that require attention.

[5] But based on those who checked "supporting or other role" and did not have to give their job category.

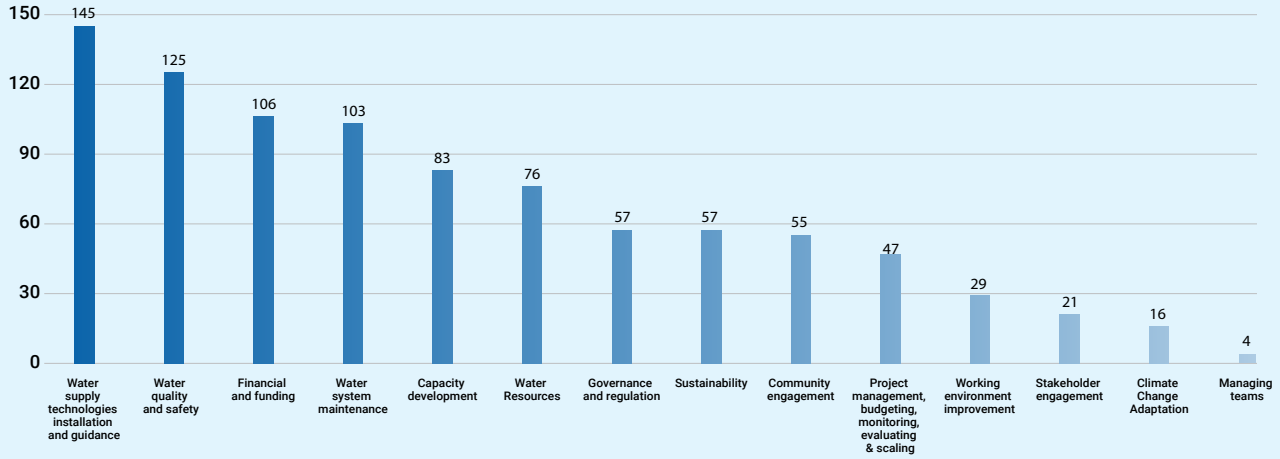


Figure 4: Number and percentage of all help questions combined (codes in ANNEX 3) - N210

Moreover, women more frequently reported queries relating to financial management, sustainability, project management, and climate change adaptation and resilience. Men predominantly raised technical queries about improving infrastructure design of water supply technologies, water quality and safety, water system maintenance (e.g., fixing faulty infrastructure), water resource management, and the working environment (e.g., logistics, salaries, and equipment) (Figure 5).

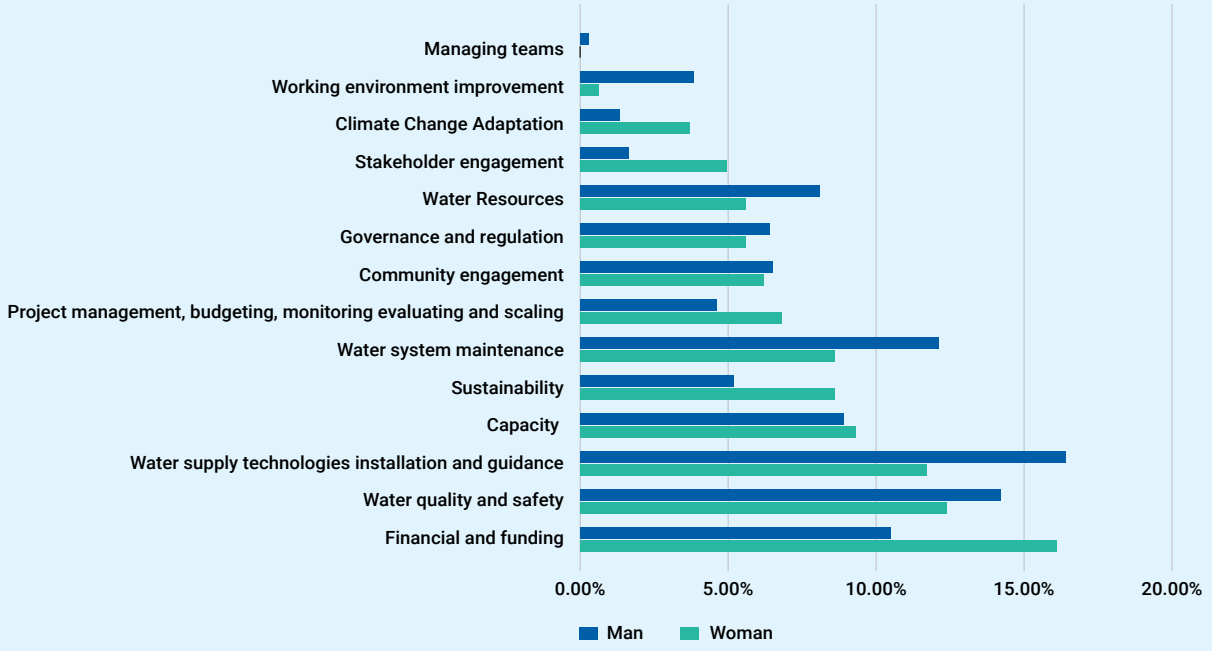


Figure 5: Percentage of queries per topic per male/female

Additionally, there is very weak evidence[6] that queries in Asia were more water resources/climate change-focused, and in Latin America and the Caribbean (LAC) more water quality-focused. The missing competencies identified (ANNEX 4 missing competencies) do not corroborate this entirely. The missing competencies identified in Central Asia are governance, rural water technologies, and then water quality and safety. In Southeast and Southern Asia, the missing competencies were rural water technologies, climate adaptability, and then water quality and safety. In LAC, the focus on missing competencies was less technical and seemed to focus more on governance, community engagement, and operation and maintenance. More data needs to be collected from these regions to validate these regional variations.

For the African region, the missing competencies, on top of rural water technologies and water quality and safety, were governance, sustainable funding and financing, ground water management, water resource management, operation and maintenance, and community engagement.

3. Barriers to a sustainable rural water workforce

The main barriers identified through the qualitative and quantitative analysis of survey respondents are job scarcity and limited incentives to work in rural areas. The lack of job creation and high reliance on volunteers indicated by the respondents show a likelihood of job scarcity. Figure 3 - why is it difficult to fill a position - already highlighted a lack of willingness to work rurally and was corroborated with qualitative data that highlighted limited incentives.

Moreover, Figure 3 highlighted that organizations posting vacancies face both a limited pool of qualified professionals, as well as applicants with a lack of practical experience.

An analysis of questions posed to those working in day-to-day roles and those in supporting/other roles underscores that inadequate materials and insufficient personnel are the most frequently identified obstacles for effective job performance in rural areas. Those in supporting/other roles, however, mention lack of materials/ equipment and insufficient personnel much less frequently (Figure 6). In Asia, despite weak evidence (N8), the lack of materials does not seem to be as big of a barrier to job effectiveness.

[6] Due to limited respondents from the regions

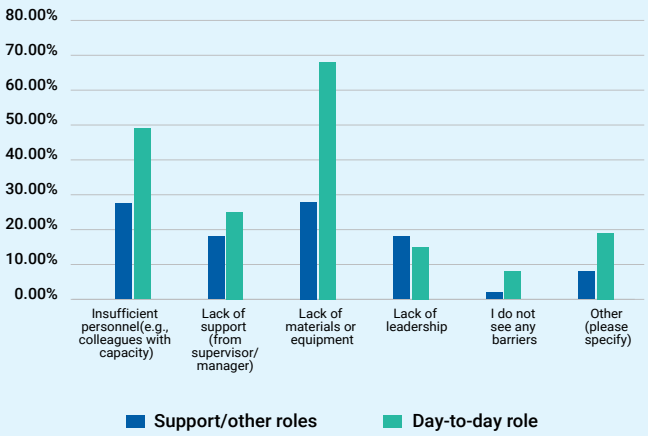


Figure 6: Barriers to job effectiveness in supporting day-to-day roles

4. Preferred learning methods and access to technology

Nearly half of the respondents rely on colleagues for issue resolution (Figure 7), by either directly consulting a colleague or messaging them. This finding includes how those working in day-to-day roles find answers to their queries and how those overseeing others in day-to-day roles provide support to their staff.

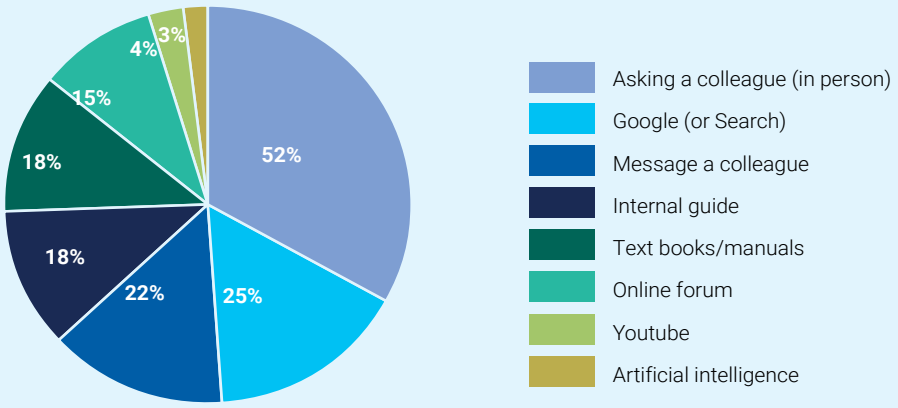


Figure 7: Methods for solving queries (those working in day-to-day roles and supervisors in day-to-day roles) N-150
Figure 7A: Methods for solving queries (day-to-day roles and supervisors in day-to-day roles) N-150

Among those overseeing others, 63% (N63) mentor their staff through the issues or questions they raise (Figure 8). This indicates that much of the problem solving occurs on the job through peer-to-peer exchanges, internal guidance documents, or mentoring by peers or supervisors. Supervisors play a crucial role as the primary resource for those working on the ground and are the ones who actively seek appropriate capacity development opportunities for their staff.

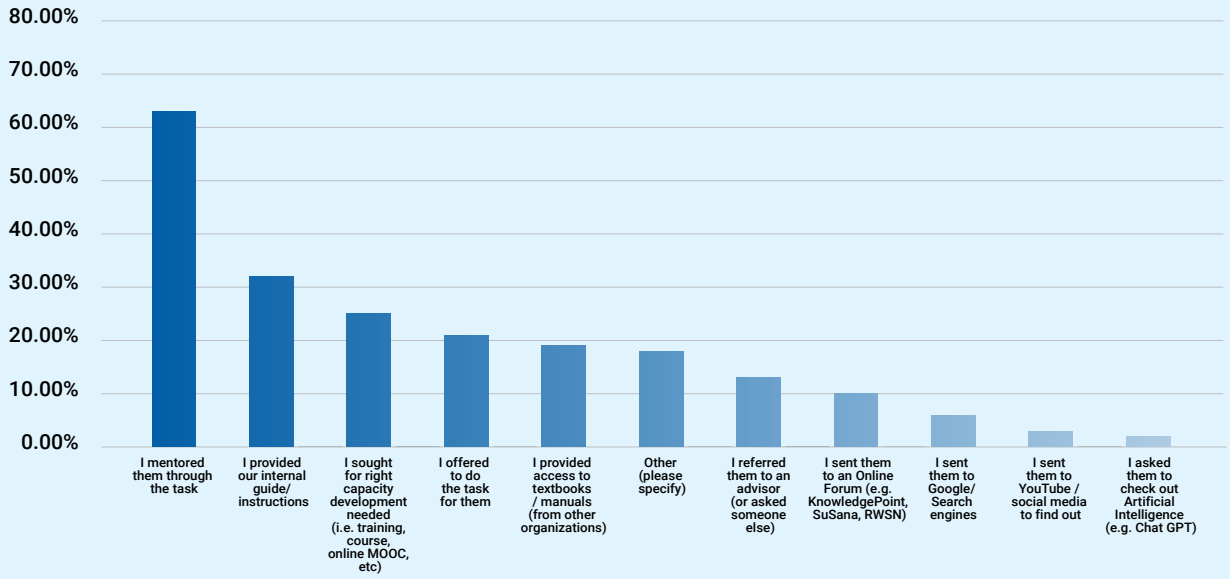


Figure 8: Percentages of how supervisors respond to queries

For most topics, the reliance on colleagues is significant, supporting the above findings. However, for areas such as water supply technologies and water quality and safety, there is still a relatively high reliance on textbooks, guides, or manuals (Figure 9). This can be attributed to the technical nature of these subjects, which require detailed drawings, standards, and step-by-step guidance for installation or water treatment. The data suggests that capacity development for technical subjects should include comprehensive guides, manuals, or procedures in addition to peer-to-peer learning.

The study further shows there currently is limited reliance on YouTube, social media, and AI for issue resolution in rural water[7].

[7] With fast developments in AI, it is worthwhile to keep monitoring this space.

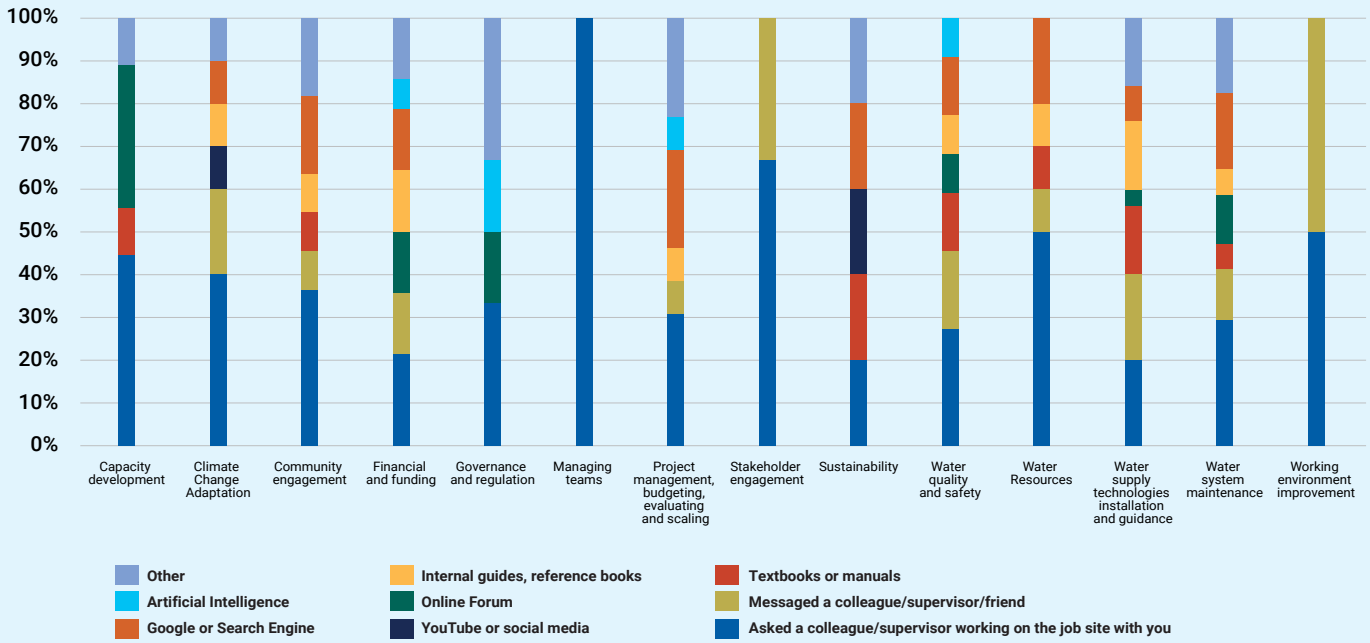


Figure 9: Number of times a specific response was used

In terms of accessibility and availability of technology and data, almost all respondents reported to have access to a cell phone, but half face limitations in data availability or are subject to high data costs. While this implies that mobile learning could be leveraged, the costs of data need to be considered.

5. Standardization of job titles

The survey revealed a notable discrepancy in job title standardization among respondents, with individuals self-describing various titles that do not consistently align with the predefined job categories or self-described responsibilities.

For instance, respondents in the engineer job category reported job titles spanning water resources-; water and habitat-; and Water, Sanitation and Hygiene (WASH)- engineers, as well as construction works supervisor. Similarly, supervisor respondents adopted diverse titles, such as WASH coordinator, program coordinator, general or executive manager.

At times, the job title appeared inconsistent with the job category. For example, community development workers assumed titles such as technician and chief

executive officer. Among the technician job category, the range of job titles was particularly broad, including WASH officer, geologist, technical assistant, and operations analyst. Conversely, the job categories—water operators, artisans/masons, and customer relations—had fewer than four respondents each, precluding meaningful conclusions from their data.

Despite this, a common set of responsibilities for achieving access to rural water emerged from the analysis (Figure 10). The key responsibilities identified by respondents encompass mobilization, construction and supervision, operation and maintenance, and overall project management and monitoring (Box 1).

Figure 10: Responsibilities in the rural water sector

- **Technical support for operations maintenance**
  Operating and maintaining water supply systems in rural communities and ensuring efficient and sustainable water services.
- **Community engagement and hygiene promotion**
  Engaging with communities to promote WASH practices and facilitate community involvement in WASH projects.
- **Project management and monitoring and evaluation**
  Managing, coordinating, overseeing, reporting on, and evaluating the impact of rural water supply projects and water initiatives.
- **Supervision of construction and operation and maintenance**
  Supervising construction as well as maintenance and operation of water supply systems, ensuring quality control and sustainability of water sources in rural areas.

Box 1: 4 key responsibilities with their descriptions

Engineers focus on supervising construction, as well as maintenance and operation of small water supply systems, ensuring quality control and sustainability of water sources in rural areas (Figure 11; codes described in ANNEX 3). They are also involved in tasks related to WASH project management, monitoring, and evaluation.

Most prominent responsibilities:

- Supervision of construction and operation & maintenance
- Project management and monitoring & evaluation
- Technical support for operations & maintenance
- Infrastructure design, construction & planning
- Community engagement & hygiene promotion

Sufficient Evidence

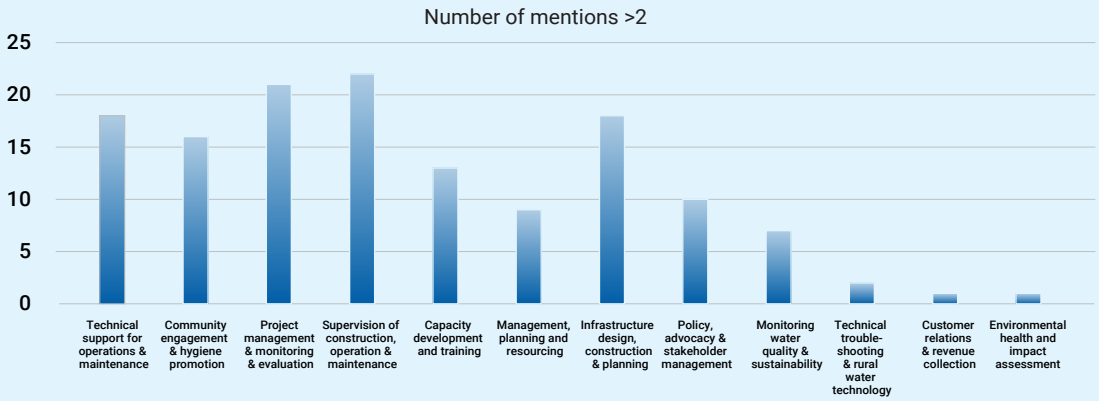


Figure 11: Responsibilities of the engineers

Supervisors focus on providing technical support for operation and maintenance (Figure 12) and can simultaneously play project management and monitoring roles.

Most prominent responsibilities:

- Technical support for operation & maintenance
- Project management and monitoring & evaluation
- Supervision of construction, operation & maintenance
- Management, planning and resourcing

Medium Evidence

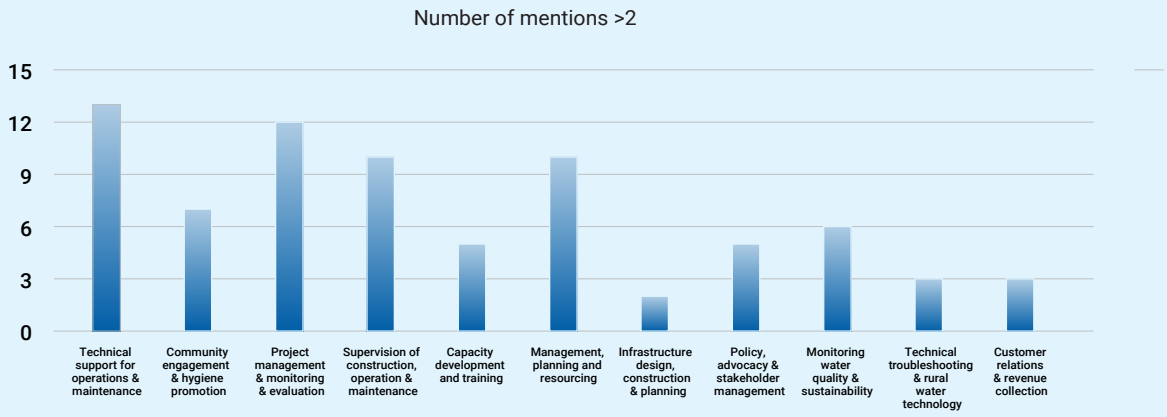


Figure 12: Responsibilities of supervisors

The community development workers' prominent responsibility lies with community engagement and hygiene promotion efforts. In half of the cases, they were also involved in operation and maintenance (Figure 13).

The low number of respondents in categories such as artisan/mason, water operator, and technician suggest that responsibilities at the local level may be underrepresented in this study. For example, the seven respondents that were technicians (N7) highlighted technical support for operation and maintenance and technical troubleshooting most often. However, to fully understand all responsibilities, additional investigation with these professionals (and community members involved in similar tasks) is necessary.

Most prominent responsibilities:
- Community engagement & hygiene promotion
- Technical support for operations & maintenance
- Environmental health & impact assessment

Medium Evidence

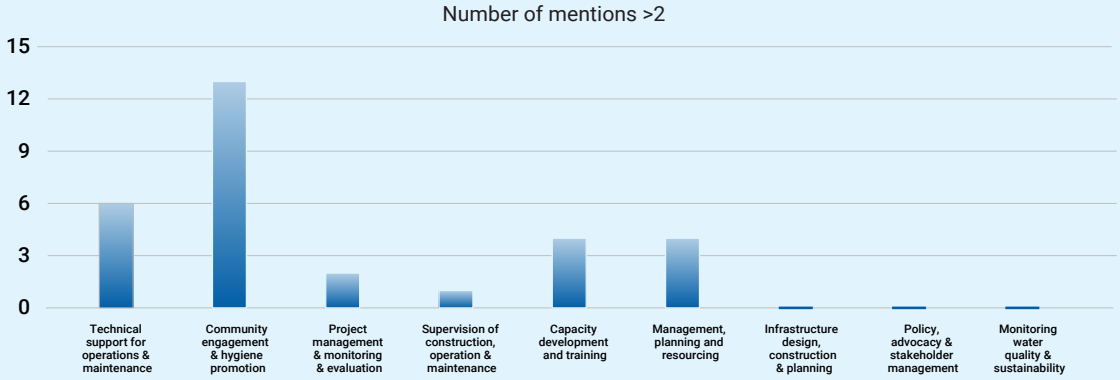


Figure 13: Responsibilities of community development workers

Recommendations

1. **Focus on technicians, technologies, and water quality and safety**
   This study recommends that countries, organizations, and development partners prioritize the creation, attraction, recruitment, development, and retention of rural water technicians.

   In terms of subject matter, the following areas should be prioritized:

   - Rural water supply technologies: This includes understanding available technologies, when to use them, and how to design, adapt, construct, install, and maintain them. Target groups for this area are engineers, supervisors, and technicians.
   - Water quality and safety: This covers water treatment for small supplies, water quality monitoring, and household water treatment and safe storage. Target groups include communities, water quality technicians/specialists, and water operators.

   Before implementing these recommendations, it is crucial to validate the identified needs with in-country stakeholders (check out Annex 6, which lists some of the missing competencies by country) and investigate what is already available on these two topics (see further research). Additionally, the strengths of the supplying organizations should be considered. For instance, an organization focused on community engagement should not shift to highly technical subjects, as this study (see section 2) also highlighted other gaps.

2. **Practice holistic capacity development—with workforce focus**
   While the survey was collecting information on capacity gaps, the barriers revealed an important point: Capacity development, beyond enhancing competencies, means tackling broader workforce issues (e.g., job creation, incentives, materials, and equipment availability). This includes considering broader aspects, such as the availability of jobs and providing support to overcome challenges within this comprehensive system. Therefore, it is recommended to adopt the four-level capacity development approach described by Lincklaen Arriëns and Wehn de Montalvo's (2013)[8] or something similar.

[8] Lincklaen Arriëns, Wouter T., and Uta Wehn de Montalvo. 2013. Exploring Water Leadership. Water Policy 15 (S2): 15–41. https://doi.org/10.2166/wp.2013.010.

3. **Use interactive capacity development approaches that employ a variety of learning methods**

   Capacity development efforts should recognize the high reliance on peers and mentors in issue resolution and integrate interaction and peer-to-peer learning in their methods. This could involve establishing learning communities/ communities of practice during or after the learning activity and facilitating exchanges across provinces, states, and internationally.

   To disseminate rural water capacity development efforts, leveraging existing networks including the Rural Water Supply Network and the Household Water Treatment and Safe Storage (HWTS) Network is recommended. This study's respondents demonstrated that these networks include professionals in supervisory roles who are responsible for identifying appropriate capacity development for their staff.

   The current lack of use of YouTube, social media, and AI for issue resolution should be considered when deciding where to host learning materials and videos. Consideration should also be given on how to attract more learners to reputable information on these platforms.

   Mobile learning could be leveraged while considering the costs of data. For instance, interactive voice response systems could be implemented, allowing individuals to call a toll-free number to access their daily or weekly learning content.

   For technical topics, capacity development materials should continue to include guides, manuals, and step-by-step approaches as foundational learning tools. However, these should be complemented with other learning methods, such as peer-to-peer interaction and virtual tours, to enhance the learning experience.

4. **Use the rural water responsibilities in this study**

   The identified responsibilities in this study, and in general the responsibilities of those who are targeted with capacity development, should be the departure point for capacity development. This allows organizations to a) assess what the person(s) needs to be able to do, b) assess what they are not yet able to do, c) assess the organization's mandate, and hence, d) what needs to be designed for the staff, the organizations, and their systems.

5. **Standardize**
   To enhance the understanding of responsibilities and competency needs, it is essential to standardize job titles and requirements. This standardization will support organizations in creating the right job positions and strengthen the supply and capacity development providers by providing clear requirements

   Organizations involved in rural water capacity and/or workforce development should collaborate to standardize key rural water jobs and use the prescribed responsibilities of this study as a starting base. Establishing international standards (such as the International Standard Classification of Occupations (ISCO)) first could be beneficial, allowing countries to align their national job standards with a global benchmark. However, this international approach should not prevent countries from developing their own standardized rural water job titles and adjusting the requirements to their context, technologies, and systems.

6. **Further research**
   The primary limitations of this assessment lie in the lack of respondents from certain job categories and regions. Further data collection from technicians, operators, and masons/artisans themselves could help validate some of the findings or provide additional details.

Areas requiring further research include:

1. **What are the available technical/capacity development resources in the two key capacity gap areas:**
   - Design, construct, operate, and maintain rural water supply technologies - For what technologies and in what contexts (is rural remote included) are there resources for capacity development efforts (training material, guides/ tools, forums/networks etc)? What are the gaps?
   - Water quality analysis, monitoring, treatment, and HWTS? - For what analysis/ treatment method and in what contexts (is rural remote included) are there? Resources for capacity development efforts (training material, guides/tools, forums/networks etc)? What are the gaps?
2. **Competency needs of remote communities:**
   Some respondents highlighted there is limited involvement of professionals and high dependence on communities in rural areas
   - What technologies are applicable in rural areas?
   - What knowledge and skills are needed for these communities (e.g., water resources management, understanding water quality and health impacts, treatment and safe storage)?
   - What knowledge and skills are needed for community-managed systems?
   - Specific in-country questions: Who provides support to these communities (e.g., community development workers, environmental health workers, or community facilitators)? What knowledge and skills do these supporters need?
3. **Job creation**
   - How are these rural water jobs created?
   - Who are the entities responsible for hiring (if any)?
   - What are the costs associated with these jobs?
   - How is demand for these jobs created? If demand is created, can entrepreneurs take on these jobs?
   - How can we develop competencies and hire locally to overcome the unwillingness to work rurally?

What's next?

GWC, CAWST, and the RWSN are committed to take action based on the report's findings and recommendations with the hope that other organizations will join their efforts.

Our approach

GWC aims to address capacity gaps in the rural water sector by combining expertise in learning design with subject matter experts to create innovative training approaches.

Our report highlights peer-to-peer learning is vital for troubleshooting and skill development. Therefore, we will continue to prioritize discussion forums in our training and explore new ways to use technology, such as leveraging WhatsApp communities to enhance this learning method.

The assessment results confirm we are on the right track with our training and resources. We currently offer two online courses on solar-powered water systems (SPWS) and are expanding this with a manual and additional online training on SPWS operation and maintenance. We are also developing online, in-person, and hybrid courses to support technicians in delivering water safely from source to tap, covering groundwater resource management, borehole drilling supervision, and supply chain management.

Given the strong call in the assessment for building capacity on water quality, we plan to offer courses on water quality, monitoring, and treatment, with a focus on chlorination. Our goal is to add value by reaching new audiences, emphasizing practical skills, filling content gaps, and partnering with other training organizations to expand our service delivery.

While our focus is on capacity development—not job creation—we are committed to forming strategic partnerships with organizations that address employment, increasing the likelihood of job placement and advancement for our trainees.

Center for Affordable Water and Sanitation Technology

CAWST can play a valuable role in addressing the capacity gaps identified in this study, particularly in the key areas of rural water supply technologies and water quality and safety. As an initial step, CAWST should validate the specific needs with stakeholders in its focus countries and investigate existing resources available on these topics. This will ensure efforts are tailored to contextualized requirements.

Leveraging its technical expertise, CAWST can then develop and contribute to capacity development materials and approaches using interactive, peer-learning methods beyond just traditional manuals, such as self-paced learning modules, facilitated online courses, e-learning resources, and training packages for facilitators to lead in-person courses. These can target key audiences like technicians, operators, and communities.

CAWST is committed to leveraging the existing HWTS Network to deliver five global webinars on water treatment technologies and safe storage; four virtual/regional learning exchanges for members in Asia, Africa, and Latin America; and to develop new resources and platforms. Potential initiatives include creating a water quality management course with a water quality risk-based approach and water safety plan for implementing decision makers, such as district-level government technicians and technical managers/supervisors from NGOs. In addition, CAWST could develop monitoring tools, like a package of sanitary inspection forms for household water treatment & safe storage (HWTS) technologies. Additionally, CAWST can build the capacity of rural water community-based organizations and technicians on measurement, monitoring, and evaluation using tools such as mWater.

Furthermore, CAWST can conduct a global learning exchange on rainwater harvesting and aquifer recharge to disseminate knowledge on these rural water supply technologies. Potential collaborations with other organizations should be explored for an integrated, holistic approach.

Rural Water Supply Network

The Rural Water Supply Network (RWSN) is a global network of individual professionals and organizations who are dedicated to rural water supply.

Our vision is a world in which all people enjoy safely managed water services that are resilient and sustainable.

Our aim is to improve the quality of rural water management and services.

Our mission is to be a convening space for individual professionals and organizations to collaborate, develop guidelines and standards, curate knowledge, and promote lifelong learning in the rural water sector.

Our theory of change is that we can achieve this by nurturing and supporting individuals, organizations and partnership through:

- Networking, connecting and convening
- Providing knowledge brokering and an information hub
- Co-developing training, guidelines, and standards.

This report helps us understand the needs and challenges of our members. We will continue to develop and update peer-reviewed manuals and guidelines for rural water professionals, work with CAWST to provide a safe spaces and public platforms for sharing ideas and experiences, and support GWC to provide training and continuous professional development to as many of our members as possible.

Embracing diversity is central to how we work, and in everything we do we will support the voice, leadership, and career progression of women and young professionals.

ANNEXES:

ANNEX 1: Survey Questions

ANNEX 2: Demographics

ANNEX 3: Assessment and Analysis Process (including codes)

Annex 4: Graphical Representation of Additional Data

ANNEX 5: Example Help Questions

ANNEX 6: Missing Competencies Per Country

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