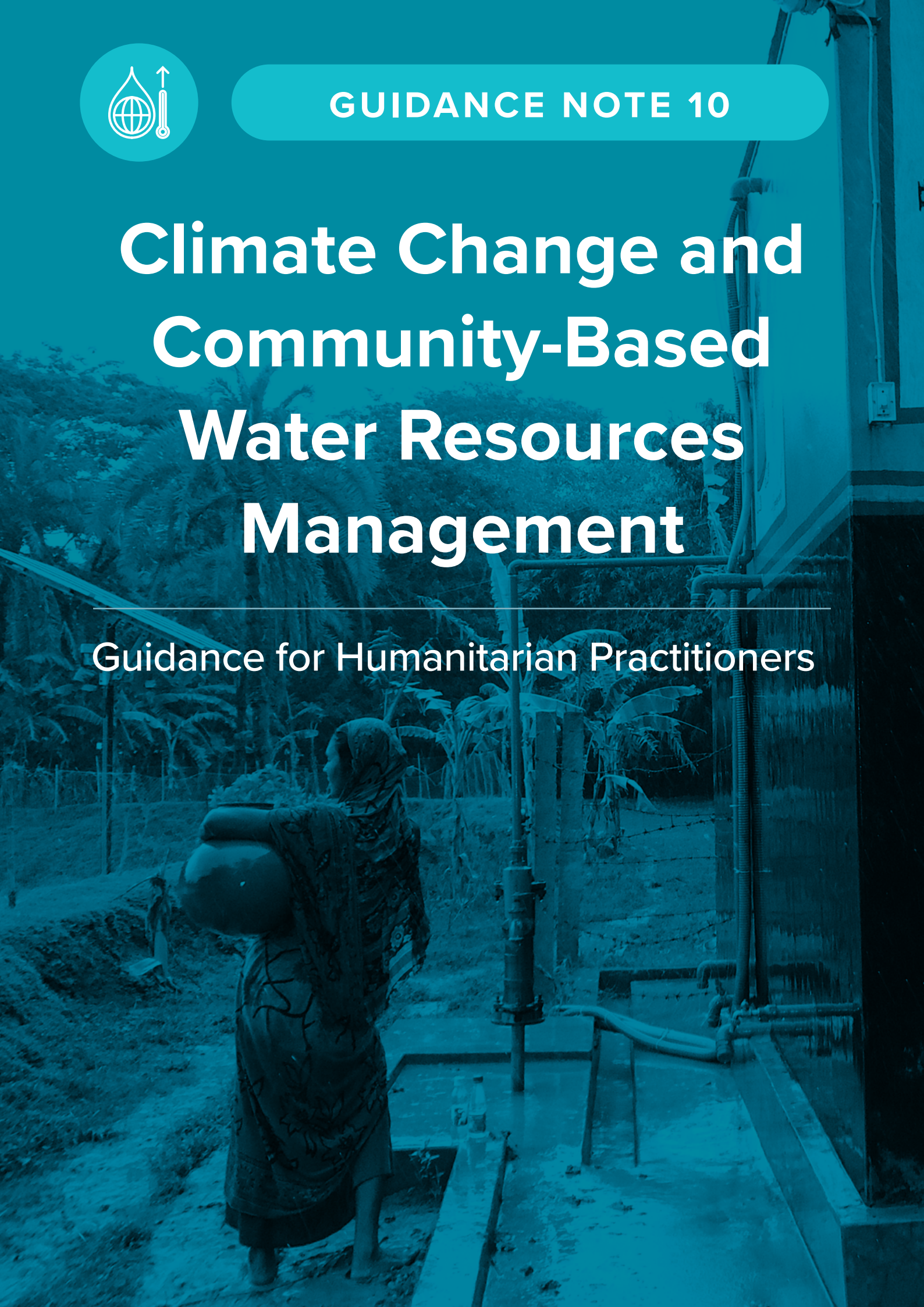
GUIDANCE NOTE 10

Climate Change and Community-Based Water Resources Management

Guidance for Humanitarian Practitioners



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Abbreviations

CBWRM	Community-Based Water Resources Management
IWRM	Integrated Water Resources Management
MOU	Memorandum of Understanding
PCVA	Participatory Capacity and Vulnerability Assessment
SDG	Sustainable Development Goal
WASH	Water, Sanitation and Hygiene
WRM	Water Resources Management

Citation

Obeidat, M. (2025). Climate Change and Community-Based Water Resources Management (CBWRM). Guidance for Humanitarian Practitioners. Oxfam. Oxford.

Acknowledgements

This guidance note was funded by the German Federal Foreign Office and written by Maram Obeidat.

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Cover Image: A solarised slow sand pond filter, Bangladesh. Photo by Andy Bastable (Oxfam)

1 Introduction

Across the globe, communities are facing increasing pressure on water resources due to climate change, conflict, displacement, environmental degradation, and shrinking development and humanitarian funding. In many places, rainfall has become more erratic, groundwater is depleting, and floods or droughts are more frequent. These challenges are especially acute in fragile or underserved areas, where formal water services are limited or unreliable.

In this context, communities themselves are not passive recipients of aid; they are often the first responders and long-term stewards of water systems. From repairing boreholes to harvesting rainwater or managing small-scale irrigation, local groups have long played a vital role in sustaining access to water. However, these efforts are often informal, under-resourced, or unsupported by national systems.

This guidance is designed to support community-led water management as a practical, climate-resilient, and sustainable approach. It reflects a shift in how external actors (NGOs, donors, local governments) engage: not as service providers, but as facilitators of local leadership, knowledge, and solutions. The goal is to empower communities to assess their own water needs, design context-appropriate solutions, and take ownership of ongoing management.

The approach draws from the principles of Integrated Water Resources Management (IWRM). IWRM is a global framework that emphasises the sustainable and equitable use of water resources through inclusive, cross-sectoral decision-making. While traditional IWRM often applies at a catchment or national level, this guidance adapts IWRM principles to the community level, with a focus on practical tools and examples tailored to rural, urban, and humanitarian contexts.

This guidance provides a flexible, step-by-step process to help communities and their partners plan, implement, and sustain water management strategies in the face of growing environmental and financial uncertainty.

1.1 Purpose and Scope

This guidance is primarily for Water, Sanitation and Hygiene (WASH) practitioners and local organisations. It provides a practical framework to design, implement, and sustain Community-Based Water Resources Management (CBWRM) initiatives. It describes a four-phase process and includes a detailed catalogue of solutions with global case studies, actionable tools, and budget considerations.

While grounded in Sustainable Development Goal (SDG) 6 (Clean Water and Sanitation), this guidance supports several other SDGs, as outlined in Annexe 4: Links to the Sustainable Development Goals (SDGs).

The guidance emphasises a bottom-up approach, supporting inclusive participation, gender equity, integration of local knowledge, and suitability across diverse contexts, including rural, urban, and humanitarian settings. By aligning water management with broader development and environmental objectives, this approach supports system-wide transformation for equitable and climate-resilient outcomes.

1.2 Target Audience

This guidance is intended for:

- Local and international NGOs working to improve water access, sanitation, and hygiene, especially in underserved areas
- Local government authorities and water management bodies, including municipal councils, district water boards, or national water agencies responsible for water resource governance, regulation, and infrastructure development
- Development practitioners and donors seeking scalable IWRM solutions - professionals such as consultants, researchers, and funding entities (for example, the World Bank, USAID and private foundations) who design, evaluate, or finance IWRM and WASH initiatives
- Private sector actors and entrepreneurs, from small-scale vendors to water utilities and agribusinesses, who play a crucial role in water access, treatment, storage, and innovation. Their engagement in community-based IWRM can enhance sustainability, cost-efficiency, and scalability by improving water use efficiency, reducing waste, and integrating recycling and treatment technologies such as greywater systems or advanced filtration. For example, in India, micro-irrigation start-ups supported by national programmes have reduced agricultural water use by 30-70%, demonstrating cost-effective, scalable solutions (Viswanathan J. A., 2023) (UN-Water)

Box 1: Key Terms

- **Climate change** is any change in climate that persists for decades or longer, arising from human activity, that alters the composition of the atmosphere (i.e. greenhouse gases emissions).
- **Climate variability** describes natural variations in the climate that are not caused by climate change (e.g., it rains more in some years and less in others).
- **Domestic or household** use of water refers to supplies consumed or used within the home to meet basic health, sanitation and hygiene needs.
- **Groundwater wells and aquifers** (underground rock layers containing water resources) which yield water from beneath the earth's surface are referred to as groundwater sources. In arid environments, groundwater is an attractive option for water supply as it is often cheaper to develop relative to other alternatives, aquifers offer more natural protection from contamination, and groundwater offers more reliability of supply against climate change and existing climatic variability.
- **Productive use of water** refers to supplies utilised to sustain crops, livestock or for manufacturing, which produce an income.
- **Vulnerability** refers to the characteristics and circumstances of a community, system or asset that make it susceptible to the harmful effects of a hazard – in this case, reduced availability of water. The main determinants of vulnerability are the social, economic, political, governance, environmental and ecological factors that characterise how well people can adapt to, prepare for, cope with and recover from stresses or shocks.
- **Water scarcity** results when available water resources are insufficient to meet the household and productive demands of the communities they support.
- **Water stress.** Households or communities which are vulnerable to water scarcity can be said to be experiencing water stress.

2 Guiding Principles for Community-Based Water Resources Management

Strong, sustainable community water systems are built on a few simple but powerful principles. The five guiding ideas below help ensure that solutions are locally owned, fair, resilient, and supported by the right mix of people and knowledge.

Community Leadership (put local people in charge): when communities lead the planning and management of water services, the results are more effective and sustainable. Local leadership ensures that solutions are designed around real needs and lived experiences. It also builds ownership, trust, and long-term responsibility for operations and maintenance (McCommon, 1990)

🛠 **Example:** In rural Kenya, water committees made up of local farmers and residents manage the boreholes and irrigation systems. They collect user fees, make repairs, and resolve disputes, reducing the need for external support (Lammerink, 1999)

Equity and Inclusion (make sure everyone has a voice and access): water systems must serve all members of a community fairly. This means involving women, youth, people with disabilities, and marginalised groups in planning and decision-making. Women are often the main users of household water systems and bring critical knowledge about what works and what doesn't in real-world use. Inclusive processes not only reduce inequality but also lead to more practical, effective, and sustainable water solutions

🛠 **Example:** In Jordan's Azraq Refugee Camp, UNICEF worked with community volunteers, including women and people with disabilities, to design and roll out disability-inclusive and accessible WASH services. By consulting affected groups on tap stand placement, shower access, and water distribution plans, the intervention enabled all residents to access services with dignity and safety. Community voices shaped the plot-level water network extension, making the system more responsive to real needs and reducing physical and social barriers to access (Tucker, 2023)

Use Local Knowledge (build on what communities already know): traditional water practices often reflect generations of experience. By combining this local wisdom with modern tools, communities can create solutions that are both culturally relevant and technically effective

🛠 **Example:** In Mali, communities manage seasonal wetlands using local knowledge of flood patterns, supported by new hydrological data to improve crop yields and water storage. (Adams, 1993) (Dixon, 2005)

Plan for Climate Resilience (design systems that can handle floods, droughts, and change): climate change is already affecting when, where, and how water is available. Communities need water systems that can adapt to unpredictable conditions, such as intense rainfall or long dry periods

🛠 **Example:** In Bihar, India, flood-prone villages installed handpumps and pour flush toilets on raised platforms located on sites safely above flood levels. This ensured continued access to clean water and sanitation during flooding while volunteers were trained in hygiene and disease prevention (Shekhar, 2010)

Work Together Across Sectors (bring in the right mix of people, skills, and support): good water management needs partnerships. Communities often work best when supported by governments, private companies, NGOs and academic institutions that contribute technical knowledge, funding, and long-term support

🛠 **Example:** In Andhra Pradesh, the NGO Byrraju Foundation launched SWEET - ‘Safe Water for Everyone using Effective Technology’ - a community-based water purification system project that produces 1000-2000 L/hr for every three villages, to be operated by trained village youths. The project was a collaboration between the NGO, the Gram Panchayat (village council), the community, donor and philanthropic organisations, turning it into a panchayat-public-private partnership (4P) model (Das, S, 2024)

Table 1 shows how the principles have been put into practice in different humanitarian and development contexts.

Table 1: Guiding Principles for Community Water Management

Principle	Example	Area of application	Key Actions	Outcome
Community Leadership	Community-led water committees manage boreholes and irrigation systems in Makueni County, Kenya	Rural water systems	Collect user fees, oversee repairs, resolve disputes	Reduced reliance on external aid, improved water access and system maintenance
Equity and Inclusion	Inclusive WASH in Azraq Refugee Camp, Jordan (UNICEF)	Refugee camp (humanitarian)	Engage women, people living with disabilities, and marginalised groups in WASH design	Improved access and dignity; responsive, accessible systems
Local Knowledge	Wetland management using flood pattern knowledge in Mali	Semi-arid farming communities	Combine traditional knowledge with hydrological modelling	Enhanced water storage, preserved ecosystems, improved crop yields
Climate Resilience	Floating gardens and early warning systems for flood-prone Bangladesh	Disaster-prone agriculture zones	Use adaptive practices like floating agriculture and risk alerts	Sustained livelihoods, reduced flood impact, greater resilience

Principle	Example	Area of application	Key Actions	Outcome
Multi-Stakeholder Collaboration	Solarised boreholes in Ajoung Thok & Pamir Camps, South Sudan (UNHCR)	Humanitarian refugee settings	Joint action by local committees, NGOs, UNHCR, and ministry support	Reliable water access, shared responsibility, and strengthened local systems

Photo: A focus group discussion with women and people living with disabilities in Kyangwali Refugee Settlement, Uganda (2023). © Ibex Ideas

Box 2: Case study: Improving livelihoods through CBWRM and adaptation in Niger

In Niger, Oxfam has supported rural livelihoods by working with communities on dry season irrigation and utilising rainfall as effectively as possible. The project has reached 1,200 rural farmers directly and 10,000 people indirectly through improved food security. These achievements are the result of:

- Improving the functional sustainability of water supply services for domestic and productive use
- Improving localised water storage facilities and practices
- Monitoring local environmental change

Project activities are focused on:

- Community mobilisation and training
- Improved siting of boreholes
- Appropriate construction of boreholes
- Installation of solar pumping systems and irrigation facilities
- Groundwater monitoring

Results and Outcomes

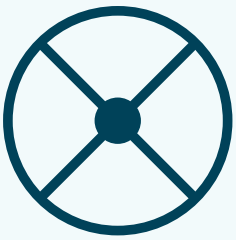
- More than 800 women are directly engaged in gardening and irrigation activities in the target village of Banibangou
- A solar pumping system is providing 50,000 litres daily
- Communities have established operating principles to ensure water supply and irrigation systems are managed appropriately
- The availability of water, the introduction of 'field schools' for training purposes, and the accessibility of inputs for women producers, have increased the number of women producers - a significant boost and diversification of production and a higher income for beneficiaries
- People were able to remain in Banibangou during the food crisis, rather than being forced to migrate (Anguko, 2019)

3 Community-Based WRM Implementation Framework

The framework comprises four interconnected phases:

1. Community Mobilisation
2. Planning and Design
3. Implementation
4. Monitoring and Feedback

Think of the framework like a wheel, not a ladder:



Each spoke connects to the others, and movement is ongoing – not one-directional.

Figure 1: Visualising the Community Water Management Cycle

Each has clear objectives, steps, and tools to guide community-led water management. While these phases are typically followed in sequence, the process is not strictly linear. Instead, the framework is cyclical and adaptive, encouraging communities to return to earlier phases as conditions change, lessons are learned, or new challenges emerge.

This approach emphasises participatory decision-making, local ownership, and alignment with broader water governance systems. Each phase strengthens the next, while also enabling communities to continuously improve and adapt their strategies over time. The result is a flexible, practical model for managing water resources in a sustainable and locally relevant way.

See also Annexe 1: Flow chart illustrating the key elements of Community-Based Water Resource Management

3.1 Phase 1: Community Mobilisation

The scope of this guidance is individual communities (such as villages, urban neighbourhoods, or camps). The aim is not to manage entire watersheds or river basins, but to support local-level action while aligning with broader governance systems where possible.

The main objective of Phase 1 is to establish or strengthen inclusive community structures, build mutual understanding of the local water context, and identify challenges and opportunities for action.

- **Support representative water management committees.** Where committees already exist, NGOs and local stakeholders can assess their structure, inclusivity, and effectiveness, and offer support to strengthen their capacity where needed. In the absence of committees, communities may choose to form new representative groups with at least 50% female participation and inclusion of youth, elders, and marginalised groups. Experience shows that fully community-managed systems can face challenges such as management overload or technical gaps. To mitigate these risks, a professionalised community management model is recommended where committees include at least one member with business, private sector, or technical expertise while maintaining strong community oversight and accountability.

  NGOs should clearly define their role in collaboration with the community committee, whether as facilitators, technical advisors, or capacity-building partners, ensuring that community leadership is respected and central to decision-making.

  🛠 **Example:** In Somalia, women-led committees managing communal wells improved equity in water access by addressing local needs through inclusive governance structures (Githinji, 2008)

This table summarises key approaches to managing water systems across different implementation settings, highlighting ownership structures, support mechanisms, and examples of operational models.

Table 2: Comparative Business Models for Community-Based IWRM in Urban, Rural, and Humanitarian Contexts

Context	Business Model	Example	Key Features
Urban	Public-private partnership with municipal integration	Jakarta, Indonesia: Community-level drainage and water services under municipal oversight. Source: (Putri, 2017)	• Tariff-based cost recovery • Integration with city systems • Complaint handling by community groups

Context	Business Model	Example	Key Features
Rural	Community-led or cooperative model with professionalised user groups	Malawi & Kenya: Trained committees manage sand dams and boreholes with NGO support. Source: (Sand Dams Worldwide, 2024)	• Local fee collection • Professional training • High community ownership • Cost-effective
Camp/ Humanitarian	NGO/UN hybrid model transitioning to refugee-managed systems with technical & financial support	South Sudan: Refugees trained to manage solar-powered water systems in camps like Jamjang and Maban. (UNHCR, 2022)	• Humanitarian-funded infrastructure • Refugee-led Operation & Maintenance • Supported by UNHCR and partners • Cost-sharing pilots

- **Introduce linkages to governance structures** to ensure long-term sustainability and policy alignment. Map relevant municipal, regional, or national water authorities, and initiate engagement through workshops or meetings. Where applicable, develop a Memorandum of Understanding (MOU) or bylaws clarifying technical, financial, and oversight roles. In humanitarian contexts, link committees with actors such as UN agencies or camp management, especially where systems are transitioning to local government.
- **Engage in preliminary financing discussions** with governance partners and community members, outlining potential funding streams such as user fees, municipal grants, or donor start-up support, while ensuring equity for vulnerable households.

- **Facilitate participatory workshops** to identify and prioritise water challenges, drawing on both community knowledge and technical expertise. Ensure women, youth, and marginalised groups can participate fully. Engage diverse stakeholders, including local authorities, private sector actors, agricultural users, and NGOs, to build collaboration and secure early commitments for technical or financial support.
- **Engage stakeholders to foster inclusive collaboration.** Effective IWRM requires collaboration between diverse groups, including local NGOs, schools, local authorities, private sector actors, agricultural users, and community members. These partnerships help ensure broad representation in identifying and addressing water challenges, while integrating local knowledge and accessing critical resources such as funding, technical expertise, innovation, and cultural legitimacy.

Partnerships are typically facilitated by NGOs or community-based organisations, working alongside water committees, user groups, or local governance bodies. While communities lead the identification of priorities, NGOs often support by mapping stakeholders, organising convening spaces, and brokering partnerships with government agencies, private actors, or technical institutions.

To ensure relevance and impact, stakeholder engagement should be guided by three key criteria:

1. Relevance to the water issue (e.g., irrigation for farmers, hygiene for schools)
2. Having influence or responsibility over water systems (e.g., water utilities, ministries, municipal departments)
3. Representation of diverse groups, including women, youth, elders, and marginalised populations

Although this guidance is designed for community-level implementation and does not cover full watershed management, communities may still find value in engaging with upstream or downstream stakeholders (e.g., nearby farms or industries) through dialogue or coordination forums. The goal is not to lead a basin-wide strategy, but to advocate for local needs and improve shared water outcomes.

Involving private sector actors operating within or near the community, such as technology providers, water-intensive businesses, or utility companies, may also be appropriate. Similarly, agricultural stakeholders must be actively engaged where farming is a major water user, ensuring that practices like irrigation and runoff management align with conservation goals.

This multi-actor collaboration supports SDG 6 (Clean Water and Sanitation), and SDG 12 (Responsible Consumption and Production) by promoting efficient, sustainable water use and decoupling economic growth from resource depletion. When well facilitated, these partnerships increase the legitimacy, impact, and long-term sustainability of IWRM initiatives.

3.2 Phase 2: Planning and design (solution identification)

This phase focuses on co-developing practical, locally appropriate solutions through active community consultation.

Step 1: Identify and prioritise water challenges

What to do:

Start by working with the community to **define the main water-related challenges** they face. These could include water scarcity, pollution, unreliable supply, seasonal flooding, or poor access for certain groups. This step fosters a shared understanding and ensures that future solutions are based on real, shared priorities.

Use simple and inclusive tools such as:

- Problem tree analysis to explore root causes of issues
- Seasonal calendars to map the timing of shortages or floods
- Water walk-throughs to observe where and how people access water
- Community mapping to understand which areas are most affected

Fully involve women, youth, and marginalised groups in the process and incorporate traditional knowledge by documenting existing practices and discussing how they can be integrated into formal plans.

During step 1, it is also important to bring in external knowledge, especially about climate risks. For example, communities might not yet be aware of long-term changes in rainfall patterns or groundwater levels. NGOs and technical actors can support them by sharing relevant information in accessible forms, such as pictures, posters, radio messages, or community storytelling.

By the end of this step, the community should have a clear, prioritised list of water challenges based on local experience and expert knowledge, providing the foundation for practical and sustainable solutions in the next phase.

Step 2: Explore and select practical water solutions

Once the main water challenges are identified, the next step is to work with the community to explore possible solutions. This is when local knowledge, experience, and outside expertise come together to develop ideas that are realistic, acceptable, and sustainable.

What to do:

✓ Organise inclusive brainstorming sessions

Hold community meetings or workshops where people can suggest different ways to solve the identified problems. Include a wide range of participants, especially women, youth, elders, people with disabilities, and others who are often left out. Use tools like:

- Open group discussions
- Idea ranking or scoring
- Visual aids and diagrams for low-literacy settings

Encourage people to share their knowledge and traditional practices (e.g., clay pot storage, rainwater harvesting) to strengthen the cultural relevance, sustainability, and acceptance of IWRM solutions while preserving traditional wisdom for future generations.

🛠 **Example:** in India's Rajasthan region, a community-led revival of Johad rainwater harvesting systems, facilitated by NGOs like Tarun Bharat Sangh, is now enshrined in state water policy, and replicated through broader WASH coordination efforts. (Tarun Bharat Sangh, 2022)

✓ Combine traditional and modern approaches:

Help the community explore how traditional methods can be improved or adapted with simple technologies. The goal is to choose solutions that:

- Fit the local environment and culture
- Use materials and skills already available
- Can be maintained by the community
- Address long-term risks, such as climate impacts

These traditional practices can be validated by engineers or hydrologists to produce blended approaches, such as enhancing traditional wells with solar pumps or combining rainwater systems with modern filtration. Communities can be invited to share new ideas they have heard about, and NGOs or technical partners can discuss their suitability for the context and explain how they work, what they cost, and what maintenance is needed.

🛠 **Example:** in rural Malawi, community members suggested building sand dams to address dry season shortages, based on their local knowledge. The NGO team supported the idea and introduced bio-sand filters to improve water quality. Together, they created a solution that was both familiar and technically effective. (Sand Dams Worldwide, 2024)

🛠 **Example:** in a refugee camp in South Sudan, community members suggested using clay pots for safe water storage, a long-standing traditional method for keeping water cool and reducing contamination. The NGO complemented this by introducing portable ceramic candle filters, which are compact, easy-to-use filtration units capable of removing bacteria and protozoa at the household level. This combination allowed families to preserve the cultural practice of clay pot storage while ensuring water met safe drinking standards during emergencies. (Das, S, 2024)

✓ **Record and communicate all proposed ideas:**

Write or draw the suggestions using flip charts, posters, or digital tools (whatever works best locally). This helps the group stay organised and allows for clear decision-making and follow-up.

Watch out for:

- Some participants may hesitate to speak: use small group work to include everyone
- New technologies might seem exciting, but they may not be affordable or suitable
- Some traditional methods may need adapting to today's climate conditions or health standards

Facilitators should keep the process balanced, open, and respectful; all ideas are valid, and the final decisions should reflect both community priorities and technical reality.

Step 3: Assess the feasibility and sustainability of proposed solutions

In step 3, assess which proposed community water solutions are realistic, affordable, and sustainable in the local context. This means checking each option against technical, financial, environmental, and social criteria with input from the community, technical experts and water authorities.

What to do:

✓ Use a simple assessment checklist

Review each proposed solution with the community by asking:

- Is it affordable, in terms of both initial cost and long-term maintenance? (This will require an assessment of costs, see below)
- Are the right materials available locally?
- What are the environmental impacts (positive or negative)?
- Is it acceptable to the community? Does it meet everyone's needs?
- Do people have the skills to build and maintain it?

Skills may include sufficient technical understanding of the equipment used, knowledge of water availability versus demand and management skills such as budgeting, fee collection, and transparent financial management to build trust.

The review can be done using scoring sheets, traffic light systems (green/yellow/red), or simple 'pros and cons' charts. Keep the process visual and participatory so that all groups can contribute.

✓ Involve technical experts

NGOs should invite engineers, hydrologists, or WASH specialists to verify the technical suitability of each option. For example:

- Testing whether local soil is suitable for sand dams
- Confirming that a solar pump will produce enough water
- Ensuring a water filter removes locally occurring contaminants

✓ Check solutions for financial and political sustainability

Communities, with NGO support as required, should consider:

- How much will the solution cost, and how will it be paid for? Assess the anticipated costs (construction, operation, maintenance, upgrades) and identify financing models, such as user fees, municipal grants, or donor start-up support. Plan for a clear transition to community-led financial management.
- How can the plan ensure the inclusion of vulnerable households?
- Are there legal or land tenure considerations? Communities and facilitators should also review legal, regulatory and land tenure aspects that affect water infrastructure to ensure that the solution can be implemented - often the regulation of water use will be through traditional systems, which are not written down but have the force of law.

✓ Refine and adapt solutions

Based on feedback from both the community and experts, adjust the proposed solutions to make them more practical. This could include:

- Simplifying a design to reduce costs
- Phasing construction over time
- Combining multiple ideas, like using rainwater harvesting with portable filters

Watch out for:

- Overlooking long-term maintenance needs
- Choosing high-tech options that are difficult to repair locally
- Failing to involve vulnerable groups in evaluating what is ‘acceptable’ or ‘affordable’
- Overlooking regulatory or land tenure aspects

Facilitators should make sure the community - not just the technical team - has a clear understanding of the requirements of each solution over time. This builds transparency, trust, and ownership.

Step 4: Finalise the community water action plan

Once the community has selected the most feasible and appropriate solutions, the final step is to pull everything together into a clear, agreed-upon action plan. This plan will guide the implementation phase and serve as a shared roadmap for all stakeholders.

What to do:

✓ Develop a simple, visual action plan

Work with the community and relevant partners to document:

- What will be done (e.g., build a sand dam, install filters, launch an awareness campaign)?
- Who is responsible for each activity (e.g., water committee, youth group, NGO, municipality)?
- When the activities take place (use a basic timeline or calendar)
- What resources are needed (materials, funding, technical support)

Use tools like flip charts, hand-drawn maps, or printed templates - whatever is easiest for the group. Keep the plan clear and visual so everyone can understand it.

✓ Assign roles and responsibilities

Clarify who will lead or support each activity.

Community roles might include:

- Overseeing construction
- Coordinating volunteer labour
- Monitoring water quality
- Managing local funds

It is important at this stage to ensure that the role of any community management structure (water management committees or similar) is agreed upon.

NGOs or authorities' roles might include:

- Providing training
- Supplying materials
- Offering technical support
- Linking with external funding or services

Make sure roles are distributed fairly and that women, youth, and marginalised groups are meaningfully included.

✓ Validate the plan with all stakeholders

Share the draft plan in an open meeting and ask for final feedback. Adjust as needed. Once there is agreement, the plan should be:

- Written down or drawn (and translated if needed)
- Shared with everyone, including partners, funders, and local authorities
- Signed or endorsed by relevant stakeholders (optional but useful for accountability)

This includes securing agreements with landowners or relevant authorities to confirm rights of access, use, and maintenance for chosen sites.

Watch out for:

- Plans that are too complex or technical for community members to follow
- Vague timelines or unclear responsibilities
- Excluding some groups from planning or validation meetings

See also Table 7 in the section 'Risks and Mitigation Strategies' below. Keeping the process transparent and inclusive will strengthen trust, ensure accountability, and set the stage for successful implementation.

3.3 Phase 3: Implementation

Phase 3 makes the solutions operational, constructing the selected CBWRM solutions, such as handpumps, sand dams, greywater reuse systems, or solar-powered water points. The community takes the lead in overseeing implementation, and NGOs or technical partners typically facilitate the process by providing training, engineering support, materials, or logistics as needed.

By involving the community throughout, during site selection, construction, supervision, and maintenance setup, the solutions are better tailored to local conditions, more cost-effective, and more likely to remain functional over time.

What to do:

✓ **Step 1: Create an implementation plan**

Work with the community to turn the phase 3 action plan into a step-by-step operational plan. This includes:

- Further breaking down activities (e.g., site prep, construction, testing, handover)
- Confirming the roles for community members, NGOs, and local institutions
- Setting a timeline based on seasons, school/work calendars, and funding cycles
- Identifying resources (materials, labour, funding, permits)
- Creating checklists to track key steps like material delivery, construction progress, and task completion

✓ **Step 2: Use local materials and skills**

Use what is available nearby to reduce costs, support the local economy, and protect the environment:

- Map the locations of local materials like sand, bamboo, or gravel
- Work with local suppliers and secure permits where needed
- Hire local labour - especially women and youth - to build skills and reduce costs

What to do:

✓ Step 3: Provide hands-on training

Ensure everyone knows how to build and maintain the system:

- Identify training needs (e.g., pump repair, water testing, solar maintenance)
- Deliver training in local languages, using simple tools like illustrated low-literacy guides for system operation and repair and live demonstrations
- Focus on inclusion - especially of women and youth, who often lead daily water-related tasks

✓ Step 4: Set up operation & maintenance (O&M) systems

Build systems that will keep the water solution(s) running for years to come:

- Form or support a water committee to lead repairs, monitoring, and cleaning
- Establish supply chains for spare parts with local vendors or cooperatives
- Create O&M schedules (e.g., weekly checks, quarterly cleanings)
- Create work schedules: community-developed timelines for tasks and maintenance
- Set up community funding (e.g., user fees or maintenance funds)

✓ Step 5: Integrate communication mechanisms

Provide regular updates to the community on progress, challenges, and successes using meetings, local media, or digital platforms. Celebrate milestones, such as system completion or successful repairs, to maintain engagement.

✓ Step 6: Link to governance and financing structures

Reinforce connections with municipal, regional, or national authorities to ensure ongoing technical support, policy alignment, and funding opportunities.

Box 3: Solar Water Pumps in South Sudan

Case Study

In the refugee settlements of Maban County, South Sudan, UNHCR and its partners implemented solar-powered water systems to ensure sustainable access to safe water. The project involved local refugee communities in both the construction and long-term operation of the systems. Refugee youth were trained to operate solar pumps, manage routine maintenance, and record water usage data. Community members helped in trench digging, setting up distribution points, and mapping household access.

This approach demonstrated:

- Strong local ownership, with trained refugee caretakers managing O&M.
- Environmental sustainability, by reducing diesel generator reliance.
- Cost-effectiveness, as solar systems lowered recurring fuel and maintenance expenses.
- Scalability, with similar models now adopted in neighbouring settlements.

Source: (UNHCR, 2025) Solar systems help build bridges between refugees and host communities in South Sudan

3.4 Phase 4: Monitoring and Feedback: ensuring accountability and continuous improvement

This phase helps communities track system performance, respond to challenges, and improve over time. Monitoring ensures systems remain functional, equitable, and sustainable. Feedback enables users to raise concerns, suggest improvements, and confirm that actions are taken.

Link monitoring to governance structures from the outset, connecting with relevant municipal, regional, or national authorities to share data and align with broader water governance systems. Formal agreements or partnerships can secure ongoing technical and policy support.

Integrate communication mechanisms to maintain transparency through community meetings, local radio, notice boards, or digital platforms, ensuring monitoring results and follow-up actions are accessible to all, including low-literacy groups.

What to do:

✓ Step 1: Define what to monitor

Work with the community to decide what to measure (indicators), based on what matters most locally. This ensures that monitoring is meaningful and manageable.

- Hold inclusive workshops with women, youth, elders, and marginalised groups to select key indicators.

  Common indicators include:

  - Water quality (e.g., turbidity, contamination)
  - Access equity (e.g., time to collect water, % of households served)
  - Functionality (e.g., pump uptime, repair delays)
  - Sustainability (e.g., frequency of maintenance, user fee recovery)

- Use simple tools suited to the context (e.g., low-cost test kits, paper forms, or mobile apps like mWater)
- Document indicators using charts, posters, or visual tools to build shared understanding

🛠 **Example:** In Jakarta, Indonesia, informal settlements used mobile apps to track water quality and drainage. (Putri, 2017)

✓ Step 2: Train and support community monitors

Train selected community members to collect and understand the data. Monitors should represent diverse groups and receive hands-on support to build their skills.

- Identify community monitors (e.g., youth, women's groups, or water committee members)
- Provide practical training on data collection, logging, and basic data interpretation
- Use appropriate formats:
  - Digital: KoboToolbox, mWater for tech-accessible areas
  - Paper: Checklists, logbooks for low-tech areas
- Establish support from NGOs or committees to ensure data accuracy and respond to problems

What to do:

✓ Step 3: Create feedback loops

Turn monitoring data into action through clear, inclusive feedback systems that provide information to decision-makers (in most cases, the community water committee). These help community members raise concerns, track improvements, and hold each other accountable.

The community water committee or other responsible body should:

- Set up accessible channels for feedback: suggestion boxes, hotlines and regular meetings
- Hold monthly or quarterly reviews to share findings and plan actions
- Report results publicly through community boards, radio broadcasts, or digital dashboards
- Ensure feedback leads to action with clear responsibilities and follow-up timelines

🛠 **Example:** In the wake of the 2010 earthquake in Port-au-Prince, Haiti, residents used noticeboards combined with suggestion boxes to communicate issues and feedback about WASH services. Suggestion box submissions were reviewed regularly, and information alongside updates on pump functionality and water distribution was disseminated publicly via community notice boards. This approach allowed communities to raise concerns, monitor improvements, and hold implementing teams accountable. (International Federation of Red Cross and Red Crescent Societies, 2011)

Common Challenges

- Ensuring monitoring and feedback tools are accessible to all, especially low-literacy users
- Turning feedback into timely action to avoid raising expectations without follow-up
- Maintaining consistent engagement, especially in crisis-affected or mobile populations

See also Annexe 3, which outlines a wide range of tools useful for CBWRM implementation

Table 3: Key tools to support monitoring and feedback

Tool	Use
Monitoring Templates	Standard forms for tracking water quality, functionality, and equity
Feedback Dashboards	Visual platforms (physical or digital) for sharing data with the community
Community Review Guides	Meeting templates to discuss data, gather feedback, and decide actions

4 Examples of Community-Based WRM Solutions

This table, and the example below it, present practical, scalable solutions for community-led integrated water resource management. Each entry outlines its use, technical considerations, the specific challenges it addresses, and IWRM links to further reading or case studies for deeper understanding.

Table 4: Catalogue of community IWRM solutions

Solution	Description and Application	Technical Considerations	Addresses These Problems	Further Reading / Examples
Rainwater Harvesting	Captures rainwater from rooftops for school/ clinic use, irrigation, or domestic use	Design for 100 - 500 m^2 rooftops, use sealed tanks, add first-flush diverters, clean gutters regularly	Water scarcity, lack of access in dry seasons, poor sanitation in institutions	UNEP Rainwater Harvesting Manual
Sand Dams	Low barriers on seasonal rivers to trap sand and store water underground	Site-specific hydrology needed; avoid erosion; recharge monitoring required	Seasonal water shortages, dryland agriculture, groundwater depletion	Sand Dams Worldwide

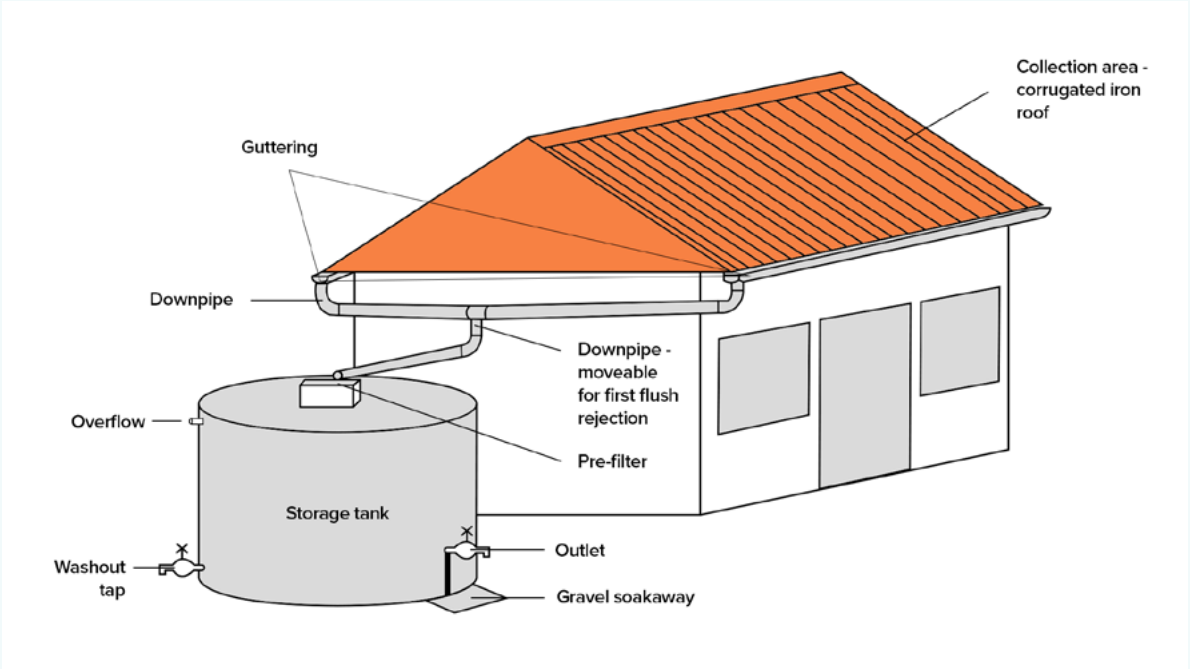
Solution	Description and Application	Technical Considerations	Addresses These Problems	Further Reading / Examples
Professionalised Community Management Groups	Committees with business/ technical skills, gender-inclusive, linked to external support	Clear bylaws, financial transparency, technical and governance training	Weak community management, financial inefficiency, limited ownership	IRC WASH Systems
Bio-Sand Filters	Low-cost filtration using sand and gravel at household level	Consistent sand sizing; annual sand changes; monitor clogging	Waterborne disease, poor water quality, lack of treatment access	CAWST BioSand Manual
Wetland Restoration	Restores degraded wetlands for flood control and water filtration	Avoid invasive species; integrate with farming; monitor biodiversity	Flooding, ecosystem degradation, poor water filtration	Ramsar Wetlands Guide
Traditional Terracing	Earthen or stone con-tours on slopes to slow runoff and retain water	Match to slope/rainfall; erosion control; appropriate terrace width	Soil erosion, low agricultural yield, water runoff	FAO Conserva-tion Agriculture
Check Dams	Small dams in streams to recharge groundwater	Manage siltation; control spillways; evaluate downstream impacts	Water table decline, seasonal scarcity, runoff management	India Check Dams Case

Solution	Description and Application	Technical Considerations	Addresses These Problems	Further Reading / Examples
Fog Harvesting	Uses mesh nets in foggy areas to collect moisture for storage	Mesh size 1-2 mm; wind protection; regular net maintenance	Lack of surface water, high-altitude water scarcity	FogQuest
Managed Aquifer Recharge (MAR)	Channels excess surface water to replenish groundwater	Must assess aquifer suitability; water must be pre-filtered; recharge only during wet periods	Groundwater depletion, unreliable boreholes	UNESCO MAR Guide
Water Recycling (Greywater)	Treats household wastewater for reuse in gardens or toilets	Separate grey/ blackwater; ensure filtration (e.g., sand, gravel); test water for pathogens	Water wastage, irrigation need, sanitation reuse	Eawag Greywater Factsheet
Spillage Water Reuse	Redirects spilled water from taps/ handpumps to gardens, nurseries, or livestock	Simple gravel drains or tanks; prevent mosquito breeding; filter as needed	Water wastage, low food production, poor drainage	No references online
Smart Water Sensors	Install *internet of things* devices at sources to monitor usage and quality	Requires calibration, mobile access, basic connectivity	Poor monitoring, leakage detection, unreported breakdowns	Akvo Flow

Solution	Description and Application	Technical Considerations	Addresses These Problems	Further Reading / Examples
Floating Cage Aquaculture	Raise fish in lakes/ reservoirs to reduce overfishing and boost livelihoods	Monitor water quality; use native species; strong cage materials	Food insecurity, overfishing, low income in lake communities	FAO Aquaculture
Lined Rainwater Pits (Birkads)	Dug or concrete-lined rain catchment reservoirs with fencing or roof covering	Shade cover reduces evaporation; basic filtration; used in pastoral settings	Lack of surface water, livestock needs, climate-induced variability	Oxfam Rainwater Harvesting for Emergency Water Supply

Figure 2: Components of domestic roof water catchment

Domestic rainwater harvesting can be simple, low technology water collection from traditional roof catchments (such as a thatched roof) collected with any available water containers. Or a properly constructed roof catchment with gutters, down pipes and water collection tanks.



Source: Oxfam's Rainwater Harvesting Guidelines, adapted from Warwick University's School of Engineering, Domestic Rainwater Harvesting research programme

5 Budget Considerations

Budget estimates in this section are intended to guide planning for communities of 2,000–5,000 people. The figures are scalable for larger populations and adaptable to different geographic and economic contexts (such as, rural, urban, or camp settings).

Costs are divided into internal (local/community-driven) and external (requiring NGO, government, or donor support).

5.1 Internal Costs:

These are estimated costs typically managed by the community or covered through local contributions:

Table 5: Internal costs

Category	Description	Estimated Range (USD)
Community Mobilisation	Meetings, workshops, materials, translation, and outreach	$500 – $1,500
Local Labour	Construction support, trenching, transport of materials	$2,000 – $5,000
In-Kind Contributions	Locally sourced materials (sand, bamboo, gravel), land, and tools	Variable
Community Training	Basic training in O&M, hygiene, and governance	$1,000 – $2,500
Operation & Maintenance (Annual)	Spare parts, minor repairs, local technician fees	$1,000 – $2,000

Note: Internal contributions often represent 10-25% of total project costs and help strengthen ownership and sustainability.

5.2 External Costs:

These costs typically require external funding through NGOs, governments, or donors:

Table 6: External Costs

Category	Description	Estimated Range (USD)
Technical Design	Engineering assessments, hydrological studies, technical drawings	$2,000 – $7,000
Infrastructure	Construction of systems (such as sand dams, rainwater harvesting, greywater systems)	$10,000 – $50,000+
Advanced Equipment	Solar pumps, smart water sensors, filtration units	$5,000 – $20,000
Capacity Building	Trainer fees, manuals, tools, long-term support	$3,000 – $8,000
Monitoring & Evaluation	Baseline studies, mobile monitoring tools, impact reviews	$2,000 – $5,000
Contingency Funds	Unforeseen delays, price inflation, supply shortages	~10% of total budget

Notes:

- Costs vary widely depending on geography, accessibility, technology level, and local market conditions.
- Budget planning should include sensitivity analysis for inflation and supply chain disruptions.
- Consider multi-source financing: user fees, community grants, local government co-financing, and climate adaptation funds.

6 Risks and Mitigation Strategies

Effective risk management is essential to ensure the successful implementation and sustainability of IWRM solutions. The following table outlines key risks commonly encountered in community-led water projects, along with corresponding mitigation strategies.

Table 7: Common Risks in Community-Led IWRM Projects and Corresponding Mitigation Strategies

Risk Category	Risk Description	Mitigation Strategy
Technical Risks	System failure due to poor design, low-quality materials, or lack of skilled labour	Engage qualified engineers in design; conduct quality checks; provide hands-on technical training to local caretakers
Environmental Risks	Flooding, drought, or environmental degradation affecting infrastructure	Site selection based on climate risk mapping; integrate resilient infrastructure (such as, elevated platforms and sand dams)
Financial Risks	Delays in funding or inability to maintain O&M due to lack of funds	Establish diverse financing streams (user fees, community funds, local government support); include contingency budget

Risk Category	Risk Description	Mitigation Strategy
Social Risks	Exclusion of marginalised groups, gender imbalance, or community disputes	Use Gender Equality and Social Inclusion tools (see Annexe 3); ensure diverse representation in decision-making; facilitate inclusive consultations and grievance tools
Governance & Institutional Risks	Weak local leadership, unclear responsibilities, or lack of policy support	Formalise roles via MOUs; build governance capacity; link with local water authorities or Ministries
Supply Chain Disruptions	Shortages or delays in acquiring materials or spare parts	Pre-identify suppliers; stock essential parts locally; develop partnerships with local vendors
Knowledge Gaps & Literacy	Limited understanding of technical maintenance, budgeting, or monitoring	Develop illustrated training manuals; use peer-to-peer learning; conduct regular refreshers
Monitoring & Data Challenges	Inconsistent data collection or use of monitoring tools	Train local monitors; use simplified tools; cross-check data through community review forums
Behavioural/ Adoption Risks	Resistance to new technologies or changes in water practices	Engage users early in solution selection; pilot interventions; integrate traditional practices into modern systems

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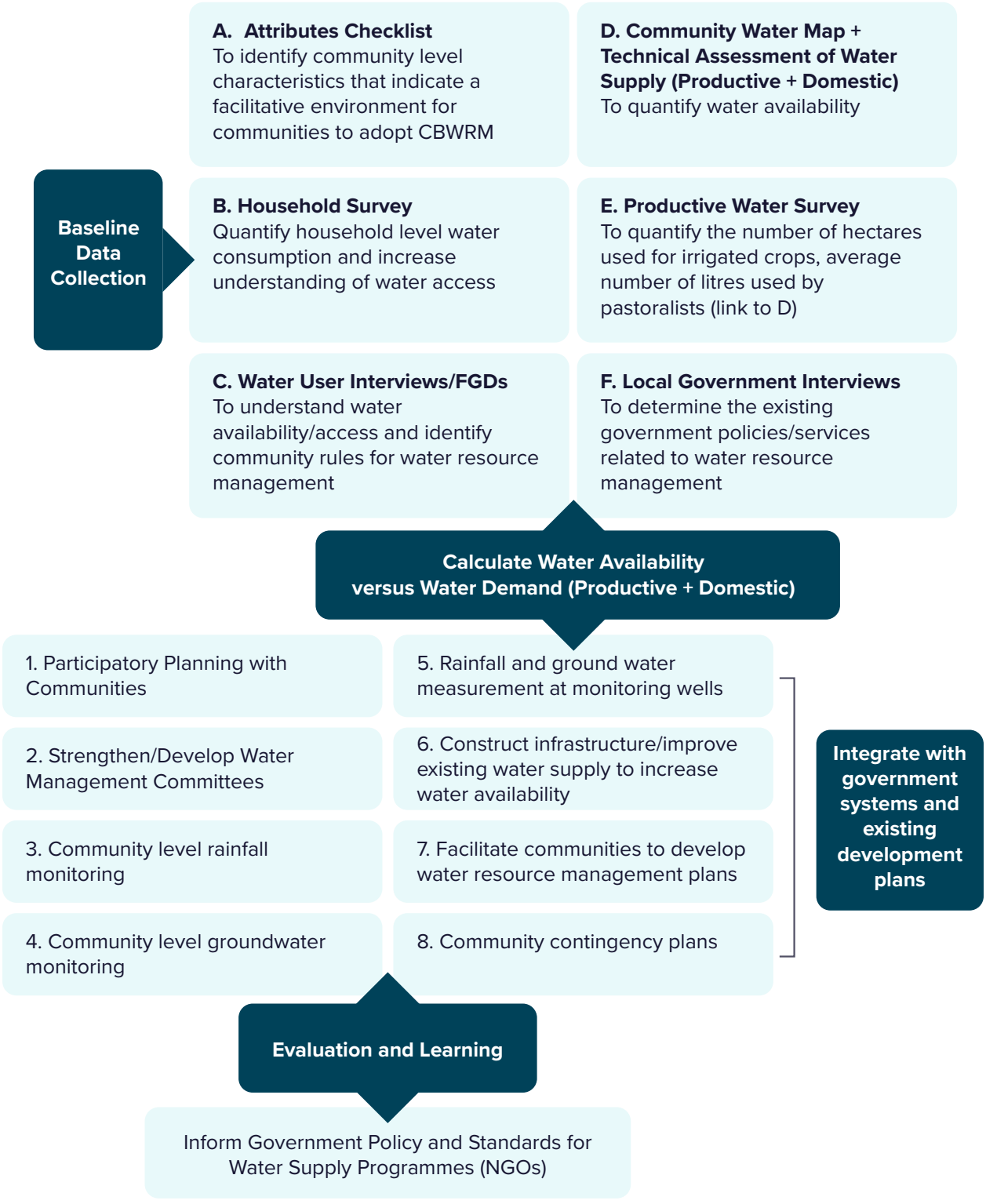
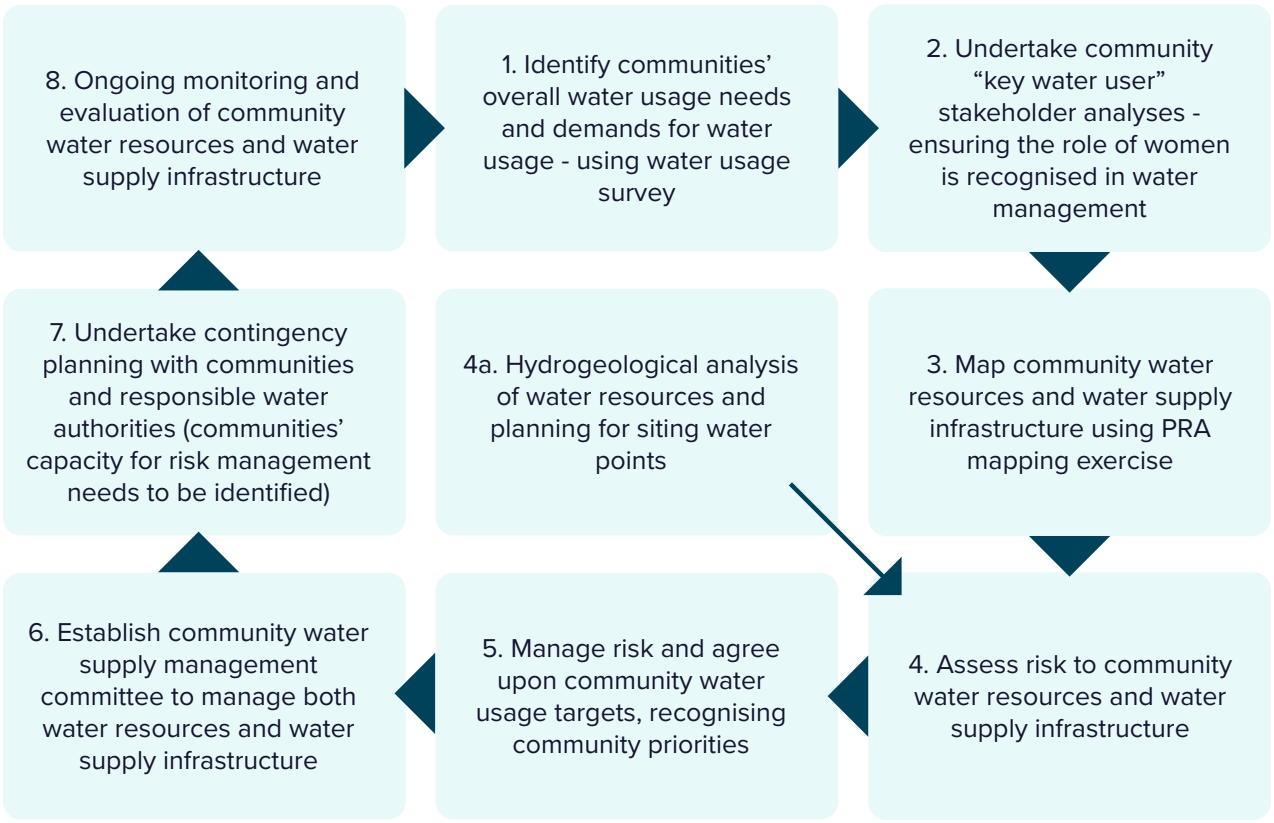
Annexe 1: Flow chart illustrating the key elements of Community-Based Water Resource Management (CBWRM)



Annexe 2: Programmatic Steps within the CBWRM model

Many of these programme steps can be incorporated into existing field assessments such as participatory capacity and vulnerability assessment (PCVA) and community-based disaster risk management or implemented where water resources emerge as a priority in other risk analyses processes. As with PCVA, the approach should be repeated as appropriate (e.g. annually or seasonally, if there is high variability between dry and rainy seasons).



Annexe 3: Tools for Community-Based WRM Implementation

This annexe presents practical tools linked to each phase of the Community-Based Water Resources Management (CBWRM) framework. These tools support inclusive, effective, and context-appropriate implementation across rural, urban, and humanitarian settings.

Assessment and Mobilisation

Tools	Purpose	Applicability
Participatory mapping tools	Create visual maps of water sources, infrastructure, and risks	Rural: hand-drawn maps on paper or soil Urban/Humanitarian: GIS for precise mapping
Stakeholder analysis matrix	Identify and prioritise stakeholders to ensure inclusivity	All contexts: ensures representation of women, youth, and marginalised groups
Water quality testing kits	Assess water safety (e.g., pH, contaminants)	Rural/Urban: community-led testing Humanitarian: rapid assessments in camps
Community forums	Facilitate open dialogue on water challenges and priorities	All contexts: town halls in rural areas, digital platforms in urban settings
Mobile Apps (e.g., Kobo Toolbox)	Collect and organise data in real-time from community workshops	Urban/Humanitarian: tech-enabled collection; less common in rural low-tech areas

Tools	Purpose	Applicability
Transect walk checklists	Document sources, infrastructure, and risks during walks	Rural: paper checklists Humanitarian: used for rapid field assessments
GESI frameworks	Analyse gender and social dynamics for equitable participation	All contexts: ensures representation of marginalised groups like women and refugees

Planning and Design

Tools	Purpose	Applicability
Logical framework analysis (LFA)	Structure planning with goals, outputs, activities, and indicators	All contexts: aligns grassroots plans with policy/technical frameworks
Community scorecards	Rank and prioritise needs and solutions	Rural: Paper-based Urban/ Humanitarian: digital for fast analysis
Hydrological modelling software	Design climate-resilient infrastructure	Urban/Humanitarian: used with NGO support Rural: simplified tools for small systems
Policy checklists	Align plans with national/ international water frameworks	All contexts: links with national plans, SDGs, water policy

Implementation

Tools	Purpose	Applicability
Community contracts	Formalise agreements on labour and resource contributions	Rural: Localised agreements Urban/Humanitarian: contracts with NGOs or authorities
Training manuals	Guide maintenance and financial management	All contexts: adapted to local literacy and technical capacity
Project management software	Track implementation progress and stakeholder coordination	Urban/Humanitarian: Trello or Asana Rural: paper-based tracking
Multi-stakeholder MOUs	Define NGO-government-community roles	All contexts: ensures role clarity in complex settings
Implementation checklists	Track step-by-step construction activities	All contexts: useful in both paper and digital formats
Work schedules	Organise timelines for construction and maintenance	All contexts: community-developed and seasonally adaptable

Monitoring and Feedback

Tools	Purpose	Applicability
Water point monitoring apps	Collect real-time data on system performance	Urban/Humanitarian: digital tools (e.g., mWater) Rural: with NGO support
Participatory evaluation workshops	Gather and discuss community feedback	All contexts: validates monitoring data and builds consensus

Tools	Purpose	Applicability
Feedback dashboards	Share monitoring results with the public	Urban/Humanitarian: digital Rural: physical boards or posters
Monitoring templates	Standardise data collection on water quality and usage	All contexts: tailored to literacy and technology access
Community review guides	Structure inclusive meetings to review data and plan responses	All contexts: supports accountability and shared decisions

Adaptation and Scaling

Tools	Purpose	Applicability
Case study templates	Document and share successes for learning or replication	All contexts: useful for community-to-community knowledge exchange
Knowledge-sharing platforms	Disseminate lessons through workshops, media, or digital networks	Urban/Humanitarian: online Rural: workshops, local radio
Cost-benefit analysis tools	Support justification for investment and replication	All contexts: strengthens funding proposals or scale-up plans
Community-led bylaws	Define governance and enforcement mechanisms	Rural: community governance Urban: adapted to formal management structures

Annexe 4: Alignment of Community-Based WRM with Sustainable Development Goals (SDGs)

This annexe outlines how the four-phase community-based IWRM process contributes to global development priorities, as defined under the United Nations Sustainable Development Goals (SDGs). While this framework is grounded in SDG 6: Clean Water and Sanitation, its cross-sectoral approach supports a range of other interconnected goals.

SDG	Goal Title	Relevance to IWRM	Example of Linkage
SDG 2: Zero Hunger	End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.	IWRM improves irrigation efficiency, secures water for agriculture, and supports sustainable farming practices.	Rainwater harvesting systems used to irrigate community gardens in drought-prone areas.
SDG 6: Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all.	Core focus of IWRM: community-led water governance, water quality improvement, equitable access, and climate-resilient water systems.	Community-managed sand dams providing year-round safe water in rural Kenya.
SDG 7: Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable, and modern energy.	Integration of clean energy solutions in water management, reducing fossil fuel dependence.	Solar-powered water pumps in refugee settlements reducing diesel use and operational costs.

SDG	Goal Title	Relevance to IWRM	Example of Linkage
SDG 12: Responsible Consumption and Production	Ensure sustainable consumption and production patterns.	Encourages efficient water use, recycling, reuse, and circular economy principles.	Greywater treatment systems enabling safe reuse for irrigation in urban gardens.
SDG 13: Climate Action	Take urgent action to combat climate change and its impacts.	Strengthens community resilience to climate impacts through adaptation measures.	Flood management infrastructure protecting households from seasonal monsoon damage.
SDG 15: Life on Land	Protect, restore, and promote sustainable use of terrestrial ecosystems.	Supports biodiversity and ecosystem health through sustainable water and land management.	Wetland restoration improving habitat for migratory birds and enhancing water filtration.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