

Approach Paper

Managing a Shared Resource: The World Bank Group’s Support for Water Resource Management

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1. Background and Context

Why Evaluate Water Resource Management?

1.1 Water is fundamental to nearly every dimension of development—food production, energy generation, public health, industrial output, and overall resilience (IPCC 2022; Smith 2022; United Nations 2024).¹ Yet water resources are under growing stress from population growth, economic expansion, climate change, and environmental mismanagement. How countries manage this finite resource will shape their capacity to sustain growth, achieve development priorities, and reduce poverty (Sadoff et al. 2015).

1.2 Water resource management (WRM), as applied in this evaluation, refers to the practical “system of systems” through which countries manage their water resources. These include hydrological systems (the water that exists and moves through rivers, aquifers, and basins), information systems (how countries measure, track, and project water availability), institutional systems (laws, policies, regulations, basin organizations, and coordination mechanisms),² and infrastructure systems (storage, conveyance, flow regulation, treatment, and nature-based solutions).³ Together, these systems determine how water availability is measured, how trade-offs among users are decided, and how water is augmented, allocated, and used across sectors.

1.3 Although WRM is closely linked to water services (such as water supply, sanitation, and irrigation service delivery) and to the broader concept of water security, it is conceptually distinct. Effective WRM governs the resource base—its stocks, flows, and variability—on which water services, agriculture, and ecosystems depend. In the World Bank Group’s water strategy, WRM plays a foundational role across all three strategic pillars: it supports Water for People by enabling reliable and equitable service provision, Water for Food by facilitating sustainable allocation and use in agriculture, and Water for Planet by maintaining environmental flows and protecting aquatic ecosystems. The Bank Group’s recently approved Water Strategy Implementation Plan (WSIP) translates this strategic framing into operational terms by organizing support around a set of scalable solutions that address service delivery, efficiency, risk reduction, and ecosystem protection, with detailed discussion provided later in the paper.

1.4 At the global level, progress in strengthening WRM is tracked through Sustainable Development Goal (SDG) target 6.5.1, which monitors countries' implementation of integrated approaches to WRM.⁴ Progress toward SDG 6.5.1 has been slow, and at current rates full achievement is expected only in 2049. This gap between global commitments and implementation in the field highlights the importance of understanding how the core systems that underpin WRM are being supported and strengthened in practice.

1.5 Strengthening WRM is central to achieving the Bank Group's mission of ending poverty on a livable planet. Water helps shape macroeconomic performance, social outcomes, and countries' capacity to manage climate-related shocks (UNESCO 2020). World Bank (2016) estimated that the economic effects of water scarcity,⁵ intensified by climate change, could reduce GDP growth by more than 6 percent by 2050 in some regions, deepening poverty and threatening stability. Yet it also found that in many regions these losses can be prevented, and even turned into gains, through better water allocation, pricing, and management policies that direct water to its most productive and equitable uses.

1.6 At the household and community level, the consequences of inadequate WRM are profound. Droughts and water shocks experienced in early childhood have long-term, and even intergenerational impacts, resulting in stunted growth, reduced schooling, and lower income well into adulthood (Damania et al. 2017; Hyland and Russ 2019). Recent evidence underscores the growing social and economic risks of water insecurity: water deficits are estimated to have accounted for about 10 percent of the rise in global migration between 1970 and 2000, while severe urban water shortages (situations in which cities are forced to restrict or suspend water supply because available water sources are exhausted) can reduce economic activity by up to 12 percent (Zaveri et al. 2021). Groundwater resources are being rapidly depleted (Jasechko et al. 2024), but they are critical for sustaining livelihoods and food security for millions (Re et al. 2022). These findings point to the ways in which WRM can influence development outcomes well beyond the water sector itself.

The Economics of Water Resource Management

1.7 WRM requires coordination among users who draw on a shared resource. When water is shared and access is difficult to control, individual decisions about use can impose costs on others, even if those decisions are privately rational (Garrick 2015). Without effective allocation rules and enforcement, the result is often overuse, degradation, and reduced collective welfare. At the same time, empirical evidence shows that users can, under certain conditions, self-organize to manage shared water resources sustainably. Ostrom (1990) shows that locally developed informal institutions

for collective resource management are more effective when they incorporate clearly defined boundaries, participatory decision-making, and graduated sanctions. When supported by appropriate management systems, water's renewable nature can allow sustainable use over time, but only where withdrawal, replenishment, and collective rules remain aligned (and where underlying hydrological conditions permit).

1.8 Water availability varies across space and time, shaping how water resources are planned, allocated, and managed. Availability changes with short-term weather patterns, seasonal cycles, and large-scale climate patterns such as the El Niño–Southern Oscillation,⁶ and is becoming more variable and uncertain due to climate change (Smith et al. 2019). Water resources also rarely align with administrative boundaries. As a result, WRM responsibilities are distributed across many institutions both horizontally (across sectors and agencies) and vertically (across national, regional, and local levels), and outcomes often depend on effective coordination at the basin or transboundary scale. The coherence of planning, allocation, and management therefore depends not only on aligning decisions across jurisdictions with hydrological realities but also on navigating political incentives, power asymmetries, and competing priorities among stakeholders.

1.9 These characteristics give rise to three interrelated challenges: achieving allocative efficiency, productive efficiency, and distributional equity. Together, these challenges determine how well societies transform a finite and variable resource into one that sustains economic growth and improves welfare. Allocative efficiency concerns how water flows to its highest-value uses across sectors and users.⁷ Productive efficiency concerns how efficiently water is used within each sector to minimize waste and maximize output per unit of water. Distributional equity concerns how access and benefits are shared across income groups, vulnerable populations, and generations. Because the value and usability of water depend not only on quantity but also on quality, these dimensions are closely linked to how water resources are managed and protected. Effective WRM therefore requires balancing allocation, use, and fairness in ways that are both socially equitable and environmentally sustainable.

1.10 Translating these economic principles into policy is a complex task because WRM typically pursues multiple objectives simultaneously. As a result, well-aligned institutions, incentives, and infrastructure investments are necessary for improved WRM outcomes. Improving allocative efficiency, productive efficiency, and distributional equity often involves trade-offs across sectors, locations, users, and time horizons. Economic theory has long emphasized that when governments pursue multiple policy objectives, they generally require multiple, well-matched policy instruments to address them effectively (Arrow 1958; Garrick and Hahn 2021). In the context of WRM, this implies that progress depends on combining complementary

measures, for example, coordinating regulatory reforms that clarify rights and responsibilities with pricing or incentive mechanisms that influence user behavior and infrastructure investments that expand or stabilize supply. Coherent bundles of institutions, incentives, and infrastructure are therefore essential for efficient, equitable, and sustainable outcomes.

The Global Challenge

1.11 Water risks, such as water stress and variability, are widespread and intensifying. Climate change is rapidly intensifying the water cycle; causing more extreme floods and droughts; worsening water scarcity (which affects more than half the world's population yearly); and threatening water quality, ecosystems, and food security (IPCC 2022). Growing water withdrawals and increasing seasonality of runoff has led to about 60 percent of the world's rivers running dry for at least part of the year (Messenger et al. 2021). The desiccation of river systems does not only constrain water availability. It also degrades water quality through processes such as seawater intrusion and reduces the capacity of aquatic ecosystems to provide essential environmental services (Thanh et al. 2023; Vörösmarty et al. 2010). Wetland loss is further eroding natural water regulation, with the loss since 1900 of 64 to 71 percent of global wetlands reducing storage, filtration, and flood-buffering services (Ramsar Convention Secretariat 2018). These pressures have cascading effects on food systems, cities, and ecosystems, increasing the vulnerability of livelihoods and the volatility of service delivery.

1.12 Reliability of supply depends critically on storage, both natural and built. Natural storage—including soil moisture, aquifers, wetlands, and glaciers—and built storage—such as dams and reservoirs—help smooth variability between wet and dry periods. While global freshwater demand has approximately doubled in the past 50 years, total storage has declined, increasing exposure to droughts and floods (World Bank 2023).

1.13 Groundwater plays a particularly important role, supplying close to half of all domestic and agricultural water use worldwide. However, groundwater reserves are being depleted faster than they are replenished, weakening a key buffer against water scarcity (De Graaf et al. 2014; Rodella et al. 2023). Growing evidence also shows that excessive groundwater pumping can reduce supply to rivers and streams, undermining environmental flows and the ecosystem functions they support (de Graaf et al. 2019). At the same time, land-use change (especially deforestation) is reducing the ability of landscapes to retain moisture and regulate local water cycles, further undermining water availability (Damania et al. 2025; GCEW 2024). Taken together, these trends point to a steady erosion of global freshwater reserves, with implications for long-term water reliability and resilience (Zhang et al. 2025).

1.14 A central challenge for WRM is aligning how water is used with how scarce it is. Despite growing water scarcity in many regions, there is little relationship between physical water stress and how intensively water is used across economies (Damania et al. 2017). Countries facing acute water scarcity are not typically those that use water most efficiently or allocate it to higher-value uses.

1.15 This disconnect reflects weaknesses in pricing, allocation, and enforcement mechanisms. Water is often treated as a low-cost or free input, with withdrawal and conveyance costs absorbed indirectly through energy or agricultural subsidies rather than paid by users (Damania et al. 2017). In many settings, withdrawal permits are weakly enforced, metering is incomplete, and tariffs fail to reflect even basic operating costs, let alone scarcity. As a result, water tends to flow toward low-value or politically favored users rather than to the sectors and regions where it could generate higher economic and social returns. Strengthening the alignment between the value of water and the price signals users face typically requires attention to issues of distribution, including affordability, competitiveness, and poverty reduction objectives. At the same time, the prevalence of informal water use and weak enforcement can significantly shape outcomes, as informal practices often operate alongside formal WRM systems. Addressing these challenges through coherent pricing, as well as regulatory and institutional reforms that recognize both formal and informal arrangements, is a core function of effective WRM systems (Garrick et al. 2023).

Role of the World Bank Group

1.16 The Bank Group supports countries in managing water resources by engaging with the four systems (paragraph 1.2) that shape how water is assessed, allocated, regulated, and sustained over time. This engagement serves multiple development objectives, including improving the reliability of water availability; enabling efficient and equitable allocation across users and sectors; supporting water-dependent economic activities; strengthening water services; sustaining ecosystems; and responding to water-related risks such as scarcity, floods, and droughts. In practice, the Bank Group engages through analytical and advisory services, policy dialogue and institutional support, investment financing for built and nature-based infrastructure, and convening stakeholders. These efforts are complemented by global and regional knowledge and financing platforms and trust-funded programs—such as the Global Water Security and Sanitation Partnership and the 2030 Water Resources Group—which support capacity building, policy dialogue, partner coordination, and the translation of analysis into reform and investment.

1.17 The Bank Group has articulated a new WSIP) that provides the operational road map for implementing the Bank Group’s Water Strategy across diverse countries. The

WSIP organizes Bank Group engagement with respect to seven scalable solutions designed to be adapted to client needs, institutional capacity, and creditworthiness. These solutions cover urban water and sanitation service optimization; bankable investments for water, wastewater, reuse, and desalination;⁸ rural water supply and sanitation; farmer-led sustainable irrigation and decentralized irrigation services; increased water and energy efficiency in centralized irrigation systems; reduction of flood and drought risk; and restoration and protection of rivers and aquifers. A central objective of this approach is to strengthen the pipeline of bankable water-related activities and to bring in private financing, including through closer engagement with the International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA), and other risk-mitigation and financing mechanisms.

1.18 Implementation of the WSIP is anchored in government-owned and government-led water compacts that define priorities, commitments, and pathways for reform and investment. Depending on the country, water compacts may specify overall ambition and targets for financing mobilization. They may also describe policy and regulatory actions intended to improve operational or financial performance and to align development partners. The use of the Multiphase Programmatic Approach allows reforms, investments, and learning to be sequenced over time, supporting more sustained and adaptable progress toward sector modernization and improved use of natural and financial resources.

1.19 While the scalable solutions identified by the WSIP emphasize services, infrastructure, efficiency, and risk reduction, the articulation of WRM institutions within WSIP is high level. Core WRM functions—such as water allocation, regulation, monitoring, and enforcement across users and sectors—are not articulated as distinct intervention areas and instead may be carried out through water compacts and associated policy actions. The WSIP indicates that the Bank Group will focus scalable solutions in countries with strong foundations that are articulated in compacts. For other countries, supporting institutions to put those core WRM functions in place will be the priority, before implementing scalable solutions. This recasts some aspects of WRM as necessary foundations for successful implementation of scalable solutions, making the topic of WRM relevant not only to the success of the overall strategy but also the medium-term rollout of the WSIP itself.

Previous Independent Evaluation Group Evaluations

1.20 Over the past decade, the Independent Evaluation Group (IEG) has evaluated several water-related areas but has not examined WRM as an integrated, cross-sectoral system. Recent evaluations have focused on downstream water services (water supply and sanitation, irrigation service delivery), specific risk domains (disaster risk

reduction), or related resource and environmental challenges (pollution management, natural resource degradation, urban resilience). Together, these evaluations documented both important achievements and persistent weaknesses in governance, pricing, coordination, hydrological analysis, and sustainability. They repeatedly noted that outcomes in services, agriculture, ecosystems, and resilience depend critically on how water resources are governed and allocated.

1.21 This evaluation builds on recent IEG work without duplicating areas that have already been assessed, such as disaster risk management and water services. It complements IEG's evaluation of disaster risk reduction by examining how countries manage water resources under longer-term scarcity, competing demands, and increasing hydrological variability, without duplicating efforts already covered such as preparedness and response to extreme events. Against this background, the evaluation will also focus on how WRM institutions are incorporated into implementation frameworks such as the WSIP, and how they interact with investment and service-focused interventions to shape the coherence of Bank Group support.⁹ The present evaluation is therefore part of a broader, ongoing program of IEG work on water and related sectors. The underlying theory of change and evidence gap analysis informing this sequencing is presented in appendix A.

2. Objectives and Intended Users of the Evaluation

2.1 The objective of this evaluation is to assess how well the Bank Group has supported client countries in managing water resources under rising pressures from climate change, population growth, and competing sectoral demands. The evaluation will generate evidence and lessons on the relevance, sustainable design,¹⁰ effectiveness, and coherence of the Bank Group's approach to WRM and identify factors that have enabled or constrained results. Its findings will inform the implementation of the forthcoming Bank Group water strategy and WSIP, as well as the Global Challenge Program on water security, all of which seek to elevate WRM as a foundation of resilience, green growth, and inclusion.

2.2 The primary intended users of the evaluation are Bank Group key decision makers. This includes the Board of Executive Directors and, in particular, the Committee on Development Effectiveness, which provides strategic oversight of IEG evaluations and advises the Board on institutional priorities. Key decision makers also include Bank Group management and operational teams responsible for implementing the new strategy and global challenge programs. Within World Bank management, the key audiences include the Water, Environment, Agriculture and Food, and Urban, Disaster Risk Management, Resilience, and Land Global Departments as well as relevant IFC and MIGA agriculture and industry departments engaged in water-related operations. The

evaluation will also inform Country Management Units and regional vice presidencies, which are integrating water security more explicitly into Country Partnership Frameworks and climate diagnostics.

2.3 Secondary users include client governments, development partners, and academic and policy research institutions engaged in water governance, climate adaptation, and natural resource management. Since no previous evaluation by IEG has focused on WRM in its entirety, the evaluation will be an important contribution to the global evidence base on how development institutions can more effectively support countries in managing water as a shared, finite, and climate-sensitive resource.

3. Conceptual Framework

A System of Systems

3.1 WRM lies at the heart of several interconnected development challenges. Increasing water risks from scarcity and variability, misallocation of water across sectors, overextraction and inefficient water use, and degrading water quality increasingly occur in the same basins. Pressures from one challenge exacerbate others—these pressures are driven by population growth; urbanization; climate change; rising demand from agriculture, cities, and industry; and increasing recognition of the importance of ecosystem services. Managing these pressures requires coordinated action across the systems that determine how water is governed, measured, and managed. The conceptual framework for this evaluation therefore views WRM as a system of systems: a set of interdependent hydrological, institutional, information, and infrastructure systems that must operate coherently to sustain the availability, reliability, equity, and quality of water resources. When these systems fail to interact effectively, water challenges reinforce one another, undermining growth and resilience.

Types of Interventions

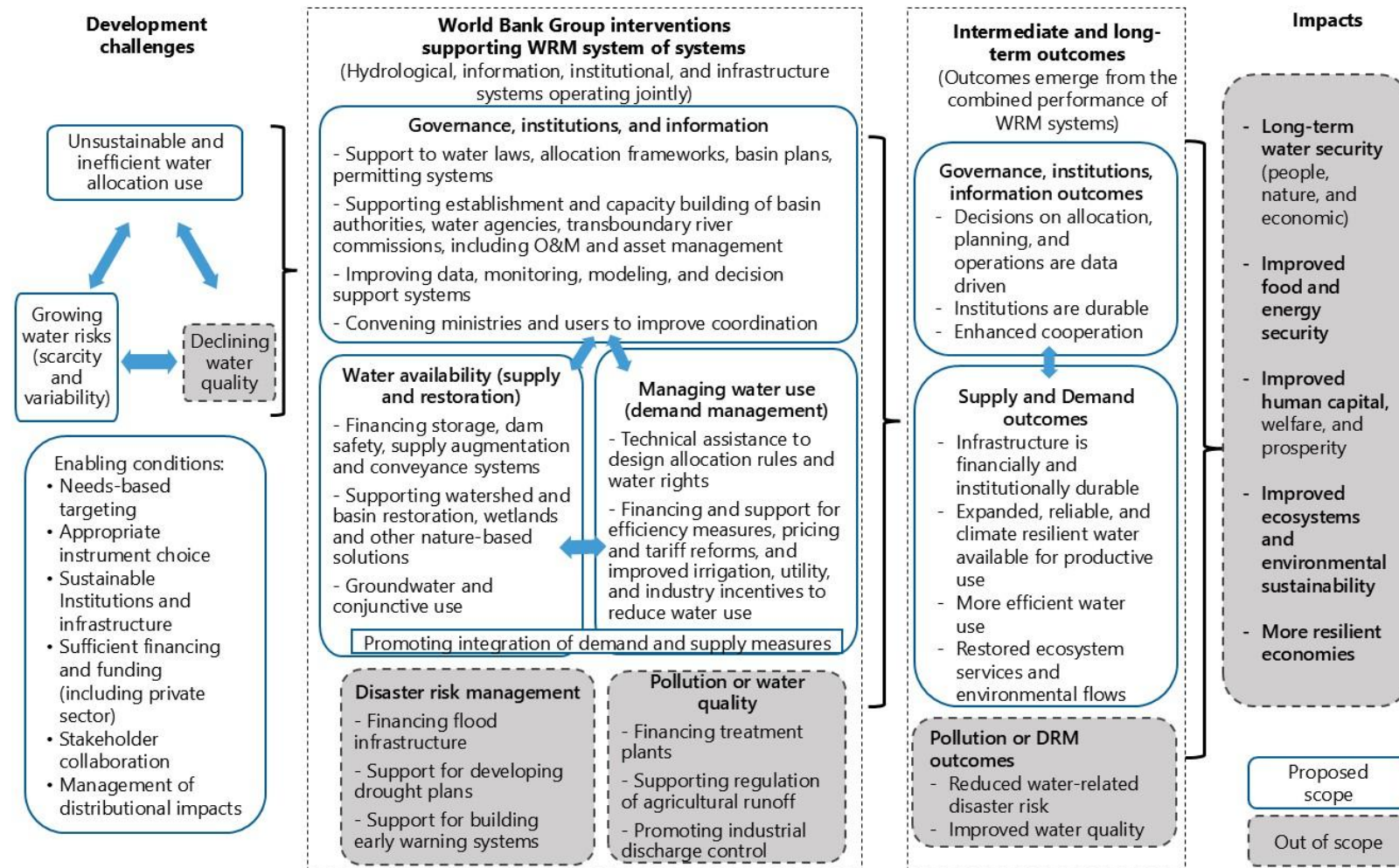
3.2 The Bank Group supports WRM through five broad types of interventions (figure 3.1). The first is governance, institutions, and information, which includes establishing the policy, legal, and regulatory frameworks that define water rights and responsibilities. These interventions involve building the capacity of local groups and authorities at the basin and national levels, and investing in data, monitoring, and analytical systems that inform allocation and planning. The second is managing water availability, which involves investments and reforms that affect the quantity, timing, reliability, and quality of supply, including surface and groundwater management, storage and conveyance infrastructure, watershed restoration, water quality interventions, and nature-based solutions. In addition to influencing supply, these

interventions can shape water quality outcomes—such as sediment transport, oxygen availability, and thermal regimes—which often arise from infrastructure design and operation rather than from pollution sources alone. The third is managing water use and demand, which encompasses improving efficiency and productivity in agriculture, cities, and industry through technologies, incentives, and behavioral change. The fourth and fifth intervention types address disaster risk management, which reduces flood and drought damage, and pollution control, which protects water quality and ecosystem health.

3.3 These intervention areas are inherently interconnected institutionally, biophysically, and financially. Governance and information systems guide the development of storage and supply, while decisions on availability shape the incentives and constraints governing water use. Improvements in efficiency can extend water supply but may also lead to rebound effects if allocation rules and enforcement are weak (Grafton et al. 2018). Data from monitoring networks inform operations and investment planning, and institutional coordination determines whether infrastructure and demand-side measures complement or conflict with each other.

3.4 In practice, different WRM systems are often complementary, and reaping the full benefits of WRM requires coordinated development across multiple domains. Thus, while figure 3.1 categorizes immediate and long-term outcomes by domain, many of these outcomes are dependent on multiple intervention types working together. For instance, better water governance can lead to improvements in allocative efficiency, bolstering water availability, water use efficiency, and ecosystem flows. Water and climate information systems are inextricably linked to water supply and demand modeling. And watershed restoration can improve water availability, ecosystem services, and water quality. Effective WRM is just one contributor to long-term impacts such as water security, human capital, environmental sustainability, and the development of resilient economies. Well-managed WRM is often a necessary but insufficient condition for achieving these goals.

Figure 3.1. Conceptual Framework



Source: Independent Evaluation Group.

Note: This evaluation conceptualizes WRM as a “system of systems,” in which hydrological, information, institutional, and infrastructure systems interact. Hydrological systems shape risks and constraints, while World Bank Group–supported interventions focus on strengthening information, institutional, and infrastructure systems. Weaknesses in any one system can undermine overall performance, even when other systems are strengthened. WRM = water resource management; DRM = disaster risk management; O&M = operation and maintenance.

3.5 This evaluation focuses on the first three types of interventions (shaded blue in figure 3.1): those that determine how water is governed, stored, allocated, and used. These align with widely recognized foundational elements of WRM reflected in SDG 6.5.1 and in the forthcoming Bank Group water strategy. The evaluation is aligned with the three key objectives of the strategy: Water for Planet, which aims to reduce water-related risks and sustainably manage water; Water for People, which aims to accelerate universal access to water, sanitation, and hygiene; and Water for Food, which aims to enhance food production and smallholder livelihoods. Achieving these three goals will require better water governance to manage, allocate, and efficiently use water. Disaster risk management and pollution control are also closely linked but fall outside the scope of this evaluation. Disaster risk management was covered in the recent IEG evaluation *Reducing Disaster Risks from Natural Hazards* (World Bank 2022). Pollution is planned for a future evaluation in the current IEG work program. As such, these topics will be referenced only where directly relevant to understanding the performance of the WRM systems that fall within the scope of this evaluation. Section 4 covers issues of scope in more detail.

Enabling Conditions

3.6 The conceptual framework relies on several enabling conditions which determine how WRM systems interact and how Bank Group support contributes to their effective functioning. These factors describe the conditions under which interventions in institutions, information, and infrastructure can generate sustained improvements in water allocation, efficiency, and sustainability.

- **Needs-based targeting:** Bank Group interventions are prioritized in basins, regions, or sectors where water-related risks and inefficiencies are most severe.
- **Appropriate instrument choice:** Financial, analytical, and policy instruments are selected and sequenced to address specific WRM challenges, with coordination across lending operations, advisory services, and partner-supported activities.
- **Institutional and infrastructure sustainability:** Governance and infrastructure systems are designed and maintained to remain functional beyond project cycles, with clear responsibilities, capacity, and mechanisms for operation and maintenance.
- **Sufficient financing and funding:** Adequate and predictable financial resources are available for both capital investments and ongoing operation, drawing from sources including domestic budgets, user fees, and private participation where appropriate.

- **Stakeholder collaboration:** Cooperation among user groups, sectors, and countries is sustained through inclusive planning, shared data, and credible coordination mechanisms that enable collective management of shared resources.
- **Management of distributional impacts and trade-offs:** The effects of WRM interventions on different user groups, and in particular vulnerable populations, are anticipated and managed to help balance efficiency objectives that consider affordability, access, and equity.

3.7 The effectiveness of WRM systems depends on both client actions and factors which the Bank Group can influence. These conditions—particularly those related to institutional sustainability and financing—shape how WRM operations are designed and what can reasonably be achieved. Because the Bank Group operates within a demand-driven model, many of these conditions depend on client government actions and lie partly outside the Bank Group’s direct control. Understanding where these conditions hold (and where they do not) clarifies the extent to which observed outcomes reflect country context, client commitment, or factors within the Bank Group’s influence. This framing will guide how the evaluation interprets variation in performance across countries and contexts. The next section builds on this conceptual foundation to define the evaluation scope and questions, which set out how the study will assess the relevance, sustainability of design, effectiveness, and coherence of Bank Group support for WRM.

4. Evaluation Scope and Questions

Evaluation Scope

4.1 This evaluation is the first in a planned two-part series on the Bank Group’s support for WRM. This first evaluation (WRM 1) will focus on the Bank Group’s interventions in the core areas of WRM: governance, institutions, information, and supply- and demand-side management (figure 3.1). Together, these domains represent foundational systems that determine how countries and basins measure, allocate, and use water resources. The evaluation will examine how the Bank Group has supported client countries in strengthening these systems through lending, nonlending, and analytical services, including its role in convening partners and facilitating coordination among national and local institutions responsible for WRM.

4.2 The evaluation scope will reflect the WRM portfolio and cover Bank Group lending and nonlending activities over the past decade. The portfolio is strongly dominated by the World Bank (736 in-scope projects), and includes comparatively

limited IFC (14 investment services and 45 advisory services) and MIGA engagements (2 guarantees; see appendix C).¹¹ For the World Bank, the portfolio will include activities that were active at any point during FY16–25 and approved after FY10. This helps ensure the evaluation will capture results and lessons from projects which are often inherently medium- and long-term endeavors. Despite the small IFC and MIGA portfolios, there is interest in scaling up private sector involvement and a One Bank Group approach in WRM across the institutions. The evaluation will therefore include IFC and MIGA operations (approved between FY16 and FY25) with a focus on drawing forward-looking lessons. The evaluation will also seek opportunities and broader lessons for including the private sector engagement and external collaboration are incorporated into Bank Group interventions, including how the Bank Group uses its convening role to align public, private, and development partners.

4.3 Other elements of WRM that are central to the Bank Group’s engagement but are outside the scope of this first evaluation are expected to be taken up in a potential second evaluation (WRM 2). While the scope of WRM 2 will be informed by the findings of WRM 1, WRM 2 plans to focus on transboundary water management,¹² as well as on water quality, pollution management, and river basin restoration, given their shared focus on ecosystem condition and water quality outcomes. Disaster risk management (particularly preparedness and response to extreme events) is excluded from both phases because it was recently evaluated by the Independent Evaluation Group (2022), although the evaluation will include interventions to address climate and hydrological variability. Two cluster evaluations on river basin restoration and transboundary water management may be carried out to provide lessons that can then feed into WRM 2. This possibility is subject to confirmation in future work program discussions.

4.4 Certain additional boundaries are also set to maintain analytical clarity and ensure a feasible portfolio scope and coverage. The evaluation will not assess water services, such as water supply and sanitation or irrigation, except where they are explicitly linked to WRM objectives (for example, groundwater regulation for urban utilities). Nor will it assess the indirect water impacts of non-WRM operations (for example, energy or transport projects) except in cases where they include explicit WRM components, such as demand management in irrigated agriculture or urban utilities. Together, these boundaries define a focused scope that captures the Bank Group’s direct contribution to how countries govern, allocate, and use water resources while avoiding duplication with other IEG evaluations.

Evaluation Questions

4.5 The evaluation asks the overarching question: How well does the Bank Group’s engagement help client countries strengthen WRM? The evaluation is structured on the

systems and interventions described in the conceptual framework (figure 3.1). The evaluation questions (EQs) follow directly from that framework, examining whether Bank Group support is well targeted; designed sustainably; and effective in strengthening the institutional, informational, and infrastructural systems that underpin WRM. They also address whether engagements exhibit both internal coherence across the Bank Group and external coherence, including the Bank Group's convening role in working with development partners. The EQs are listed here, with more details given in appendix B.

- **EQ1 (relevance and sustainable design): To what extent are the Bank Group–supported WRM interventions relevant to client countries' water resource challenges and designed to be financially and institutionally sustainable?**
 - **EQ1.1 (targeting):** To what extent are hydrological and socioeconomic conditions, SDG 6.5 targets, water risks, and key diagnostics informing the targeting of the Bank Group–supported WRM interventions?
 - **EQ1.2. (sustainable design):** To what extent are Bank Group interventions designed for long-term financial and institutional sustainability?
- **EQ2. (effectiveness): To what extent have World Bank–supported interventions been effective in supporting countries to improve WRM?**
 - **EQ2.1 (effectiveness of interventions):** To what extent have World Bank–supported interventions strengthened WRM systems at the national and basin level?
 - **EQ2.2 (complementarity):** To what extent have World Bank interventions promoted complementarity between supply- and demand-side measures within the same countries or basins?
- **EQ3 (coherence): To what extent has Bank Group support to WRM been internally and externally coherent in integrating private sector actors and in using its convening power to bring partners together?**
 - **EQ3.1 (engaging the private sector):** To what extent are efforts to engage the private sector in WRM internally coherent, and what enabling conditions support private sector integration?
 - **EQ3.2 (convening partnerships):** To what extent has the Bank Group successfully convened and collaborated with development partners and other actors on WRM?

4.6 EQ1 (relevance and sustainable design) will examine how well the Bank Group’s support for WRM aligns with client countries’ water resource challenges, and whether interventions are designed for long-term sustainability. The evaluation will assess the extent to which hydrological and socioeconomic conditions (for example, baseline water stress and water productivity), national development priorities, and international commitments such as SDG 6.5.1 have informed the selection and design of interventions across the core WRM domains of governance, institutions, information systems, supply augmentation, and demand-side management. The analysis will consider whether WRM operations are concentrated in countries and basins facing the most acute risks of high scarcity and low productivity. It will also examine whether the choice of instruments and entry points articulated in the Bank Group’s plans—and implemented under supported programs—reflects sound diagnostics.

4.7 EQ1 will also examine whether project designs incorporate credible provisions for financial and institutional sustainability. That is, are WRM institutions and infrastructure likely to remain functional well beyond the project period? This includes design elements including clear operational mandates, recurrent funding arrangements for operation and maintenance, and durable coordination mechanisms. The emphasis on design reflects both the Bank Group’s greater influence on design choices and the reality that many WRM engagements are relatively young, making sustainability outcomes difficult to assess directly.

4.8 EQ2 (effectiveness) will assess the results achieved through World Bank support to the core domains of WRM. The evaluation will examine the extent to which interventions in governance, institutions, and information systems have strengthened water allocation, planning, and coordination at national and basin levels. It will also consider whether supply augmentation and demand-side measures have increased the availability and reliability of water, increased allocative and productive efficiency of water use, or achieved stated policy objectives where explicit trade-offs are present and acknowledged. The analysis will evaluate whether supply augmentation measures—such as storage, conveyance, watershed management, and groundwater recharge—and demand-side management interventions in agriculture, cities, and industry have increased the availability and reliability of water resources and improved the efficiency of water use. The evaluation will consider whether these interventions, when implemented together, have produced complementary outcomes across supply- and demand-side measures.

4.9 EQ3 (coherence) will provide lessons on how the Bank Group’s support for WRM has worked in practice across internal and external partners. This question focuses on understanding the processes, conditions, and institutional arrangements that have facilitated or hindered collaboration. Internally, the evaluation will examine how Bank

Group teams have coordinated across the World Bank, IFC, and MIGA, and how private sector actors have been incorporated into WRM interventions, whether through joint initiatives or through stand-alone World Bank operations. Given the limited number of joint Bank Group operations to date, instead of focusing on measurable joint outcomes this analysis will examine institutional coherence, considering collaboration processes, division of roles, and conditions that enable future One World Bank Group engagement under the Bank Group WSIP. Externally, the evaluation will provide lessons on how the Bank Group uses its convening power to collaborate with development partners, trust-funded initiatives, and other actors in the water sector. Collectively, these insights will help inform how future WRM support can be organized more coherently across institutions and stakeholders.

5. Evaluation Design

5.1 The evaluation will adopt a mixed methods design, combining quantitative and qualitative data (table 5.1). Triangulation of evidence from various data sources and methods will strengthen validity and credibility of findings. This approach will allow for an assessment of relevance, effectiveness, sustainability, and coherence of Bank Group support for WRM. Details of the proposed methods can be found in appendix B. The methodological blocks are shown in table 5.1.

Table 5.1. Evaluation Methodology Summary

Evaluation Questions	Portfolio Review and Analysis	Content Analysis	Literature Review	Geospatial Analysis	Case-based Analysis	Stakeholder Interviews
EQ1- Relevance and Sustainable Design						
EQ1.1- Targeting Use of hydrological, socioeconomic, and diagnostic evidence in targeting WRM interventions	x	x	x	x	x	x
EQ1.2- Sustainable Design Financial and institutional sustainability of WRM intervention design	x	x	x		x	x
EQ2- Effectiveness						
EQ2.1- Effectiveness of Interventions Effectiveness in strengthening water allocation, governance, information, and supply- and demand-side management	x	x	x		x	x

Evaluation Questions	Portfolio Review and Analysis	Content Analysis	Literature Review	Geospatial Analysis	Case-based Analysis	Stakeholder Interviews
EQ2.2- Complementarity Complementarity between supply- and demand-side measures	x	x	x		x	x
EQ 3- Coherence						
EQ3.1- Private Sector Integration Internal coherence and enabling conditions for private sector integration	x	x	x		x	x
EQ3.2- Building Partnerships Extent of World Bank Group efforts to convene and collaborate with development partners	x	x	x		x	x

Source: Independent Evaluation Group.

Note: WRM = water resource management; EQ = evaluation question.

- Portfolio review and analysis (PRA):** The PRA will serve as the backbone of the evaluation by systematically coding project documents (such as Project Appraisal Documents, Implementation Completion and Results Reports, Implementation Completion and Results Report Reviews, and Project Performance Assessment Reports) and diagnostic materials (including Country Partnership Frameworks, Systematic Country Diagnostics, Country Climate and Development Reports, and sector assessments) using a taxonomy based on academic and gray literature to identify and categorize the interventions.¹³ For EQ1, the PRA will assess whether hydrological, socioeconomic, and institutional diagnostics—as well as SDG 6.5.1 assessments—appropriately informed project targeting and design, as well as whether interventions aligned with national WRM priorities and incorporated sustainability measures such as recurrent financing, clear institutional mandates, and cost-recovery mechanisms. For EQ2, the PRA will code the entire in-scope WRM portfolio to examine the effectiveness of governance reforms, institutional coordination, information systems, and supply- and demand-side measures, private sector integration and external partnerships. It will link interventions to documented results using achievement of outcome indicators, enabling identification of portfolio-wide patterns that speak to what has worked well, what has not, and where deeper investigation is needed. Where relevant, the PRA will also review applicable Bank Group Corporate Scorecard indicators and Results Narratives to assess the extent to which existing corporate metrics capture key WRM system-level and institutional outcomes. The analysis will also apply a comparison of intervention

bundles across the portfolio to identify factors associated with stronger outcomes. For EQ3, the PRA will review Bank Group operations to assess how private sector integration and internal and external collaboration with development partners have been incorporated into WRM engagements. The PRA will provide portfolio-wide patterns and lessons on what enabled or constrained coherent collaboration.

- **Content analysis:** Content analysis will examine how Bank Group analytical and diagnostic work has shaped the design and targeting of WRM interventions. For EQ1, this includes reviewing project documents and upstream analytics such as water security assessments and Country Climate and Development Reports, as well as related advisory services and analytics and diagnostic work to determine whether key insights were incorporated into intervention logic and sustainability design. For EQ2, content analysis of project documents will assess whether project designs, result chains, and implementation arrangements reflect good practice for effective WRM—including appropriate integration of technical, institutional, and behavioral elements—and whether interventions within the same country or basin were intentionally linked or coordinated. This method will help assess the internal and external coherence and technical robustness of WRM operations across the portfolio.
- **Geospatial analysis:** This analysis will complement other methods to assess whether Bank Group interventions have targeted the areas experiencing the greatest hydrological stress, vulnerability, or water-related risks. Where project geolocations exist, they will be overlaid with national and global datasets—such as AQUASTAT, the World Resource Institute’s Aqueduct Water Risk Atlas, and the Notre Dame Global Adaptation Initiative’s Water Vulnerability Index—to determine whether interventions were placed in high-need areas. This method supports EQ1 by examining spatial alignment between project locations and water challenges and complements case studies and PRA findings by providing objective evidence on geographic targeting. Geospatial analysis offers the most systematic and replicable way to assess spatial alignment. Although targeting will also be assessed through project documents, analytical work, and national-level indicators, these alternatives either rely on self-reported information or lack the spatial resolution needed to evaluate basin-level needs.
- **Structured literature review:** The evaluation will incorporate a structured literature review to situate the Bank Group engagement within global evidence and good practice on WRM. The review will draw on systematic reviews as well as academic publications, practitioner reports (from, for example, the International Water Management Institute, the International Water Resources

Association, the Organisation for Economic Co-operation and Development, the Global Water Partnership, and the Consortium of International Agricultural Research Centers), and relevant gray literature identified through targeted searches (for example, Google Scholar, Web of Science) using keywords aligned with the EQs. The review will concentrate on identifying and extracting the material and then synthesizing the most influential and policy-relevant studies on WRM governance, institutional and financial sustainability, efficiency measures, and private sector engagement. This material will serve as a benchmark for assessing the effectiveness of World Bank interventions. The literature review will also help identify a typology or a taxonomy of interventions that can provide a structured way of analyzing the in-scope portfolio. For EQ1, the review will identify diagnostic frameworks and sustainability principles relevant to sound WRM design. For EQ2, it will summarize evidence on which institutional reforms, information systems, and supply- and demand-side measures tend to improve water allocation, reliability, and efficiency. For EQ3, it will review lessons from other development partners on private sector integration, aid coordination, and collaboration.

- **Stakeholder interviews:** Semistructured interviews will be conducted primarily through case studies and will involve Bank Group task teams, government counterparts, basin authorities, development partners, service providers, private sector actors, and beneficiaries. For EQ1, semistructured interviews will validate how targeting and design decisions were made, clarify the role of diagnostics or technical assessments, and fill information gaps where documentation or geospatial data are incomplete. For EQ2, semistructured interviews will verify reported results, capture institutional and behavioral outcomes not reflected in quantitative indicators, and identify enabling or constraining conditions that shaped intervention effectiveness. These insights will strengthen causal inference and provide grounded perspectives on how WRM interventions performed in practice. For EQ3, semistructured interviews with major development partners in country case studies, as well as approximately 10 separate semistructured interviews with donors of major trust funds and trust fund managers, will help identify lessons on convening mechanisms and collaboration. The evidence from separate interviews will be used for triangulation of findings from case studies.
- **Case studies (country level and basin level):** Case studies will be conducted in selected countries and selected basins (see sampling criteria in the Sampling and Coverage section). Case studies will provide deeper evidence on relevance, effectiveness, and coherence by combining PRA findings, detailed document reviews, semistructured stakeholder interviews, geospatial analysis, and site

visits in selected basins. For EQ1, case studies will assess how well project design and targeting were informed by diagnostics and aligned with national needs. For EQ2, they will evaluate how governance reforms, institutional coordination efforts, infrastructure investments, and demand-management measures strengthened water governance, improved water availability and reliability, and enhanced efficiency of water use. Outcomes will be verified against independent datasets where possible. A separate, forward-looking case study will specifically focus on early experiences with country compact (and World Bank–IFC joint implementation plan for WRM), as stated in the draft Bank Group WSIP, assessing collaboration dynamics, challenges, and lessons for scaling the One World Bank Group approach. This information will be complemented by the other case studies, which will also assess private sector integration and any bottlenecks or barriers to private sector integration and internal collaboration. In addition, all case studies will include perspectives from clients, development partners, and Bank Group staff on external collaboration and partnerships. Through comparative analysis across cases, this method will illuminate patterns of what works, why, and under which conditions.

Sampling and Coverage

5.2 The evaluation design will apply methods at the selected portfolio, country, and basin levels (figure 5.2). It will include a comprehensive mapping of the entire WRM portfolio, with deeper analysis for projects with sufficient evaluability and data availability. About seven country case studies will be performed: six countries will follow a common analytical framework to allow comparability across contexts, and one additional case will focus specifically on early lessons on the One World Bank Group approach. Other cases will also assess any bottlenecks with promoting One World Bank Group.

5.3 The evaluation will use a nested case study design for selected country cases, where the portfolio and contexts permit. Governance, institutional arrangements, and information systems are primarily rolled out at the national level. Supply- and demand-side interventions, by contrast, are more relevant at the basin level, where changes in availability, reliability, and efficiency can be observed. National- or state-level reforms can also impact stakeholders at local levels. To observe these results, one or two subbasins will be selected to examine how national-level changes impact selected local stakeholders. This nested approach enables the evaluation to link national-level governance reforms with basin-level operational results, triangulate evidence across multiple levels of analysis, and understand how local context and other factors influence outcomes.

5.4 Six of the seven country cases will be selected based on: (i) elevated water scarcity and risks, (ii) low water productivity, (iii) limited progress toward SDG 6.5 (integrated water resource management) implementation based on historical data showing higher needs at the beginning of the evaluation period, and (iv) the significance of World Bank engagement in the WRM sector. Governance-related interventions will be examined primarily at the national level. The list of countries identified in the WSIP will also be considered.

5.5 The seventh case study will focus on the One World Bank Group approach. Given that such integrated operations remain limited in the current WRM portfolio, this case will be selected to capture early experiences and distill lessons that can inform future Bank Group collaboration models in the water sector. The other cases will also assess any factors inhibiting private sector integration and the promotion of One World Bank Group collaboration.

Figure 5.1. Levels of Analysis



Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; PRA = portfolio review and analysis; WRM = water resource management.

Limitations and Mitigation

5.6 Weak documentation across multiple areas may limit evaluability. Coordination efforts, demand-side dialogue, just-in-time technical assistance, and private sector

integration (One World Bank Group collaboration) are often insufficiently documented in project files or advisory services and analytics databases. Limited documentation may obscure the extent of joint work across the Bank Group. To address this, the evaluation will systematically gather evidence through interviews with task teams and clients and will verify references through fieldwork and external partner sources. When documentation is too limited to support firm conclusions, the evaluation will present findings as lessons on enabling factors rather than definitive assessments of effectiveness.

5.7 A further limitation emerges from the potential misclassification of interventions when identifying and coding WRM-relevant activities across a diverse portfolio. WRM interventions are often embedded within broader sectoral projects—such as agriculture, urban services, energy, or climate adaptation—and may serve multiple objectives simultaneously. This creates a risk that activities are either overclassified as relevant to WRM based on keywords, or underclassified when WRM functions are implicit rather than explicit. To mitigate this risk, the evaluation will apply a structured typology or taxonomy anchored in the WRM theory of change (figure A.2) and informed by established frameworks for institutional strengthening, information systems, and infrastructure investments. Projects will be coded at the activity level based on their intended function within WRM systems—such as allocation, regulation, information provision, storage functions, or demand management. Classification decisions will be reviewed iteratively through manual validation, cross-checks across evaluators, and triangulation with project documents, interviews, and case study evidence.

5.8 Geospatial evaluability is constrained by geospatial data availability and quality of project location data. Not all WRM-relevant projects report precise geotagged locations, and in many cases location information is limited to broad administrative units rather than basin- or subbasin-specific coordinates. This reduces the precision with which spatial alignment between interventions and hydrological need can be assessed. In addition, global hydrological datasets (for example, the World Resource Institute’s Aqueduct Water Risk Atlas, AQUASTAT, and NASA’s Gravity Recovery and Climate Experiment) differ in spatial resolution, update frequency, and coverage. Some relevant indicators—such as groundwater depletion or basin-level efficiency metrics—are available only at coarse scales. To address these constraints, the evaluation will use precise geotags where they exist, employ basin-level or subnational proxies where project locations are incomplete, and clearly flag cases where spatial alignment cannot be evaluated robustly. In such instances, triangulation with diagnostics, interviews, country strategies, and other national data sources will be used to assess targeting.

5.9 Outcome verification for supply and demand interventions is uneven. Hydrological outcome dataflows, reservoir storage, conveyance losses, groundwater

levels, and evapotranspiration are not consistently tracked in operational systems or project monitoring and evaluation frameworks. Outcome indicators often focus on infrastructure built or training delivered rather than improved availability, reliability, or efficiency. This limits the ability to measure effectiveness directly from project documentation. The evaluation will mitigate this by relying on operator or agency datasets where accessible, field verification during case studies, interviews with basin authorities and implementing agencies, and independent hydrological or operational records (for example, the International Benchmarking Network for Water and Sanitation Utilities, regulator reports). Where corroborating evidence cannot be obtained, the evaluation will qualify ratings accordingly.

5.10 Attribution limitations are expected, as WRM outcomes depend on multiple actors, policies, and environmental factors. This will be mitigated through qualitative rubrics, triangulation with partner records, and contextual analysis of enabling conditions such as political commitment and institutional stability.

5.11 The literature base is diverse but uneven across domains. The global evidence base on WRM governance, water allocation, and institutional design is strong (for example, Garrick 2015; Garrick et al. 2023; Grafton et al. 2018; Lawless et al. 2024; OECD 2018). However, evidence on the effectiveness of specific WRM project modalities, especially hybrid natural–built infrastructure, demand-management programs, and private sector integration, is thinner. Where literature is limited, findings will be framed cautiously and linked to broader principles rather than specific causal claims.

6. Quality Assurance Process

6.1 The evaluation will follow IEG’s quality assurance processes to ensure the rigor and usefulness of its design, analyses, and findings. These processes include internal IEG and Bank Group management review, two one-stop review meetings that also benefit from advice from IEG’s methods advisory function team, and a review by external peer reviewers. Regular interactions with management representatives are also anticipated to ensure factual accuracy and maximize utility. In addition, data collection protocols for all components will ensure systematic application of methods to minimize bias and ensure credibility.

6.2 The evaluation will be peer reviewed by the following external peer reviewers:

- Mark Smith (Director General, International Water Management Institute)
- Dustin Garrick (Professor, Director, Collaborative Water Program, University of Waterloo)

- Aditi Mukherji (Director, Climate Change Adaptation and Mitigation Impact Action Platform of the Consortium of International Agricultural Research Centers Research Program on Water, Land and Ecosystems)

7. Engagement and Outreach

7.1 The main output of the evaluation will be a report presented to the Bank Group's Committee on Development Effectiveness of the Board of Executive Directors. The team will share emerging findings with relevant Bank Group counterparts as they become available.

7.2 IEG will engage internal and external stakeholders throughout the evaluation process. This will include structured interviews and dialogue with regional and technical Bank Group counterparts, as well as consultations with clients, development partners, and country experts during field visits. The team will develop an outreach and dissemination plan in collaboration with IEG's Knowledge and Communications department. Dissemination efforts will include internal and external outreach through products such as visual storytelling pieces, blogs, podcasts, webinars, tailored presentations, and conference sessions.

8. Resources

8.1 The team conducting this evaluation will be led by Jason Russ and co-led by Ebru Karamete. The members of the team include Nina Rinnerberger (senior evaluator to support implementation of methods), Shenghui Feng (portfolio analysis), and Thomas Panella (senior adviser). Amit Patel is the team's methods adviser. Additional team members will be recruited as needed, including local consultants, to assist with case studies. The evaluation will be prepared under the guidance of Penelope Jackson (manager), Carmen Nonay (director), and Sabine Bernabè (vice president and Director General, Evaluation).

8.2 Timeline and Budget: IEG plans to deliver this evaluation in the fourth quarter of FY27. The team will conduct in-person fieldwork for case studies in Q4 FY26 and Q1 FY27, hold the one-stop review meeting in Q2 FY27, and request management comments on the draft report during Q3 FY27. The final report will be submitted in Q4 FY27. See appendix D for more details. The expected budget for the evaluation is \$1,185,000, inclusive of all staff fixed costs and variable costs. Details of the expected budget can be found in appendix E.

¹ For the purposes of this Approach Paper, resilience refers to the capacity of people, systems, and economies to anticipate, absorb, adapt to, and recover from water-related shocks and stresses, such as droughts, floods, and increasing variability, while maintaining core development functions.

² In many contexts, these formal systems operate alongside informal rules, customary practices, and unregulated uses that shape water allocation and access in practice.

³ Consistent with a system of systems perspective, this evaluation treats WRM as encompassing not only the “Three Is” (information, institutions, infrastructure) but also the underlying hydrological (water resources) system.

⁴ Integrated water resource management refers to the coordinated management of water, land, and related resources to balance economic, social, and environmental objectives (Grigg 2016). While the concept has been debated and interpreted in different ways, it is widely used as a reference framework in international policy and provides the basis for monitoring progress under SDG 6.5.1

⁵ Water scarcity is a condition where there is not enough clean water to meet ecological needs and the demand for human consumption.

⁶ The El Niño–Southern Oscillation is a recurring climate pattern characterized by periodic variations in sea surface temperatures and atmospheric pressure across the central and eastern tropical Pacific Ocean. It oscillates between warm (El Niño), cool (La Niña), and neutral phases, influencing rainfall, temperature, and drought patterns worldwide.

⁷ Where “value” reflects economic, social, and strategic objectives, rather than just market values.

⁸ Based on the draft WSIP circulated in December 2025.

⁹ Because the WSIP is newly adopted, the projects and activities in this evaluation predate this strategy and were designed under earlier strategic frameworks. As such, the evaluation does not assess WSIP implementation but instead will aim to provide evidence and lessons that can inform how WRM-related interventions—and in particular enabling WRM institutions—may be incorporated more effectively into WSIP implementation going forward.

¹⁰ Specifically, whether project designs incorporate credible provisions for long-term financial and institutional sustainability (see sections 4 and 5 of this Approach Paper).

¹¹ Note that these portfolio figures are preliminary and will change on deeper analysis of the portfolio.

¹² Although transboundary water management will be covered in WRM 2, in some basins, national outcomes may be inextricably linked to transboundary factors. The topic is therefore unavoidable in WRM 1, and such cases will be flagged and evaluated accordingly. Likewise, transboundary institutional interventions may include national-level components. These components will be in-scope in WRM 1.

¹³ Gray literature (or grey literature) is material and research produced by organizations outside of the traditional commercial or academic publishing and distribution channels. Common gray literature publication types include reports (annual, research, technical, project, and so on),

working papers, government documents, white papers, and evaluations. Organizations that produce gray literature include government departments and agencies, civil society or nongovernmental organizations, academic centers and departments, and private companies and consultants.

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Appendix A. Theory of Change and Evidence Gap Analysis for Independent Evaluation Group Water Evaluations

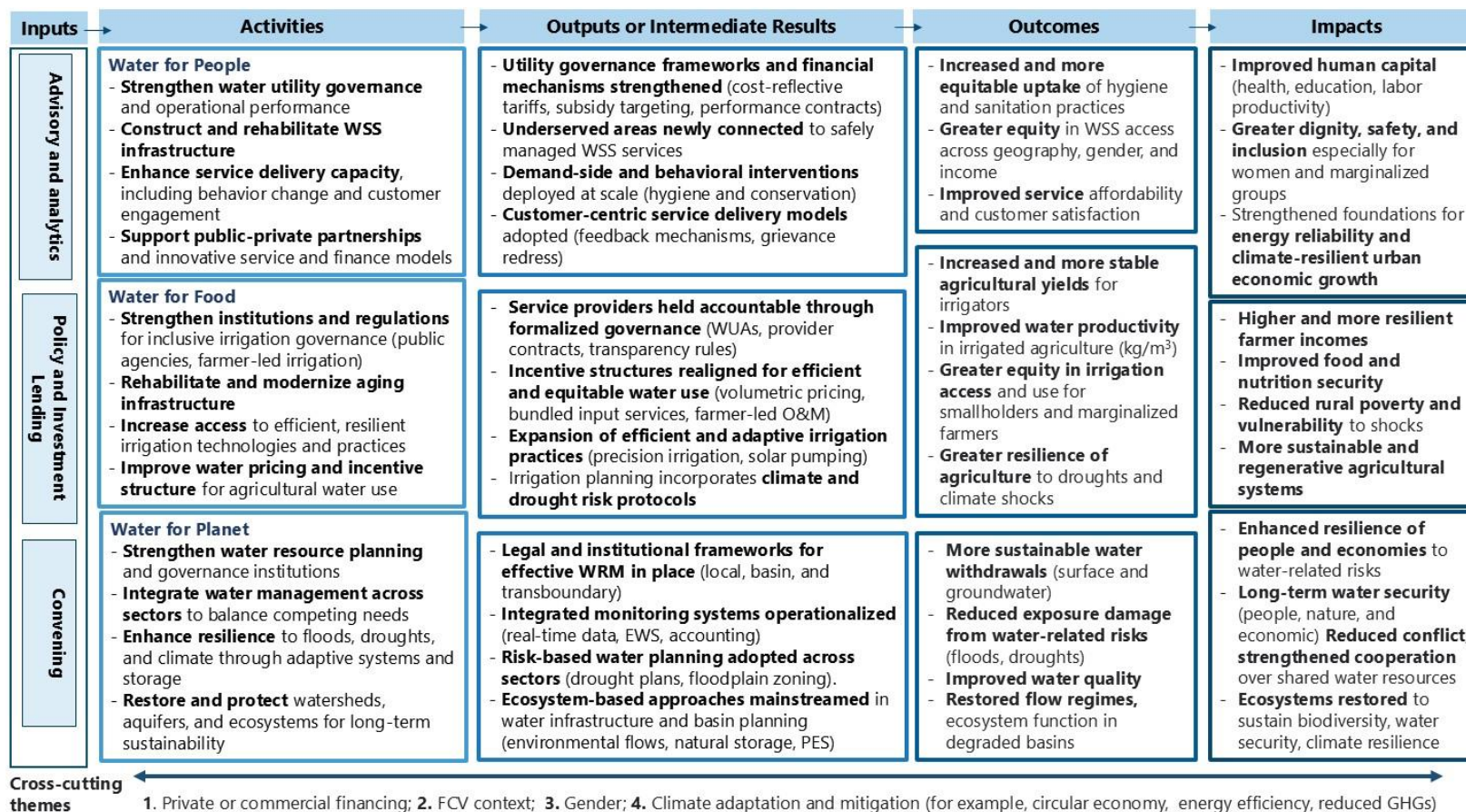
This appendix presents the theory of change and evidence gap analysis that situate the present evaluation within the broader body of work by the Independent Evaluation Group (IEG) on water-related sectors. It documents how recent IEG evaluations have examined downstream services, risk management, and related environmental challenges, and explains how the current evaluation complements, rather than duplicates, those efforts by focusing on the cross-sectoral systems that govern water resources.

IEG's recent evaluations of water supply and sanitation, irrigation service delivery, pollution management, urban resilience, natural resource degradation, and disaster risk reduction have collectively generated substantial evidence on sector-specific outcomes and constraints. These evaluations assessed access, service quality, infrastructure performance, preparedness for shocks, and environmental management. They also identified recurring issues related to governance, pricing, institutional capacity, coordination, and sustainability. However, each evaluation addressed these issues from a sectoral or thematic entry point rather than through an integrated water resources management lens.

Figure A.1 presents IEG's overall water theory of change, spanning Water for People, Water for Food, and Water for Planet. The figure defines the activity space for World Bank Group support to the water sector and illustrates how advisory and analytical services, policy and investment lending, and collaboration with external partners are expected to translate into outputs, outcomes, and impacts across these three domains. This overall theory of change provides the common reference framework for recent IEG evaluations and for the evidence gap analysis presented in this appendix.

Building on this overall framework, the present evaluation applies a water resource management (WRM)-specific theory of change as an analytical lens through which to understand the water theory of change (figure A.2). The WRM theory of change cuts across the Water for People, Water for Food, and Water for Planet pathways in figure A.1. It focuses on how hydrological conditions, information systems, institutions, and infrastructure jointly shape water allocation, efficiency, equity, sustainability, and resilience. This lens emphasizes the systems that govern how water resources are assessed, allocated, and managed over time, and how weaknesses in these systems can undermine outcomes in water services agriculture, ecosystems, and risk management.

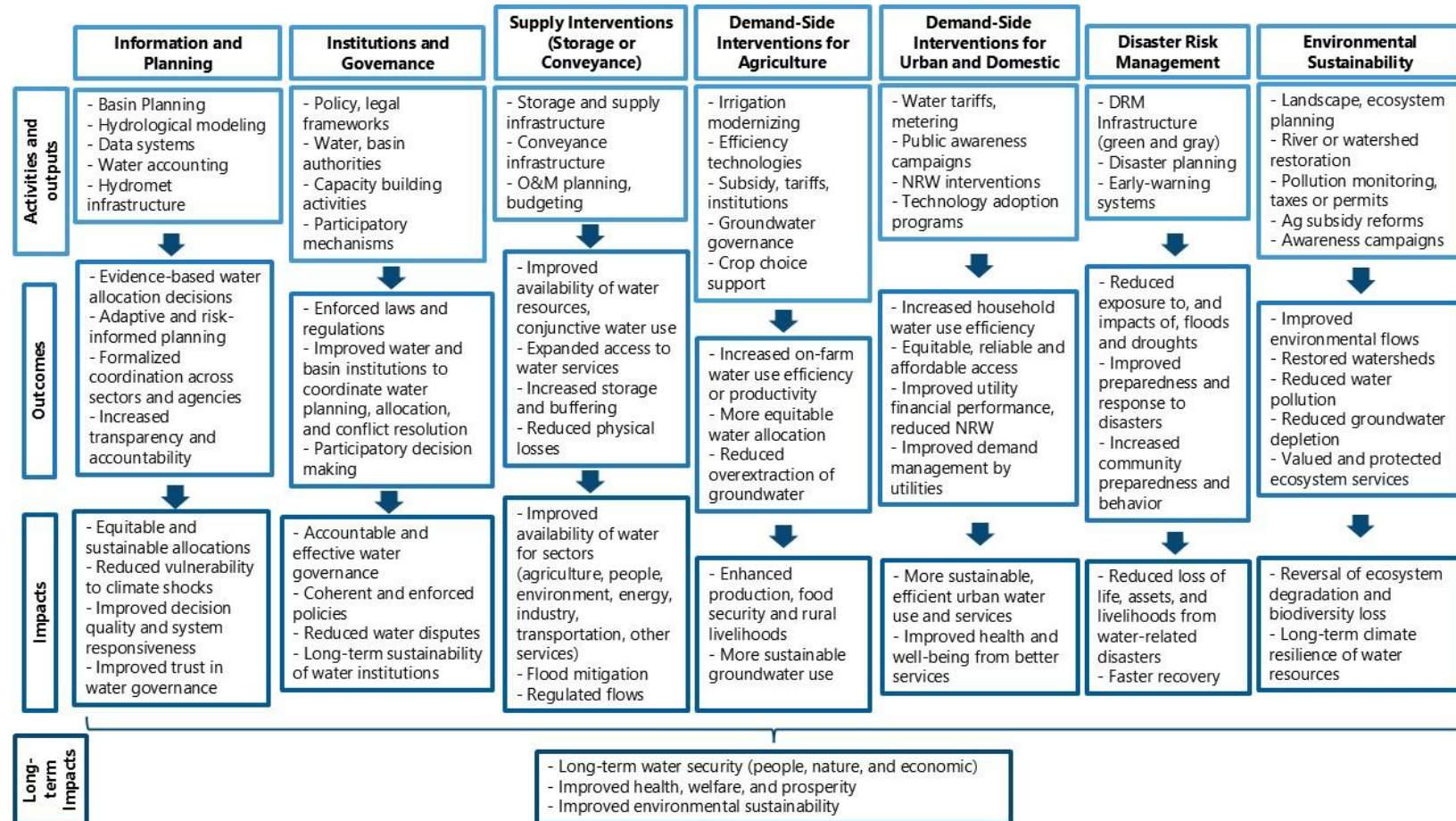
Figure A.1. Water Theory of Change



Source: Independent Evaluation Group.

Note: The figure shows a simplification of a very complex relationship. Causal impacts generally flow from left to right, but rows also interact with one another. EWS = early warning systems; FCV = fragility, conflict, and violence; GHG = greenhouse gases; O&M = operation and maintenance; PES = payment for ecosystem services; WRM = water resource management; WSS = water supply and sanitation; WUA = water user agreement.

Figure A.2. Water Resource Management Mapping



Source: Independent Evaluation Group.

Note: The figure shows a simplification of a very complex relationship. Causal impacts generally flow from top to bottom, but different columns also interact with each other. DRM = disaster risk management; NRW = nonrevenue water; O&M = operations and maintenance.

The evidence gap analysis (table A.1) maps recent IEG evaluation coverage onto the activity categories defined in the overall water theory of change. It identifies which elements of the Water for People, Water for Food, and Water for Planet activity space have been at least partially evaluated in recent years and which have not. This mapping shows that while downstream service delivery, infrastructure, and disaster risk interventions have received substantial evaluative attention, foundational elements of water resources management—such as basin-level planning, water allocation trade-offs, groundwater management, and the long-term sustainability of surface and groundwater systems—have not been the primary focus of past evaluations.

Table A.1. Evidence Gaps Across Water-Related Evaluations

Activities	Evaluation Coverage
<p>Water for People</p> <ul style="list-style-type: none"> • Strengthen water utility governance and operational performance • Construct or rehabilitate WSS infrastructure • Enhance service delivery capacity, including behavior change and customer engagement • Support public-private partnerships and innovative service models 	<p><i>A Thirst for Change</i> (World Bank 2017) assessed how the World Bank supported</p> <ul style="list-style-type: none"> • Improvements in WSS governance, • Infrastructure development, • Service delivery—particularly for underserved populations, • Behavior change and demand-side interventions, and • The role of public-private partnerships and performance-based contracting.
<p>Water for Food</p> <ul style="list-style-type: none"> • Strengthen institutions and regulations for inclusive irrigation governance (public agencies, <i>private farmer-led irrigation</i>) • Rehabilitate and modernize aging infrastructure • Increase access to efficient, resilient irrigation technologies and practices • Improve water pricing and incentive structure for agricultural water use 	<p><i>World Bank Support for Irrigation Service Delivery</i> (World Bank 2019) assessed how the World Bank supported</p> <ul style="list-style-type: none"> • Governance and accountability of irrigation service providers, • Rehabilitation and modernization of aging infrastructure, • Expansion of efficient irrigation technologies and practices, and • Efforts to reform water pricing and strengthen farmer-led management.

Activities	Evaluation Coverage
<p>Water for Planet</p> <ul style="list-style-type: none"> • <i>Strengthen water resource planning and governance institutions</i> • <i>Integrate water management across sectors to balance competing needs</i> • Enhance resilience to floods, droughts, and climate through adaptive systems • <i>Restore and protect watersheds, aquifers, and ecosystems for long-term sustainability</i> 	<p>Elements of Water for Planet have been partially covered in recent IEG evaluations:</p> <ul style="list-style-type: none"> • <i>Reducing Disaster Risks from Natural Hazards</i> (World Bank 2022) reviewed World Bank efforts to build resilience to floods, but drought preparedness and response received limited attention. • <i>The Natural Resources Degradation and Vulnerability Nexus</i> (World Bank 2021) examined how the World Bank addressed natural resource degradation and vulnerability, including attention to ecosystem degradation and gaps in groundwater management. • However, foundational elements of water resources management remain undervalued, such as basin-level planning, allocation trade-offs, and long-term sustainability of surface and groundwater systems.

Source: Independent Evaluation Group.

Note: The left column shows activities that were partially covered in recent years. Activities in italics were not covered or were hardly covered. IEG = Independent Evaluation Group; WSS = water supply and sanitation.

The present evaluation is designed to address these gaps by examining WRM as a system of systems that operates across sectors, risks, and time horizons. It builds on insights from prior evaluations while shifting the analytical focus to the institutional, informational, and hydrological foundations that shape allocation, efficiency, equity, and sustainability. In doing so, it complements evaluations of disaster risk reduction—which emphasized preparedness and response to shocks—by examining how countries manage water resources under longer-term scarcity, competing demands, and increasing variability.

Together, the theory of change and evidence gap analysis helped inform the scope of the current WRM evaluation. They clarify why certain areas that have been recently evaluated are not revisited in depth, and how the current evaluation contributes to a coherent, sequenced program of IEG work on water services, water risks, and WRM. The following paragraphs summarize the key findings of recent IEG evaluations and explain their relevance to WRM.

- **Water supply and sanitation (*A Thirst for Change: An Evaluation of the World Bank Group's Support for Water Supply and Sanitation with Focus on the Poor, 2018*):** This evaluation found that World Bank support expanded access to water supply and sanitation, but service sustainability for poor people lagged due to weak utility governance, underpricing, and insufficient operations and maintenance. The evaluation recommended stronger financial viability, targeting that prioritizes poor people, and institutional reforms linking tariffs, subsidies, and performance. According to the FY 2020 Management Action Report validation, implementation progress was largely complete and IEG concurred with management's proposal to retire the recommendations (World Bank 2020). While water supply and sanitation are distinct from WRM, they both depend

critically on the availability and quality of water resources; thus, their sustainability is closely tied to how effectively those resources are governed and allocated.

- **Irrigation service delivery** (*World Bank Support for Irrigation Service Delivery: Responding to New Challenges and Opportunities, 2019*): IEG found that World Bank–financed irrigation projects often emphasized hardware and area irrigated rather than sustained service quality, cost recovery, and water productivity. It recommended shifting focus toward service outcomes, modernization, volumetric measurement, asset management, financially viable operations and maintenance and better integrating groundwater management. Irrigation service delivery represents a key end user of water resources, and its long-term efficiency and reliability are inherently dependent on well-managed and equitably allocated water supplies. This was a meso evaluation, a type of sector-specific evaluation that did not include recommendations.
- **Pollution management** (*Towards a Clean World for All: An Evaluation of the World Bank Group's Support to Pollution Management, 2017*): This evaluation examined the Bank Group's support for managing pollution across air, water, and land from 2000 to 2016. It found that interventions in wastewater treatment and water quality management were often limited by gaps in municipal institutional capacity, underpricing, and challenges in cost recovery, affecting their effectiveness and sustainability. International Finance Corporation (IFC) advisory services facilitated the structuring of public-private partnerships in wastewater and waste management, but many projects faced political and institutional constraints that hindered commercial closure and investment effectiveness. The evaluation recommended strengthening pollution monitoring and enforcement mechanisms, integrating pollution management into sector strategies, and building institutional and municipal capacity, all of which are relevant for managing water resources sustainably and ensuring that water quality supports both human and environmental needs.
- **Urban resilience** (*Building Urban Resilience: An Evaluation of the World Bank Group's Evolving Experience, 2019*): This evaluation assessed the Bank Group's support for urban resilience from 2007 to 2017, including infrastructure, disaster preparedness, and climate adaptation. While focused on cities, it noted limitations in technical capacity and institutional arrangements at the urban and municipal level, which constrained the effectiveness and sustainability of resilience interventions supported by the Bank Group, including urban water and drainage. The evaluation also identified gaps in hydrological analysis, urban flood and drainage planning, and cross-sector coordination. It recommended

improving hydrological and risk assessments, integrating resilience measures into urban planning, and strengthening coordination across sectors. The evaluation noted that addressing technical and institutional gaps is important for the effective management of urban water and drainage systems.

- **Natural resource degradation** (*The Natural Resource Degradation and Vulnerability Nexus: An Evaluation of the World Bank's Support for Sustainable and Inclusive Natural Resource Management, 2021*): This evaluation noted that, over the past decade, the World Bank has adequately addressed forest, soil, and land degradation but has largely overlooked groundwater and small-scale fisheries in areas where these resources are most at risk. Most groundwater activities were satisfactorily implemented, but their impact on use and depletion is unclear, with most projects lacking mechanisms to limit unsustainable use or identify vulnerable users. The evaluation recommended that the World Bank (i) analyze links between degradation and vulnerability in country diagnostics; (ii) strengthen governance, financing, and policy reforms addressing both degradation and vulnerability; and (iii) improve coordination and measurement across global departments. Bank Group management has incorporated these priorities into Country Climate and Development Reports and lending and policy operations. The 2024 Management Action Report Validation rated implementation as **emerging evidence** for recommendations 1 and 2 and **limited evidence** for recommendation 3, noting progress in nexus analytics and governance integration but slower interpractice collaboration (World Bank 2024). These findings are directly relevant to WRM, highlighting the role of soils, forests, and aquifers in buffering shocks, sustaining productivity, and reducing climate- and water-related vulnerability.
- **Reducing disaster risks** (*Reducing Disaster Risks from Natural Hazards: An Evaluation of the World Bank's Support FY10–20, 2022*): IEG found that the World Bank made strong contributions to disaster risk reduction (DRR) through support for preparedness, early warning, and resilient infrastructure, but that coverage remained uneven across hazards, geographic regions, and sectors. It recommended expanding DRR activities to underserved areas, strengthening measurement of how DRR affects exposure and vulnerability, and improving inclusion of vulnerable populations in project design. The World Bank management agreed, and the 2024 Management Action Report Validation rated implementation as **emerging evidence** of progress, noting portfolio expansion into new sectors and regions, greater use of nature-based solutions, and improved methods for measuring vulnerability and exposure (World Bank 2024). These findings are pertinent to the WRM evaluation, as both evaluations address

resilience to hydrologic changes. Whereas the DRR evaluation focused on the management of extreme events, such as floods and droughts, the current evaluation will examine how countries manage water resources under chronic stress, competing demands, and growing hydrological variability. Together, these perspectives provide a more complete picture of how the World Bank supports countries in managing both the shocks and the stresses associated with water risk.

Appendix B. Evaluation Design Matrix and Evaluation Methods

EQ1: Relevance and Sustainable Design

To what extent are World Bank Group–supported water resource management (WRM) interventions relevant to client countries’ water resource challenges and designed to be financially and institutionally sustainable?

- **EQ1.1 (targeting):** To what extent are hydrological and socioeconomic conditions, Sustainable Development Goal 6.5 targets, water risks, and key diagnostics informing the targeting of Bank Group–supported WRM interventions?
- **EQ1.2. (sustainable design):** To what extent are Bank Group interventions designed for long-term financial and institutional sustainability?

Under this question, the evaluation will examine how well Bank Group–supported WRM interventions have been targeted to address client country needs and whether they have been designed for long-term financial and institutional sustainability. The following methods will be applied:

- **Portfolio review and analysis (PRA):** This will form the foundation of the analysis. The PRA will systematically code project and diagnostic documents to determine whether hydrological, socioeconomic, and institutional diagnostics, as well as Sustainable Development Goal 6.5 assessments, informed project design and targeting. It will also assess alignment with national WRM priorities and identify sustainability features such as recurrent funding, clear institutional mandates, and cost-recovery mechanisms.
- **Content analysis of project and diagnostic documents:** This will be conducted to examine how Bank Group analytical work, such as water security diagnostics, Country Climate and Development Report documents, and other assessments, have shaped intervention targeting and design.
- **Geospatial analysis:** This will be used to assess whether interventions have been appropriately targeted to areas of greatest water stress or vulnerability. Where project geolocations are available, they will be overlaid with national and global datasets (for example, AQUASTAT, the World Resource Institute’s Aqueduct Water Risk Atlas, and total water storage from NASA’s Gravity Recovery and Climate Experiment). This will help determine whether Bank Group projects have been concentrated in high-need areas. In addition, socioeconomic need will

also be taken into account using spatially disaggregated data on, for example, population density, local GDP, agricultural potential.

- **Literature review:** The evaluation will also undertake a focused, narrative literature review to identify global good practices and diagnostic frameworks related to sustainable financial and institutional WRM design. This analysis will also benchmark Bank Group designs against accepted good practices for institutional and financial sustainability drawn from relevant, global literature.
- **Stakeholder interviews:** as part of case studies with Bank Group task teams and client counterparts will be used to validate targeting and design logic and fill data gaps where project-level or geographic information is incomplete.
- **Case studies (country and basin level):** Case studies will provide deeper evidence on how well targeting and design processes were informed by diagnostics and national needs, triangulating PRA findings, geospatial data, interviews, and document reviews.

EQ2: Effectiveness

To what extent have World Bank–supported interventions been effective in supporting countries to improve WRM?

- **EQ2.1 (effectiveness of interventions):** To what extent have World Bank–supported interventions strengthened WRM systems at the national and basin level?
- **EQ2.2 (complementarity):** To what extent have World Bank interventions promoted complementarity between supply- and demand-side measures within the same countries or basins?

This question will assess how effectively World Bank–supported interventions have contributed to strengthened water governance, improved availability and reliability of water supply, and enhanced efficiency of water use. The following methods will be applied:

- **PRA:** The PRA will systematically code all WRM operations to assess the effectiveness of governance reforms, institutional coordination, information systems, and supply- and demand-side measures. It will link each intervention to documented results using Independent Evaluation Group outcome ratings and identify portfolio-wide patterns of what worked well and what did not. The PRA will also identify any relevant lessons.

- **Content analysis:** This will review project documents and advisory work to assess whether interventions were designed and implemented in ways consistent with good practice for effective WRM. This also includes examining the quality of result chains.
- **Case studies (country and basin level):** Case studies at the country and basin level will incorporate document review, interviews, and fieldwork. Interviews with ministries, basin authorities, Bank Group staff, development partners and beneficiaries will be used to verify reported results and institutional and behavioral outcomes, and to identify enabling or constraining conditions. Reported project outcomes will be verified, where possible, against independent data sources such as the International Benchmarking Network for Water and Sanitation Utilities, national regulator reports, or operator records.

EQ 3: Coherence

To what extent has Bank Group support to WRM been internally and externally coherent in integrating private sector actors and in using its convening power to bring partners together?

- **EQ3.1 (engaging the private sector):** To what extent are efforts to engage the private sector in WRM internally coherent, and what enabling conditions support private sector integration?
- **EQ3.2 (convening partnerships):** To what extent has the Bank Group successfully convened and collaborated with development partners and other actors on WRM?

This question will provide lessons on the Bank Group’s early efforts to engage the private sector and One World Bank Group approach, as well as lessons on external collaboration and convening partners in WRM.

- **PRA:** The PRA will review Bank Group operations to assess how private sector integration and collaboration with external partners have been incorporated into WRM engagements. For private sector integration, it will identify how World Bank, IFC, and Multilateral Investment Guarantee Agency (MIGA) instruments were combined or sequenced, whether coordination was operational, and whether interventions helped mobilize private investment or strengthen enabling conditions. For convening partnerships, it will map the extent and nature of collaboration with development partners—such as cofinancing, joint platforms, or aligned technical assistance—and assess whether cooperation improved alignment, reduced duplication, or increased policy traction. The PRA

will provide portfolio-wide patterns and lessons on what enabled or constrained coherent collaboration.

- **Content analysis:** This will examine project documents, joint implementation plans, trust fund reports, and institutional coordination materials to assess how collaboration was designed and operationalized. For private sector integration, it will review roles across World Bank, IFC, and MIGA, the use of complementary instruments, and evidence of joint decision-making or shared results. For external partnerships, it will assess whether collaboration objectives, roles, and mechanisms were clearly defined and whether coordination arrangements contributed to improved results. This method will reveal how well collaboration was embedded in design and whether it functioned as intended.
- **Case studies (country and basin level):** Case studies will provide deeper insights into how private sector engagement, One World Bank Group collaboration, and donor coordination worked in the field. They will examine how coordinated Bank Group instruments influenced private investment, regulatory readiness, or institutional reforms, including a dedicated case study and analysis of the World Bank–IFC–MIGA joint implementation plan. Case studies will also assess how Bank Group convened development partners at country level, whether joint efforts improved alignment or efficiency, and which contextual factors shaped collaboration outcomes. Interviews with Bank Group teams, client ministries, private actors, and development partners will validate findings and highlight operational lessons.
- **Literature review:** This will synthesize global evidence on effective private sector participation in WRM and best practices for aid coordination. It will draw on Organisation for Economic Co-operation and Development, International Water Management Institute, Global Water Partnership, United Nations Economic Commission for Europe, and Bank Group sources to identify enabling conditions—such as regulatory frameworks, risk-sharing mechanisms, governance structures, and coordination platforms—that support successful collaboration. These insights will serve as benchmarks for assessing World Bank performance and help interpret portfolio and case study findings within broader international experience.
- **Stakeholder interviews:** As part of the case studies, interviews with World Bank, IFC, and MIGA teams, as well as client ministries and private sector actors, will explore how joint engagement functioned operationally, what incentives or barriers affected coordination, and how effectively instruments were combined to prepare or catalyze private investment. They will also clarify enabling

conditions, institutional dynamics, and lessons on scaling One World Bank Group collaboration. In terms of external collaboration and convening partners, interviews with Bank Group task teams, trust fund managers and major donors, and client agencies at the country and corporate level will examine how the Bank Group convened development partners, whether collaboration mechanisms were meaningful, and what helped or hindered alignment and division of labor. These interviews will generate lessons on the quality, effectiveness, and comparative advantage of the Bank Group's convening role.

Table B.1 indicates the key evaluation questions, judgment criteria, data sources, collection and analysis methods, and the risks and mitigation strategies associated with these aspects.

Table B.1. Evaluation Design Matrix

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
Overarching evaluation question: How well does the World Bank Group’s engagement help client countries strengthen WRM?				
EQ1. To what extent are Bank Group–supported WRM interventions relevant to client countries’ water resource challenges and designed to be financially and institutionally sustainable?				
EQ 1.1 To what extent are hydrological and socioeconomic conditions, SDG 6.5 targets, water risks, and key diagnostics informing the targeting of Bank Group–supported WRM interventions?	<p>Highly relevant when: Bank Group WRM interventions are explicitly informed by hydrological, socioeconomic, or institutional diagnostics and by progress assessments against SDG 6.5.1.</p> <p>Interventions are clearly aligned with national and basin WRM strategies or priorities, showing consistency between World Bank design and country water sector challenges.</p> <p>Interventions are targeted appropriately based on the nature of the intervention—for example, supply augmentation in countries, regions, or basins facing the highest water stress or vulnerability; demand management in areas with the greatest inefficiency or overuse.</p>	<p>Portfolio of relevant Bank Group projects (including, where possible, geolocations). Bank Group diagnostic work (for example, CPFs, SCDs, NDCs, CCDRs), other analytics (for example, water security diagnostics, CCDRs), and Bank Group, national and basin WRM strategies.</p> <p>Secondary data on SDG 6.5.1 and key World Bank reports and basin strategies. Academic and gray literature (internal and external) on accepted good practice approaches for institutional and financial sustainability of water governance, institutional coordination, and information systems to provide benchmarks for assessing results. Stakeholder interviews with Bank Group, development partners, and client country stakeholders. Case studies in selected countries provide deeper evidence on targeting.</p>	<p>PRA and content analysis of project documents to assess the level of integration of diagnostics and SDG 6.5 findings; and alignment with national and basin WRM priorities or strategies, as well as identifying design features of World Bank interventions for sustainability.</p> <p>Geospatial analysis to assess targeting of Bank Group interventions and identify gaps (overlay project locations on water scarce or high risk areas together with socioeconomic vulnerability or high population density to visualize targeting)</p> <p>Structured literature review to identify good practices for targeting of WRM interventions.</p> <p>Case studies to provide deeper evidence on how well targeting was informed by diagnostics and national needs, triangulating PRA findings, geospatial data, interviews, and document reviews.</p> <p>As appropriate, some methods include the aid of AI.</p>	<p>Risk: WRM activities embedded in sector projects may be misclassified during the PRA</p> <p>Mitigation: Apply function-based typology or taxonomy with manual validation.</p> <p>Risk: Project geolocations are not always reported and data gaps in diagnostics or sociohydrological indicators may exist at the national and basin level.</p> <p>Mitigation: Use multiple datasets to supplement information gaps and, where necessary, default to country-level data since many hydrological variables are spatially correlated. Conduct interviews with TTLs to obtain additional geographic information and verify project targeting.</p>

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
EQ 1.2 To what extent are Bank Group interventions designed for long-term financial and institutional sustainability?	Highly sustainable when: Design includes features supporting long-term institutional and financial sustainability, such as clear mandates, budgeted recurrent funding, cost-recovery mechanisms, or integration into national planning and monitoring systems.	Portfolio of relevant Bank Group projects (including, where possible, geolocations). Bank Group diagnostic work (for example, CPFs, SCDs, NDCs, CCDRs), other analytics (for example, water security diagnostics), and national or basin WRM strategies. Academic and gray literature (internal and external) on accepted good practice approaches for institutional and financial sustainability of WRM interventions. Stakeholder interviews with Bank Group, development partners, and client country stakeholders. Case studies in selected countries provide deeper evidence on sustainable design.	PRA and content analysis of project documents to assess how hydrological and socioeconomic diagnostics informed project design, as well as identifying design features of World Bank interventions for sustainability. Structured literature review to identify accepted good practices for sustainable design of WRM interventions, and use as benchmarks for comparison. Case studies to provide deeper evidence on how well project designs were informed by diagnostics and national needs, triangulating PRA findings, interviews, and document reviews. As appropriate, some methods include the aid of AI.	Risk: Many sustainability elements depend on factors outside the project's control (for example, tariff-setting authority, staffing norms, political commitment), making sustainability difficult to assess credibly. Mitigation: Assess enabling conditions using country and sector diagnostics and interview evidence, and interpret design sustainability because of these contextual constraints.
EQ 2. To what extent have World Bank-supported interventions been effective in supporting countries to improve WRM?				
EQ.2.1: To what extent have World Bank-supported interventions strengthened WRM systems at the national and basin level?	Highly effective when: Evidence shows that governance and institutional reforms supported by the World Bank are implemented and functional, with clear mandates, improved coordination across agencies or basins, and operational information systems that are regularly used in planning, allocation, or decision-making. Supply-side interventions result in sustained improvements in water availability, reliability, or efficiency, such as increased storage	Portfolio of relevant World Bank WRM projects (PADs, ISRs, ICRs, ICRRs, and PPARs) to identify reported results on governance reforms, institutional performance, information system functionality, water availability, reliability, and efficiency outcomes. Case studies (field-based) in selected countries and basins to validate the functionality of institutions, effectiveness of information systems, and performance of supply- and demand-side interventions. Operational data from utilities or agencies: production volumes, supply	PRA of project documents to review relevant governance, institutional, information system, supply-side, and demand-side interventions, and to assess reported results using achievement of outcome indicators. Comparison of intervention bundles across the portfolio to identify factors associated with stronger governance, availability, reliability, or efficiency outcome. Case-based analysis in selected countries and basins to examine in	Risk: WRM activities embedded in sector projects may be misclassified during the PRA. Mitigation: Apply function-based classification with manual validation. Risk: Attribution weak in multipartner settings. Mitigation: Trace contribution pathways and validate with stakeholders. Risk: Institutional effectiveness hard to measure.

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
<p>capacity, enhanced baseflow, reduced losses, or improved continuity of supply.</p> <p>Demand-side interventions lead to measurable and durable improvements in efficiency, such as reduced nonrevenue water, lower water use intensity, or improved cost recovery.</p> <p>Behavioral or institutional changes supporting efficient water use are evident—such as metering, tariff reform, or adoption of water-saving technologies or practices.</p> <p>Enabling conditions for effective water allocation and reallocation have been achieved, including clearly defined water rights, rules for reallocation acknowledging trade-offs, and administrative capacity for enforcement.</p> <p>Efficiency and supply reliability gains contribute to basin-level sustainability, reflected in reduced overabstraction or deferred need for new supply investments.</p>	<p>continuity, treatment capacity, or reuse output for desalination and wastewater projects (for example, World Bank Water Data, IBNET).</p> <p>Relevant government strategy documents and commitments: basin plans, national water balance or storage assessments, postworks inspections.</p> <p>Academic and gray literature (internal and external) on recognized good practices in WRM governance, institutional performance, and operational efficiency to provide benchmarks for interpreting reported results.</p> <p>Stakeholder interviews under case studies with World Bank staff, client ministries, basin authorities, and development partners to confirm reported outcomes, institutional effectiveness, and sustainability of improvements.</p>	<p>depth how World Bank support has influenced institutional effectiveness, information use, and the operational performance of supply- and demand-side interventions; compare actual performance to intended design capacity or service levels where verifiable operational or hydrological data exist.</p> <p>Comparison across cases to identify factors associated with stronger governance, availability, reliability, or efficiency outcomes, such as leadership, institutional capacity, O&M financing, incentives, or data systems.</p> <p>Content analysis of project and supervision documents, to assess the magnitude, durability, and credibility of reported improvements (institutional functionality, water availability, reliability, or efficiency), triangulated with interview and fieldwork evidence.</p> <p>Literature Review to identify good practices and benchmarks in WRM governance, institutional arrangements, and operational efficiency, to provide interpretive context for assessing effectiveness.</p> <p>As appropriate, some methods include the aid of AI.</p>	<p>Mitigation: Use structured qualitative rubrics based on literature.</p> <p>Risk: Reform implementation often depends on factors outside World Bank control.</p> <p>Mitigation: Assess contextual and enabling conditions—such as political commitment, fiscal capacity, and institutional stability—to interpret effectiveness and contribution.</p> <p>Risk: Reported effectiveness may rely on physical outputs (for example, kilometers built, capacity added, meters installed) rather than verified improvements in water availability, reliability, or efficiency.</p> <p>Mitigation: Require corroborating outcome evidence (hydrological, operational, or user-based) before rating a project as effective; note where data do not permit outcome verification.</p> <p>Risk: Demand-side results may lack direct evidence of behavioral change or tariff acceptance.</p> <p>Mitigation: Use qualitative interviews and beneficiary perspectives to supplement quantitative indicators and</p>	

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
EQ 2.2: How effectively have World Bank interventions promoted complementarity between supply- and demand-side measures within the same countries or basins?	<p>Highly effective when: Evidence shows intentional coordination between supply augmentation and demand-management efforts, either within the same operation, across sequenced operations, or through concurrent dialogue and technical assistance.</p> <p>Complementarity is explicitly recognized in design or implementation documents, such as multisectoral diagnostics, shared targets, or cross-referencing between supply and demand initiatives.</p> <p>Demand-side measures are integrated or sequenced to mitigate rebound effects from new supply—for example, pairing with irrigation or WASH investments with efficiency standards, tariff reforms, or allocation rules.</p> <p>The Bank Group or its clients collaborate with other development partners or national programs to ensure that demand management complements supply</p>	<p>Portfolio of relevant World Bank projects to identify references to complementary supply- and demand-side activities, shared diagnostics, or coordinated design and implementation within the same basin, sector, or time period.</p> <p>Cross-reference project timelines and locations to identify overlaps or sequences between supply- and demand-focused operations.</p> <p>Academic and gray literature (internal and external) on accepted good practice approaches for complementarity of water supply and demand systems.</p> <p>Core diagnostics and studies (for example, Water Security Diagnostics, policy notes, JITs, technical assistance reports) to assess whether complementarity was recognized as part of the country or basin engagement strategy.</p> <p>Case studies (field-based) and stakeholder interviews with World Bank task team leaders, CMU water leads, client ministries, basin authorities, utilities, irrigation departments, and partner agencies to verify coordination and collaboration mechanisms in practice.</p>	<p>PRA: supply-anchored portfolio mapping to identify where supply-side interventions coincided or were sequenced with demand-side activities by the World Bank or clients, using project databases and ASA records.</p> <p>Content analysis of project and analytical documents (PADs, ICRs, ASA outputs) to identify explicit references to coordination, shared diagnostics, or mutual design intent between supply and demand measures.</p> <p>Qualitative coding of evidence on complementarity under categories such as intentional integration, sequenced coordination, parallel but unlinked, or no complementarity observed.</p> <p>Case study analysis to examine how coordination between supply and demand interventions affected water use efficiency or sustainability outcomes, and to identify institutional or contextual enablers and constraints.</p> <p>Comparative synthesis to contrast cases with strong complementarity against those</p>	<p>triangulate across multiple evidence sources. Global databases such as IBNET offer additional sources for many utilities.</p> <p>Risk: Complementarity outcomes (for example, improved water balance, reduced stress) may result from multiple actors or external reforms, not exclusively World Bank coordination.</p> <p>Mitigation: Use triangulation across project documentation, partner records, and stakeholder interviews to assess the World Bank’s role relative to other contributors. Compare cases with and without World Bank-supported demand measures to identify plausible contribution.</p> <p>Risk: Evidence of complementarity (particularly demand-side dialogue or JIT TA) may be underdocumented in project files and ASA databases.</p> <p>Mitigation: Use interviews with World Bank task teams, CMUs, and client agencies to reconstruct coordination efforts; verify references through fieldwork and external</p>

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
	<p>investments at basin or service provider level.</p> <p>Evidence of complementarity can include both the mitigation of rebound effects (for example, new supply triggering higher consumption) and the presence of clear synergies where efficiency gains amplify the benefits of new supply (for example, sustained improvements in abstraction, reductions in basin-level stress, or deferred need for new infrastructure).</p>		<p>with isolated supply-side actions, highlighting lessons for integrated design.</p> <p>Comparator case study: compare outcomes (water use efficiency, total water demand) in cases where there is complementarity versus only supply-side activities.</p> <p>As appropriate, some methods include the aid of AI.</p>	<p>partner information where possible.</p>
EQ 3. To what extent has Bank Group support to WRM been internally and externally coherent in integrating private sector actors and in using its convening power to bring partners together?				
EQ3.1 To what extent are the efforts to engage the private sector in WRM internally coherent, and what enabling conditions support private sector integration?	<p>Highly coherent when:</p> <p>The Bank Group demonstrates clear and functional collaboration among World Bank, IFC, and MIGA teams, with complementary roles across investment, advisory, and risk-sharing instruments to attract private sector investments.</p> <p>The initiative has successfully catalyzed or prepared transactions that mobilize private investment or participation in water management.</p> <p>The approach establishes or strengthens enabling conditions—policy, regulatory, or institutional—that make private engagement feasible and sustainable beyond the pilot context.</p>	<p>Portfolio of Bank Group projects on the extent of private sector integration.</p> <p>JIP and related documentation (for example, concept notes, coordination frameworks, and governance arrangements) outlining roles and responsibilities across World Bank, IFC, and MIGA.</p> <p>Internal reports and communications on progress, coordination meetings, pipeline development, and early outcomes from the joint initiative.</p> <p>Stakeholder interviews with Bank Group task team leaders, IFC and MIGA counterparts, CMU staff, and client ministries or agencies under case studies, to capture operational experiences perspectives and enabling factors on collaboration and private sector integration.</p>	<p>Case study analysis in selected countries to assess factors for private sector integration and one specific case to analyze the joint implementation plan between World Bank, IFC and MIGA to assess how collaboration across Bank Group was structured and operationalized.</p> <p>Content analysis of project and institutional documents to identify private sector integration and coordination mechanisms, sequencing of instruments, and evidence of joint decision-making or shared results.</p> <p>Thematic analysis of lessons from literature on private sector integration interviews with Bank Group staff, client agencies, and</p>	<p>Risk: Limited documentation of joint operations.</p> <p>Mitigation: Use interviews and internal sources to reconstruct collaboration.</p> <p>Risk: Lessons remain generic.</p> <p>Mitigation: Develop actionable recommendations linked to operational levers.</p> <p>Risk: Evidence from a single pilot limits generalizability and may not capture the diversity of One World Bank Group collaboration models.</p> <p>Mitigation: Frame findings as lessons on enabling conditions and institutional design rather than as conclusive evidence of effectiveness.</p>

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
EQ3.2: To what extent has the Bank Group successfully convened and collaborated with development partners and other actors on WRM?	<p>Highly coherent when:</p> <p>The Bank Group has actively engaged with other development partners in WRM at programmatic and country levels.</p> <p>Collaboration objectives, roles, and areas of comparative advantage were clearly defined.</p> <p>Coordination mechanisms (for example joint platforms, cofinancing, aligned technical assistance) were implemented and used.</p> <p>The collaboration contributed to improved alignment, reduced duplication, or increased financing or policy traction.</p> <p>Stakeholders identify specific factors, enabling or constraining, that affect the quality and</p>	<p>Literature Review: International and regional evidence on private sector integration (OECD, GWP, IWMI, World Bank reports)</p> <p>Supporting policy and regulatory documents describing the enabling environment for private participation in water management.</p> <p>Any available monitoring data, evaluations, or lessons-learned notes from the JIP or comparable Bank Group initiatives.</p> <p>Case studies in selected countries to assess lessons and enabling factors for private sector integration and Bank Group internal coherence.</p> <p>Portfolio of Bank Group projects on the extent of external collaboration.</p> <p>Trust fund reports on outcomes on collaboration of development partners.</p> <p>Stakeholder interviews under case studies with Bank Group task team leaders, development partners, and client ministries on Bank Group role on collaboration and convening. Separate stakeholder interviews with major donors of trust funds and trust fund managers Bank Group’s convening role.</p> <p>Case studies in selected countries to assess lessons and factors on external collaboration.</p> <p>Literature (OECD, UNECE, GWP, Bank Group) on aid coordination in water resources management.</p>	<p>partners to capture perceptions of effectiveness, challenges, and enabling or constraining factors.</p> <p>As appropriate, some methods include the aid of AI.</p> <p>Case study analysis in selected countries to assess whether the Bank Group collaborated with development partners and whether collaboration contributed to improved alignment, reduced duplication, or increased financing or policy traction and draw lessons on Bank Group’s convening role.</p> <p>Content analysis of project and trust fund documents, development partner assessments to identify coordination mechanisms, sequencing of instruments, and evidence of improved results.</p> <p>Thematic analysis of lessons from literature on aid coordination and interviews with Bank Group staff,</p>	<p>Risk: Limited documentation on coordination efforts and outcomes</p> <p>Mitigation: Use interviews.</p> <p>Risk: Interview responses may reflect institutional narratives rather than operational realities.</p> <p>Mitigation: Ensure anonymity, interview across hierarchies and institutions, and compare perspectives (for example donor versus recipient).</p>

Evaluation Questions	Judgment Criteria or Evidence Threshold	Information Sources and Data Collection Methods	Data Analysis Methods	Risks and Mitigation Strategies
	outcomes of the Bank Group's convening role.		client agencies, and partners to capture perceptions of coherence, challenges, and enabling or constraining factors.	

Source: Independent Evaluation Group.

Note: AI = artificial intelligence; ASA = advisory services and analytics; CCDR = Country Climate and Development Report; CMU = Country Management Unit; CPF = Country Partnership Framework; GWP = Global Water Partnership; IBNET = International Benchmarking Network for Water and Sanitation Utilities; ICR = Implementation Completion and Results Report; ICRR = Implementation Completion and Results Report Review; IFC = International Finance Corporation; ISR = Implementation Status and Results Report; IWMI = International Water Management Institute; JIP = joint implementation plan; JIT = Just-In-Time Note; MIGA = Multilateral Investment Guarantee Agency; NDC = nationally determined contributions under Paris Climate Agreement; OECD = Organisation for Economic Co-operation and Development; PAD = Project Appraisal Document; PPAR = Project Performance Assessment Report; PRA = portfolio review and analysis; SCD = Systematic Country Diagnostic; SDG = Sustainable Development Goal; TA = technical assistance; TTL = task team leader; UNECE = United Nations Economic Commission for Europe; WASH = water supply, sanitation, and hygiene; WRM = water resource management.

Appendix C. Portfolio Review and Analysis

This appendix outlines the scope of the evaluation, methods for identifying the portfolio, and a descriptive analysis of the portfolio. Note that all figures presented here are preliminary and are subject to change as the Independent Evaluation Group (IEG) probes deeper into the activities of each project.

Portfolio Identification

To identify the activities that should be included in the evaluation portfolio, IEG used several portfolio identification methods and means of verification across the three portfolio types (governance, institutions, and information as well as supply- and demand-side management).

The portfolio includes World Bank, International Finance Corporation (IFC), and Multilateral Investment Guarantee Agency (MIGA) activities that were active at any point during FY 2016–25 and approved after FY10. The preliminary review indicates a large body of relevant World Bank work on water resource management (WRM), an emerging IFC portfolio, and a very small number of MIGA projects (table C.1).

World Bank

Identifying the universe of potentially relevant activities. To identify the World Bank evaluation portfolio, IEG used a combination of project tags using WRM theme codes (85 water resources management; 241604 water resources management), keyword searches, and manually supervised artificial intelligence tools. IEG intentionally kept the keyword taxonomy broad and simple to maximize recall and avoid missing relevant projects given inconsistent theme tagging across time and practices. The keyword taxonomy used for the searches is listed in Box C.1. Using the combined output from these methods, IEG manually screened projects based on project text data including project development objectives, component titles, and indicators, project description, project abstract, Project Appraisal Document abstract, Prior Action, Project Paper Abstract, and Implementation Completion and Results Report abstract. This combined approach generated an expanded list of 3,387 activities (after removing duplicates), of which 1,626 are lending projects and 1,761 are nonlending activities. Both bank- and recipient-executed activities are included in the portfolio.

Box C.1. Search Taxonomy Used for Text Mining to Identify Evaluation Portfolio

The search taxonomy included the following keywords:

water*; hydro-met*; hydromet*; hydrolo*; drought; dam; irrigation; canal; saltwater; freshwater; seawater; riverwater; rainwater; groundwater; wastewater; underwater; backwater; greywater; blackwater; greenwater; hydroclimatic; hydroinformatics; "IWRM"; "WRM"

Source: Independent Evaluation Group.

Determining the in-scope evaluation portfolio. To identify the relevant in-scope portfolio from the universe of potentially relevant activities, IEG conducted comprehensive manual validation, assessing both overall relevance to the evaluation and the alignment with the specific focus areas of WRM. For World Bank projects, IEG used *iπ* (IEG Portfolio Identifier), developed by IEG's methods team, primarily for automated screening based on WRM theme codes and targeted keyword searches. IEG also used *iπ* as a complementary input to our manual review, helping flag borderline cases and reduce the risk of missing relevant projects. To guide the AI tool's analysis of project text data, IEG developed specific prompts (box C.2) with clear instructions and examples, which was then applied systematically for portfolio-wide screening. This blended approach combined efficiency in narrowing the pool with rigor and consistency in final inclusion decisions and WRM focus-area classification.

Box C.2. Prompt Identifier Used for Identifying WRM-Relevant projects

Inclusion Criteria

A project is labeled TRUE if it explicitly contains one or more water resource management (WRM) activities within its objectives, components, indicators, abstracts, or descriptions. Classifications must cite (i) the exact matched text and (ii) justification linking it to one of the three WRM intervention areas:

1. Water Governance, Institutions and Information

Examples (only if water specific):

- Water laws, policies, basin/catchment plans, allocation frameworks, IWRM
- Establishing or strengthening water ministries/agencies/basin authorities/WUAs
- Hydrological modeling, water data and information systems (for example, hydromet, groundwater monitoring), water accounting, participatory basin governance, water-focused capacity building

2. Managing Water Availability (Supply-side interventions)

Examples (only if water specific):

- Water storage/augmentation for resource regulation: reservoirs, multipurpose dams, groundwater recharge, desalination/reuse
-

- Watershed restoration, wetland protection, nature-based solutions improving flows/recharge
- O&M of water resource infrastructure

3. Managing Water Use (Demand-side interventions)

Examples (only if water specific):

- Water allocation rules, permit systems, abstraction limits
- Water pricing/tariffs/markets and water efficiency programs/technologies (irrigation, utilities, agriculture)
- Nonrevenue water or leakage reduction, water metering, conservation campaigns

Exclusion criteria:

Do NOT label projects as TRUE if they are

- Pure irrigation service–expansion projects
- Hydropower without broader water management functions
- Green financing with generic references to water
- WASH (water supply, sanitation, and hygiene) projects focused solely on service delivery (access, treatment, distribution)
- Marine/coastal ecosystem projects without freshwater or watershed–coastal WRM links

Source: Independent Evaluation Group.

Note: NRW = nonrevenue water.

International Finance Cooperation

To identify IFC projects relevant to WRM, IEG applied the same search taxonomy outlined in box B.1. IEG used this taxonomy to search through project objectives, descriptions, expected impacts, and other text fields for both investment services (IS) and advisory services (AS) operations. Because IFC IS does not report a “closed FY” comparable to World Bank lending operations, the evaluation period was standardized to FY16–25 for all IFC portfolios.

This process identified 249 AS projects and 133 IS projects containing one or more WRM-related keywords. These were subsequently reviewed manually to confirm relevance. Of the AS projects, 45 were identified as WRM-related, and of the IS projects, 14 were identified as relevant.

Multilateral Investment Guarantee Agency

For MIGA, the team similarly applied the WRM search taxonomy to search through project objectives, descriptions, expected impacts, environmental and social information, and other available text fields for all guarantees issued during FY16–25.

The search identified 84 potential projects containing one or more WRM-related keywords, which were then manually reviewed to confirm relevance. After manual validation, 2 projects were confirmed as WRM-related.

Portfolio Description

World Bank Lending

The following section describes the results of the World Bank lending portfolio, including projects that were active at any point during FY16–25 and approved after FY10.

There are 736 World Bank lending projects with WRM in-scope activities, of which 245 are active and 491 closed. The descriptions of the 736 in-scope projects validated by the team are presented disaggregated by Region (table C.1), and Global Practice (table C.2).

Table C.1. World Bank Lending Water Resource Management Preliminary Portfolio by Region FY10–25

Region	Projects (no.)	Share (%)
Africa	5	0.7
AFE	105	14.3
AFW	148	20.1
EAP	74	10.1
ECA	117	15.9
LAC	96	13.0
MNA	76	10.3
SAR	115	15.6
Total	736	100.0

Source: Independent Evaluation Group.

Note: The table covers projects with WRM components or WRM activities. AFE = Africa Eastern and Southern; AFW = Africa Western and Central; EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MNA = Middle East and North Africa; SAR = South Asia.

Table C.2. World Bank Lending Water Resource Management Portfolio by Global Practice, FY10–25

Global Practice	Projects (no.)	Share (%)
Agriculture and Food	135	18.3
Education	2	0.3
Energy & Extractives	18	2.4
Environment, Natural Resources & the Blue Economy	97	13.2
Finance, Competitiveness and Innovation	6	0.8

Global Practice	Projects (no.)	Share (%)
Governance	3	0.4
Health, Nutrition & Population	2	0.3
Infrastructure, PPP's & Guarantees	1	0.1
Macroeconomics, Trade and Investment	35	4.8
Social Protection & Jobs	6	0.8
Social Sustainability and Inclusion	6	0.8
Transport	6	0.8
Urban, Resilience and Land	96	13.0
Water	323	43.9
Total	736	100.0

Source: Independent Evaluation Group.

Lending portfolio. Of the lending portfolio, 572 are IBRD/IDA, 99 Recipient Executed Trust Fund activities, 54 Global Environment Facility, 8 Special Financing, 2 Guarantees, and 1 Carbon Offset. They included 637 investment project financing, 65 development policy financing and 34 projects for results support (Program-for-Results).

Of the 491 closed lending projects, 307 have an ICR, of which 268 projects have an ICRR (data as of November 2025). 84 percent of the evaluated projects were rated moderately satisfactory or higher. A breakdown of the portfolio is provided in table C.3.

Table C.3. Independent Evaluation Group Outcome Ratings for Closed Evaluated Projects, FY10–25

Outcome Rating	Projects (no.)	Share (%)
Highly satisfactory	9	5.3
Satisfactory	109	40.0
Moderately satisfactory	107	40.0
Moderately unsatisfactory	34	12.0
Unsatisfactory	7	2.7
Highly unsatisfactory	2	0.0
Total	268	100.0
Moderately satisfactory and above	225	84.0

Source: Independent Evaluation Group.

Portfolio type 1: Governance, institutions, and information. For WRM governance, institutions, and information (n = 478), the portfolio identifies a universe of projects that supports improved water policy, planning and regulatory frameworks; enhanced operational capacity of water utilities and sector institution; strengthened institutional capacity for WRM; and better data, information and early warning systems for water resources, hydrology and climate.

Portfolio type 2: Supply-side management. For managing water availability (n = 198), projects support supply augmentation (such as reservoir or dam improvements, water reuse to augment water availability, and managed aquifer recharge) and restoration (such as river and floodplain restoration to enhance ecological flows, and riparian buffer rehabilitation).

Portfolio type 3: Demand-side management. For managing water demand (n = 308), projects focus on improved irrigation and agricultural water use efficiency, enhanced urban or community water use efficiency, metering, and behavioral change, and reduced nonrevenue water losses.

There is substantial overlap across intervention types. Many projects, for example, combine type 1 governance support (for example, WRM policies, hydrological information system) with type 2 supply augmentation (for example, increased storage capacity, or restoration works). Similarly, type 3 projects that focus on managing water use (for example, nonrevenue water reduction, improving irrigation efficiency) often include type 1 elements to strengthen institutional or policy frameworks that enable sustainable water demand management. The distribution of the 736 lending projects across the three WRM intervention areas is shown in table C.4.

Table C.4. World Bank Water Resource Management Portfolio Across Intervention Types, FY10–25

Portfolio Type	Total Projects (no.)	Closed Projects (no.)	Closed Projects Evaluated by IEG
1. Governance, institutions, and information	478	317	180
2. Supply-side management	198	118	64
3. Demand-side management	308	179	107

Source: Independent Evaluation Group.

Note: There is substantial overlap between intervention types and hence the total number of projects (including closed projects) exceeds the total portfolio count. IEG = Independent Evaluation Group.

World Bank Analytical and Advisory Services

Nonlending activities that were active at any point during FY16–25 and approved after FY10 have been classified to date using $i\pi$ (the IEG Portfolio Identifier); these classifications will be further validated during the portfolio review and analysis and as part of the case studies. To date, 583 nonlending activities have been identified by $i\pi$ as relevant to WRM, of which 581 are closed.

International Finance Corporation Investment Services and Advisory Services Portfolios

Across both IS and AS portfolios, the relevant projects primarily focused on these three main areas: (i) demand-side management especially in terms of agricultural water efficiency through water-saving irrigation and farm-level technologies; (ii) urban/utility water efficiency and service performance (nonrevenue water, metering, losses, and utility PPPs); and (iii) water supply augmentation and resilience investments (desalination, bulk supply and treatment, reuse, basin-level planning, and hydro/dam projects with watershed management).

In-scope IFC projects validated by the team are described in tables C.5 and C.6.

Table C.5. International Finance Corporation Investment Services Water Resource Management Portfolio by Primary Sector, FY16–25

Primary Sector Name	Projects (no.)	Share (%)
Agriculture and Forestry	5	35.7
Chemicals	1	7.1
Electric Power	1	7.1
Finance and Insurance	4	28.6
Utilities	3	21.4
Total	14	100.0

Source: Independent Evaluation Group.

Table C.6. International Finance Corporation Advisory Services Water Resource Management Portfolio by Primary Product Business Area, FY16–25

Primary Product Business Area Code	Projects (no.)	Share (%)
CAE	1	2.2
CB	1	2.2
CTA-PPP	11	24.4
ESG-ESS	4	8.9
FIG	1	2.2
INR	2	4.4
MAS	21	46.7
WTR	4	8.9
Total	45	100.0

Source: Independent Evaluation Group.

Multilateral Investment Guarantee Agency Portfolio

Of the two MIGA projects confirmed as relevant to WRM, one supported seawater desalination in China, and the other financed a bulk water facility in Rwanda that included supply augmentation and storage reservoirs.