PROJECT PERFORMANCE ASSESSMENT REPORT

ANGOLA

Water Sector Institutional Development

Report No. 192746
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2/7/2025

Finance, Private Sector, Infrastructure, and Sustainable Development

Independent Evaluation Group

Abbreviations

GABHIC	Office for the Administration of the Cunene, Cubango, and Cuvelai River Basins
ICR	Implementation Completion and Results Report
IEG	Independent Evaluation Group
INAMET	National Institute of Meteorology and Geophysics
INRH	National Water Resources Institute
IRSEA	National Electricity and Water Regulatory Institute
NRW	nonrevenue water
PDISA	Water Sector Institutional Development Project
PDISA II	Second Water Sector Institutional Development Project
PNA	National Water Plan
PPAR	Project Performance Assessment Report
TA	technical assistance
WRM	water resource management

All dollar amounts are US dollars unless otherwise indicated.

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This report was prepared by Alvina Erman, based on field mission in February 2024. The report was peer reviewed by Vijay Jagannathan, senior water resource management consultant, and panel reviewed by Jack van Holst Pellekaan, senior evaluation consultant. Jean-Jacques Ahouansou provided administrative support.

Note: IEG = Independent Evaluation Group; PPAR = Project Performance Assessment Report.

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This is a Project Performance Assessment Report (PPAR) by the Independent Evaluation Group (IEG) of the World Bank Group on the Water Sector Institutional Development Project (P096360). This instrument and the methodology of this assessment are discussed in appendix D. Following standard IEG procedure, copies of the draft PPAR were shared with relevant government officials for their review and comment.

Basic Data

Country	Angola	World Bank financing commitment	$177.0 million
Global Practice	Water	Actual project cost	$233.2 million
Project name	Water Sector Institutional Development	Revised project cost	$232.4 million
Project ID	P096360	Actual amount disbursed	$220.3 million
Financing instrument	Investment project financing	Environmental assessment category	B
Financing source	IDA-45010, IDA-49700		

Dates

Event	Original Date	Actual Date
Approval	07/31/2008	07/31/2008
Effectiveness	08/30/2010	08/30/2010
Restructuring, Additional Financing	06/06/2011	06/06/2011
Restructuring	05/16/2012	05/16/2012
Mid-Term Review	09/22/2015	09/22/2015
Restructuring	04/28/2016	04/28/2016
Restructuring	07/18/2017	07/18/2017
Restructuring	09/06/2018	09/06/2018
Closing	10/31/2020	04/30/2021

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Summary

Background and Description

In the early 2000s, after an extended civil war, Angola's water supply infrastructure was severely deficient. Urban centers faced overwhelmed water supply and sanitation systems due to rapid urbanization driven by rural conflict. The lack of investment and rehabilitation resulted in low access levels and service quality, disproportionately affecting poorer households. Angola is considered a water resource–rich country. However, the distribution of water is uneven, leading to significant scarcity and drought issues in the southern regions. Over the past decade, the region has experienced several droughts that triggered severe food shortages that affected millions of people and caused significant economic losses. Recognizing the need for improved water security in the country, the government of Angola prioritized access to potable water postwar, enacting the Water Law in 2002 and approving Vision 2025 in 2008, which aimed for universal urban water access in the country by 2025.

The Water Sector Institutional Development Project's (Projecto de Desenvolvimento Institucional do Sector de Água; PDISA) was conceived and implemented in a postwar context of minimal government capacity, aiming to address the pressing need for basic water services in underserved peri-urban areas. The objective of PDISA was "to strengthen the institutional capacity and efficiency of agencies in the water sector to improve access of water service delivery" (World Bank 2020, 1). PDISA sought to achieve this objective through institutional reform, including the establishment of provincial water and sanitation utility companies, a national water regulator, and a water resource management institute expected to support financial viability of service delivery and sustainable water resource management (WRM). The newly established institutions received extensive technical assistance (TA) under the project. Capital investments in water supply infrastructure were expected to improve access to water services for urban and peri-urban households. Finally, the piloting of a river basin management plan and the rehabilitation of hydrological stations were expected to establish a system for WRM and improve monitoring of water resources to inform decision-making. The project was approved on July 31, 2008, with $57 million in International Development Association financing. Additional financing of $120 million was provided in 2011 for rehabilitating water supply systems. The project closed on April 30, 2021.

What Worked, What Didn't Work, and Why?

The PDISA project achieved its objective of improving access to potable water with over 100,000 new household connections built, servicing nearly 700,000 people, but the benefits were undermined by unreliable service access, mainly due to insufficient water supply and high levels of nonrevenue water (NRW).

PDISA facilitated institutional reforms within the water sector that promoted a culture of cost recovery and accountability. The establishment of provincial public water and sanitation utility companies consolidated service provision and promoted financial self-sustainability, which enhanced efficiency. Additionally, the creation of a national water regulator, the National Electricity and Water Regulatory Institute (Instituto Regulador dos Serviços de Electricidade e de Água) depoliticized water tariffs and provided incentives for utilities to reduce NRW, which further supported efficiency. PDISA also contributed to the institutional foundations of WRM through the establishment of the National Water Resources Institute (Instituto Nacional de Recursos Hídráulicos; INRH). Moreover, the project improved access to water to over 100,000 urban and peri-urban households, and investments in customer cadastres and TA programs bolstered the financial viability of water utility companies, resulting in some improvements in billing efficiency and staffing. Additionally, these utilities helped improve the quality of informal water delivery by collaborating with informal water providers, an indirect contribution of PDISA.

PDISA investments in the water supply faced significant challenges in providing reliable and sustainable water services to urban dwellers despite large capital investments. Expansion of the water supply network added to water shortages, which contributed to reductions in service hours and intermittent supply. Additionally, in at least one instance, the project's attempt to invest in bulk water intake exacerbated vulnerabilities to drought, highlighting the importance of WRM in planning. High NRW levels[1] (reaching 55 percent on average) posed a major challenge to cost recovery for utilities. Although efforts were made to address NRW through metering and incentives, such as the establishment of National Electricity and Water Regulatory Institute, more robust strategies (including performance-based contracts linked to NRW reduction efforts) are needed to address NRW in the future. Gaps in strategic planning for WRM efforts resulted in underused investments and reduced impact; notably, water quality and wastewater treatment were left outside the scope of PDISA, presenting an opportunity to adopt a more comprehensive approach to water management in the future.

Has Water Resource Management Improved?

The project led to some improvements in WRM in Angola through the creation of the INRH and the implementation of a cost recovery model for water pricing. However, the limited capacity, inadequate financing, and limited convening power of INRH hindered the advancement of WRM in the country. Moreover, the implementation of the Kwanza River Basin Management Plan and the potential utility of the rehabilitation of hydrological stations were hampered by a lack of strategic objectives and partnerships, stakeholder engagement, and adequate TA and training. Finally, infrastructure investments under the water supply component fell short in considering sustainable WRM principles, underscoring the need for better integration between the WRM and water supply components to achieve effective water management.

Lessons

This assessment shares the following four lessons:

1. **Effective WRM requires a strong institutional framework with adequate capacity and resources.** The project demonstrated that without sufficient capacity, resources, and technical support, INRH struggled to carry out its WRM mandate effectively. This limitation resulted in significant gaps in data collection, analysis, and infrastructure maintenance, hindering INRH's ability to implement WRM effectively. Moreover, although INRH was acknowledged as a WRM authority within the water supply sector, the evaluation found a lack of demonstrated convening power beyond this sector, limiting its ability to unify and coordinate various institutions and interests. However, the relationship between INRH and the Office for the Administration of the Cunene, Cubango, and Cuvelai River Basins (Gabinete para Administração da Bacia Hidrográfica do Rio Cunene; GABHIC) complicated effective coordination due to overlapping responsibilities and resource allocation inefficiencies. External assistance needs explicit and persistent engagement from technical experts to develop the relevant institutions and improve their ability to effectively manage water resources.

2. **Effective WRM requires accurate, timely data and fit-for-purpose hydrological and meteorological (hydromet) infrastructure.** The project demonstrated that sustainable water management hinges on reliable hydrological data, often unavailable to the stakeholders who rely on these data for decision-making due to inadequate integration between WRM and supply components. The location of hydrological stations and technology choices led to challenges, including equipment failure due to lack of maintenance and insufficient local training, as well as vandalism. Simpler, more sustainable technologies, like manual gauge readings reported via cell phones, proved more effective and sustainable. Ensuring the availability of relevant data for decision-making requires not only fit-for-purpose and cost-effective technology coupled with local training and support systems but also hydromet infrastructure that is integrated well with the water supply sector, as well as other sectors reliant on these data.

3. **Not addressing NRW undermines the benefits of investments in water supply and WRM and negatively affects financial and environmental outcomes.** While the project included activities that could have contributed to NRW reduction through measures like metering and pipe rehabilitation, reducing NRW was not an objective of PDISA. The TA-based service contracts did not hold the TA provider accountable for whether performance was enhanced, and NRW was not monitored through the contracts. As such, these contracts did not create stronger incentives for TA providers to monitor NRW, understand what drives NRW, and help the utilities reduce water losses directly. The creation of robust incentive structures to encourage utilities to minimize water losses alongside investments in physical infrastructure that reduce losses are important contributions to effective WRM.

4. **Network expansion needs to be aligned with production development and cost management for reliable service provision.** The project prioritized network expansion over bulk water production capacity and NRW reduction, adding to water shortages that contributed to unreliable service, which undermined the benefits of the network investment. This project's experience also underlined the crucial importance of establishing adequate water storage facilities to maintain a consistent and reliable service. This project also demonstrated the need to ensure that utilities can absorb the operating costs from new production facilities by securing enough new clients.

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[1] NRW is caused by technical and commercial water losses. Due to a lack of monitoring of the water systems, the utilities did not have exact information on the importance of technical water losses in relation to the commercial losses. However, the utilities that were interviewed estimated that technical and commercial losses are equally important drivers of NRW.

1. Background, Context, and Design

Background and Context

1.1 In the early 2000s, after an extended civil war, Angola's water supply infrastructure was extremely deficient. The water supply and sanitation systems in urban centers were overwhelmed by the conflict-driven rapid urbanization in rural areas. Lack of investment and rehabilitation resulted in low levels of access and low-quality services, with poorer households less likely to be connected. Cholera, driven by inadequate access to water and sanitation, was endemic at the time, with a 2006 outbreak resulting in over 48,000 cases. With about 62 percent of the population living under the poverty line and less than half of the population having access to improved drinking water,[1] human development conditions were abysmal. Life expectancy was 47 years, and nearly one-quarter of all children died before they reached age five.

1.2 Angola is rich in water resources, but resources are not evenly distributed, and some parts, such as the southern part of the country, suffer increasingly from water scarcity and drought. The country has 77 river basins, 43 hydrological basins, and important upstream positions in several international basins. In most parts of Angola, water is bountiful. The southern region—covering Cunene, Huíla, and Namibe provinces—is drier, and the region has suffered several severe droughts in the past decade (Serrat et al. 2022). According to a postdisaster needs assessment conducted in 2016, a drought that started in 2013 had affected over a million people, causing $749 million in losses (UNDP 2016). In 2021, 1.3 million people were facing severe hunger, according to the World Food Programme (2021). While droughts are not new to Angola, climate change will likely increase the frequency and intensity of droughts and floods.

1.3 There is increasing pressure on water resources in Angola due to the expansion of water supply systems, which compete with demand from energy production and commercial and agricultural water users, all while the country is facing increasing risk of chronic water scarcity, hydrological uncertainty, and extreme weather events. The population served by water supply systems has increased by over 6 million over the past 20 years, but among the urban population, an additional 10 million people remain unserved by piped water (Angola, COSEF 2008; Angola, Instituto Nacional de Estatística and ICF International 2016; Angola, Instituto Nacional de Estatística, Ministério da Economia e Planeamento 2021). The agricultural sector employs just below half of Angola's workforce and supports 90 percent of the rural population. Commercialization of agriculture, which is dependent on the expansion of irrigation, is therefore at the core of Angola's growth strategy as the country tries to diversify the economy away from oil and gas dependence (World Bank 2019a). Only 8 percent of Angola's arid land is currently under cultivation, and the improved management of water resources will play a crucial role in the country's ability to expand agricultural production sustainably while meeting other demands for water as well.

1.4 Water resource management (WRM) is critical to Angola's economic and sustainable development, but given the uneven geographic distribution of water resources and increasing climate uncertainty, it is a major challenge. Angola's WRM infrastructure collapsed during the war, leaving few of the 189 hydrometeorological stations operational and resulting in a lack of contemporary data on surface and groundwater resources. Meanwhile, water usage in the country remains undocumented. Following the war, the government prioritized access to potable water, enacting the Water Law (2002),[2] which mandated cost recovery tariffs and decentralized service delivery. The government's Vision 2025 strategy aimed for the country to achieve universal urban water access by 2025, and substantial investment programs were launched, including the $650 million Water for All program (Angola, Ministério do Planeamento 2007).

1.5 The Water Sector Institutional Development Project (Projecto de Desenvolvimento Institucional do Sector de Água; PDISA)[3] was subsequently launched to support institutional reform and expand water access, building on earlier World Bank efforts under the Emergency Multi-Sector Recovery Program Projects.[4] PDISA was conceived and implemented in a postwar context characterized by minimal government capacity and a lack of prior experience in WRM. This difficult context was further exacerbated by the urgency and large scale of the need to deliver critical water services to underserved peri-urban populations.

Objective, Design, and Financing

1.6 **Objective.** The project's original objective was "to strengthen the institutional capacity and efficiency of agencies in the water sector to improve access and reliability of water service delivery" (World Bank 2008, 2). It's revised objective at closing was "to strengthen the institutional capacity and efficiency of the Recipient's agencies in the water sector to improve access to water service delivery" (World Bank 2020, 1). As such, improving the reliability of water service delivery was dropped as an objective because reliability depended on many factors outside of the project's influence. However, at project closing, available information on reliability showed an improvement, though the PPAR did not find convincing evidence to confirm this (World Bank 2020).

1.7 **Design.** The project was designed to support a mix of activities for the water sector at large, including sectorwide institutional development at the national level and more targeted infrastructure investments for water supply and capacity building at the provincial level. The project included four components: (i) Development of Institutions in the Water Supply and Sanitation Subsector, which supported the establishment of provincial water and sanitation utilities ("utility companies") and the development of the National Electricity and Water Regulatory Institute (Instituto Regulador dos Serviços de Electricidade e de Água; IRSEA) to strengthen the institutional framework for the water supply subsector; (ii) Water Resource Management, which has included the development of a dedicated institution (the National Water Resources Institute [Instituto Nacional de Recursos Hídráulicos; INRH], the piloting of a River Basin Management Plan for the Kwanza River Basin, and the rehabilitation of a few of the country's hydrological stations; (iii) Rehabilitation of Water Supply Systems, which supported the rehabilitation and expansion of piped water access in selected cities (Malanje, Kuito, N'dalatando, Huambo, Uíge, and Lubango); and (iv) Capacity Building and Change Management, which supported capacity building at the national and provincial levels through technical assistance (TA), as well as monitoring and evaluation and project management.

1.8 The causal links in the project's theory of change (see appendix B)—from project activities to the achievement of project outputs and outcomes—were direct and valid, and the achievement of the project's revised objective could be attributed to the project's interventions.

1.9 **Dates and Financing.** The project was approved on July 31, 2008, but became effective over two years later, on August 30, 2010. The original International Development Association financing was $57 million. Additional financing of $120 million was provided. Thus, total International Development Association financing was $177 million, of which $153.8 million was disbursed. The $120 million of additional financing in 2011 led to a significant reallocation of project funds associated with additional financial support to the component focused on the rehabilitation of water supply systems.

2. What Worked, What Didn't Work, and Why?

Results

2.1 PDISA helped promote a culture of cost recovery for service provision of potable water supply. The project supported the creation of eight provincial utility companies and a national regulator for the water sector. These institutions have helped promote a culture of cost recovery for service provision.

2.2 PDISA helped improve access to water for close to 700,000 people, but the lack of reliability of service provision is undermining the benefit of this result. This lack of reliability is mainly driven by insufficient water production (intake) and high levels of nonrevenue water (NRW). Securing the water resources needed to sustainably supply a growing customer base with a higher-quality service requires paying attention to both adequate bulk water availability at the source and improved management of water service delivery.

2.3 PDISA helped advance the WRM agenda in Angola by supporting the creation of INRH, but this institution remains too weak to carry out its mandate. In the water supply sector, INRH is recognized as a service provider for WRM, and the government remains committed to supporting WRM, illustrated by the approval of a new raw water extraction fee in 2021. However, INRH faces challenges in carrying out its mandate due to capacity and resource gaps and has limited convening power outside of the water supply sector.

2.4 Nevertheless, PDISA represents a significant milestone in Angola's water sector development, laying the foundation for a continued and transformative engagement that has positioned the water sector as the largest in the World Bank's Angola portfolio today (approximately $2 billion). By aligning itself closely to government priorities, providing hands-on support, and cultivating partnerships, PDISA exceeded the targets of many performance indicators, and its achievements surpassed the initial scope. Building directly on PDISA's achievements, the World Bank expanded its portfolio in the water sector with the approval of the Second Water Sector Institutional Development Project (PDISA II) in 2017 (P151224, US$350 million) and Climate Resilience and Water Security in Angola (RECLIMA)[5] in 2022 (P177004, US$450 million), including $300 million in co-financing from the French Agency for Development. These follow-on engagements leveraged lessons learned from PDISA to address concerns regarding service continuity, integrated WRM, and enhanced sustainability. Through this phased and iterative approach, PDISA laid the foundation for a long-term transformative engagement of the World Bank in Angola's water sector.

What Worked and Why?

2.5 The institutional reforms supported by PDISA helped modernize and professionalize the institutional landscape in the water sector and improved the conditions for the financial sustainability of the service delivery of water, in addition to improving fiscal transparency and accountability. The Independent Evaluation Group (IEG) mission concluded that the government remains committed to the reforms supported under the project. The institutions established under the project have continued to strengthen the capacity to carry out their mandates after project closing.

2.6 The establishment of provincial public water and sanitation utility companies ("utilities") was an important step toward ensuring the financial sustainability of service delivery. Before PDISA, water supply provision in Angola was dispersed between the provincial and municipal authorities and private, mostly informal, water providers. PDISA supported the first wave of utilities created, including in Bié, Cuanza-Norte, Huambo, Malanje, and Uíge in 2013–14. In the years that followed, 17 utilities were created. In the later stages, PDISA supported the establishment of utilities in Huíla, Moxico, and Namibe. The creation of the utilities supported financial sustainability because these utilities share the goal of becoming self-sustaining businesses, and they are economically incentivized and mandated by law to recover their costs (although the utilities have yet to achieve this objective). With a more focused mandate, a growing customer base, and intensive investment programs by the government, including the World Bank–financed investments, the utilities are gaining scale. The provinces not supported by PDISA have received support from the African Development Bank through a project that drew inspiration from PDISA.[6]

2.7 The establishment of a national regulator for the water sector helped depoliticize the water tariff that also supported financial sustainability of service delivery. Before PDISA, the water tariff was set by the provincial government, with input from the Ministry of Finance, and was mainly driven by political priorities. The project supported the creation of IRSEA, which was officially established in 2016 (Joint Executive Decree no. 59/16). A new provincial tariff regime developed in 2018 established a uniform tariff based on different consumer categories for drinking water consumption throughout the country (Joint Executive Decree no. 230/18). After project closing, a tariff approval process was established (Presidential Decree no. 255/20), defining a methodology for setting the tariff based on the principles of cost recovery. The reform also enabled IRSEA to charge the utilities for their regulatory services, supporting its independence as a regulatory body. To set the tariff, the utilities provide a tariff proposal to IRSEA based on the annual income required to achieve cost recovery, which is primarily driven by the operational expenditures. Capital expenditures are currently not accounted for in the water tariff calculations because they are financed and carried out by the central government. The IEG mission found that while IRSEA is not yet fully independent, the reform has made tariff-setting a more transparent, consistent, and objective process, and all stakeholders were positive about the support and service provided.

2.8 PDISA also supported WRM through the creation of the more autonomous National Water Resources Institute (INRH). The inception of INRH in 2014 marked a significant shift from its precursor department within the National Directorate of Water (Direcção Nacional das Águas) and aimed to establish a more autonomous institution. INRH was entrusted with a sweeping mandate around the management of water resources at the national and basin levels, in line with the systems envisaged under the 2002 Water Law. INRH is recognized, at least in the water supply sector, as a service provider for WRM and is increasingly called on by utility companies to provide solutions in the field. "We are clients of INRH," said the director of one utility company about seeking the support of national institutions in solving water scarcity challenges. A new raw water extraction fee, approved in 2021, illustrates the government's continued commitment to support WRM, and, if enforced, the fee will help promote sustainable use of water resources while generating income for INRH (Presidential Decree no. 41/21). (A more detailed analysis of the results related to WRM can be found in the "Has Water Resource Management Improved?" section).

2.9 PDISA financed the installation of 108,903 new urban and peri-urban household connections, which provided better access to improved water sources for 696,976 people in the provincial capitals N'dalatando, Malanje, Uíge, Huíla, Huambo, and Kuito. The project achieved these results, despite significant exchange rate losses, thanks to the use of a cheaper clustered approach to the installation of household connections. In theory, households can now turn on the water in their homes instead of obtaining water from a well, public standpipe, or private water supplier, saving people money and time while enabling them to access safer water than before. However, while the IEG mission found that beneficiaries have better access to water, households still depend on alternative water sources due to intermittent service provision from the water utilities.

2.10 For the utility companies in the supported provinces, PDISA has supported the financial viability of water provision through investments in added connections, a customer cadastre, and a TA program. By adding 108,903 new connections and supporting the utilities in creating a technical cadastre of over 60,000 connections, the project helped the utilities increase the customer base and billing efficiency. According to the Implementation Completion and Results Report (ICR), the number of cadastre connections (potential customers) increased from 41,000 in 2016 to 122,000 in 2019 among the six utilities that were supported with TA (World Bank 2020). The number of cadastre connections kept increasing after closing, and in the fourth quarter of 2022, there were 179,000 (Angola, Ministério da Energia e Águas n.d.). As a result of an improved customer cadastre, billing efficiency also increased, from 14 percent in 2016 to 58 percent in 2019, and has continued to increase after project closing, reaching 71 percent in the fourth quarter of 2022 (World Bank 2020; COWI 2022). The number of staff per 1,000 connections (another indicator of financial efficiency) has also continued to improve. All of the supported utilities had staff-to-connection ratios ranging from 3-to-1 to 8-to-1 in 2022, which is the recommended range; the average ratio of 5.7-to-1 was down from 6.5-to-1 in 2019, an improvement from 13.5-to-1 in 2016 (World Bank 2020; Angola, Ministério da Energia e Águas n.d.).[7] Improved billing efficiency and staffing should result in improved cost recovery. Data on cost recovery are more difficult to access, but the few data points that are available indicate that utilities continue to struggle to cover their operational costs.[8] (See appendix D for a full analysis of the performance-related data on utilities.)

2.11 The utility companies also contribute to improving informal water provision by working with informal operators. The informal water sector is estimated to be the largest informal subsector in the country, and these water providers play a significant role by bridging the service gap that water users face (Cain and Baptista 2020). For example, in 2019, 16 percent of the urban population relied on "truck water" as their primary source of drinking water (Instituto Nacional de Estatística, Ministério da Economia e Planeamento 2021). In Luanda, an estimated 40 percent of the population rely on this type of water. Informal water provision takes different forms in different parts of the country, but typically the water is expensive and of low quality, representing both a significant household expenditure for urban poor people and a health hazard, as evidenced by outbreaks of highly transmissible diseases, including cholera (Cain 2020). IEG found that the utilities have been working with the informal providers by installing bulk water supply points to provide safe water supply, mitigating the risk of disease.

What Didn't Work and Why?

2.12 The utility companies have struggled to deliver reliable water service, affecting the quality of water access for beneficiaries. PDISA's capital investments in the water supply system benefited close to a million urban dwellers with added household connections and the rehabilitation of old networks, but the initiative has struggled with issues of service continuity and water pressure. Most interviewed households reported that access is limited to a few days per week, and in one city access was limited to only a few hours each week. This lack of service reliability was also observed for older connections, where some residents noted a marked decrease in service quality and frequency after the PDISA intervention. The average continuity of supply in 2022 was notably low, with only nine hours of service on average across the six utility companies supported under PDISA, reflecting a decline from preinvestment levels (World Bank 2008 2020; COWI 2022, 2023).[9]

2.13 PDISA's approach to align network expansion with existing production capacities, instead of investing in new bulk production, placed additional pressure on water supply, which affected service reliability. PDISA prioritized network expansion over investments in bulk water production or reducing water losses by making targeted, strategic investments within the available resources. However, IEG found that investments contributed placed additional pressure on water supply that resulted in a reduction in the number of hours of water supply service to urban customers. [10] Utility company technicians confirmed that network expansions made it more difficult to meet demand. To cope with these shortages, utilities provide water to selected neighborhoods only a few times a week. By comparing average volume of water production per installed connection, the PPAR found that the utility companies supported by PDISA only produced about 58 percent of the amount produced by a comparison group of utility companies not supported by PDISA between 2020 and 2023 (see appendix D for details). It is worth noting that PDISA II, building on the experiences from PDISA, focuses more on addressing supply issues than PDISA did (World Bank 2017). While this is necessary, it also introduces new challenges in determining how utilities will manage the associated increase in operational expenditures, particularly for electricity costs, associated with the new production facilities. Another approach to increasing water availability would be to reduce water losses, which is often more cost effective than increasing the water supply (Wyatt et al. 2016).

2.14 While dropping "reliability of service" as a project objective was a pragmatic decision, the project's limited success in strengthening reliability limited its benefits. Operationally, dropping the reliability aspect of the project development objective was a sound decision, as achieving this objective was not aligned with the project's design, which prioritized new connections over addressing water supply issues and its achievement would have depended on numerous variables beyond the project's control. However, moving forward, it is crucial that projects ensure that investments in increasing the number of connections are accompanied by corresponding investments in water production to meet the growing demand and maintain quality of service. Projects could achieve this objective either by financing investments in water supply directly or by supporting a reduction in NRW through other means, such as better donor coordination.

2.15 PDISA did not extend the necessary support to help the government and the utilities secure sufficient water resources in a sustainable manner to meet the growing demand generated from the additional connections financed by PDISA. In at least one case reviewed by the IEG team, the expansion of the water network was accompanied by investments in extracting groundwater. Since these pumps drew water from the same aquifer as the existing system, the investment increased the system's vulnerability to aquifer drawdowns, particularly during drought years. When a severe drought affected the area between 2019 and 2022, the aquifer completely dried up, and the water resources have not yet fully recovered. This outcome underscores the critical importance of managing groundwater and surface water holistically to address escalating climatic risks. To effectively respond to these challenges, future water supply projects must integrate comprehensive WRM strategies from the outset, ensuring stronger impact and alignment with broader sectoral goals. Traditional water management approaches, which rely on historical rainfall and weather patterns, must be replaced with data-driven strategies that proactively mitigate future water supply risks. Building on lessons learned from PDISA, the recently approved World Bank project RECLIMA intends to support this risk mitigation by mapping groundwater resources and assessing their quality to improve the knowledge base for decision-making (World Bank 2022).

2.16 The high level of NRW is a significant constraint for utility companies in achieving cost recovery and a major WRM concern. The average level of NRW for PDISA-supported provinces was 55 percent between 2020 and 2023, while it was 59 percent for a comparison group of utilities using the same methodology as for relative production (described in appendix D). This finding implies that less than half of the water produced by the utility companies is paid for by the consumers, and the rest of the water is lost as commercial or technical losses. The finding was supported by interviews with technicians from utility companies who estimated the range of losses between 50 percent and 70 percent. As a comparison, the average NRW for lower-middle-income countries is 40 percent (New IBNET n.d.). While the utilities could not provide IEG with an accurate breakdown of technical versus commercial losses, their estimates suggest a 50–50 split. The challenges in addressing NRW begin with a lack of data to distinguish between the share of commercial and technical losses, which are critical for enabling utilities to prioritize their efforts effectively. Second, utilities often face limited capacity to tackle both technical losses—through the maintenance and repair of pipelines—and commercial losses, which require improvements in metering, billing, and fee collection systems. Finally, there is a lack of incentives for utilities and other stakeholders to prioritize NRW reduction, further hindering progress in this area. While PDISA included efforts to address each of these challenges in different ways, as discussed in the following sections, PDISA was not explicitly designed to address NRW. Since reducing NRW is crucial to achieve financial sustainability of utilities and ensure quality of service provision—goals that were central to PDISA, future World Bank engagements should pay more attention to addressing NRW in project design.

2.17 Data collection on NRW was supported by the installation of metered connections, but meters were vandalized, and utilities struggled to collect the data from them to inform billing each month. All connections that PDISA installed were metered. IEG found several issues related to the meters during visits to the water utilities. There is a problem with vandalization of the meters for their scrap value, and some households disabled meters to pay a lower flat rate instead of the consumption-based block tariff rate. In addition, the utilities struggled to collect the data from metered customer since they had to physically go to households and manually read the meters each month to inform billing. Instead, utility staff preferred the easier option of switching from metered billing to flat-rate payments to improve collection, which would increase NRW.

One concern is that several large water consumers, like private companies and public institutions, end up with unmetered connections and pay a flat fee that is much lower than it should be based on the amount of water consumed. If the installation of meters had targeted larger water consumers, it could have reduced commercial water losses.

2.18 PDISA supported the reduction of technical water losses through the rehabilitation of old networks, but achievements may have been undermined by the reduction in service continuity. Over 1,000 kilometers of water networks were installed or rehabilitated under the project. TA supported utilities on maintenance and upkeep, as well as customer responsiveness. However, these key performances were not sufficiently monitored under PDISA. As part of PDISA II, the number of complaints addressed within 72 hours is one of the performance indicators monitored in the payment-for-results contracts, which is positive. It is worth noting that the reduction in continuity of supply may have undermined efforts in pipe rehabilitation because the risk of technical losses is higher when the continuity of hours of supply is low. But overall, since technical losses were not monitored, it is difficult to evaluate the outcome of the efforts to reduce technical losses.

2.19 The establishment of a water regulator, IRSEA, could potentially incentivize the water utilities to reduce NRW since IRSEA does not allow the utilities to cover NRW-related costs in their water tariff proposals. This incentive structure will push the utilities to reduce the NRW. Before PDISA, this incentive structure did not exist, and it is a major improvement from the previous system. However, naturally, due to the high levels of NRW, the new tariff will not allow utilities to recover the costs of operation. At the time of the IEG mission, a water tariff based on the new and improved methodology that would lead to this objective had not yet been finalized but proposals were under review.

2.20 As mentioned previously, the TA provided under PDISA was not designed to contribute to NRW monitoring or reduction. In PDISA, TA was focused on support to utilities for basic operation and management, and while utility-level performance indicators were monitored,[11] TA providers were not held accountable for performance, and NRW was not among the indicators covered(World Bank 2020, annex 7).[12] Building on lessons from PDISA, PDISA II has moved to a performance-based management contract approach with payment for results, which reflects a major improvement. However, the level of NRW is still not included among the performance indicators against which the TA firms receive payments (COWI 2022, 2023).

2.21 To help utilities address NRW, future engagements should consider facilitating comprehensive NRW reduction programs in the utilities, including both investments and performance-based contracts based on NRW. Performance-based management contracts with private companies, incorporating payment structures tied to NRW reduction achievements, have yielded positive results in various contexts (Kingdom et al. 2006). Case studies from Malaysia, Barbados, and Brazil illustrate the positive impact of the use of performance-based contracts on NRW reduction (Kingdom et al. 2018). For these contracts to be effective, private firms must be given sufficient authority to implement necessary measures, such as enforcing operational changes or investing in technological upgrades. Additionally, complementary investments in infrastructure and equipment, such as metering systems and leak detection technologies, are critical to achieving sustained NRW reduction (Wyatt et al. 2016).

2.22 Collection efficiency, which is the percentage of the billed amount that a utility can collect from its consumers, lags other performance aspects, perhaps due to the lack of incentives for utilities to reduce commercial losses. In 2023, collection efficiency was 70 percent, which was the same as in 2019, when the project closed, and lower than in 2016, when collection efficiency was 75 percent (World Bank 2020; Angola, Ministério da Energia e Águas n.d.). In interviews with utility companies, the IEG mission team was informed that their priorities to improve collection efficiency focused on community-sensitization campaigns, better payment options, customer responsiveness, and improved collection rates among large water consumers, including public institutions such as provincial governments, municipalities, police departments, and schools. However, while the technical aspects of improving cadastres, billing, and payment technology are important, addressing issues related to incentives and corruption are much more challenging (Andrés et al. 2021; Jenkins 2017). Anecdotal evidence collected by IEG suggests that paying off collection officers to avoid paying or to lower water bills is a common practice in the country. However, on a positive note, IEG captured a story from one utility company that had achieved compliance from the police department by threatening to cut the connection. Conversely, the same utility company cut the water connection for local schools due to noncompliance.

2.23 The activities financed by PDISA associated with WRM have not achieved their objectives of establishing a system for WRM and improving hydrological monitoring.[13] PDISA financed the Kwanza River Basin Management Plan to establish a system for WRM. While the plan included a useful diagnostic of water resources and water users, its impact was limited, as evidenced by the lack of stakeholder engagement, dissemination, follow up, and plan implementation. The rehabilitation of hydrological stations across the country has fallen short of supporting WRM monitoring and planning. Many stations fell out of use soon after the project's completion due to vandalization and a lack of maintenance. The IEG mission found that 24 stations were producing data, compared with 60 at project closing, two and a half years earlier (World Bank 2020).

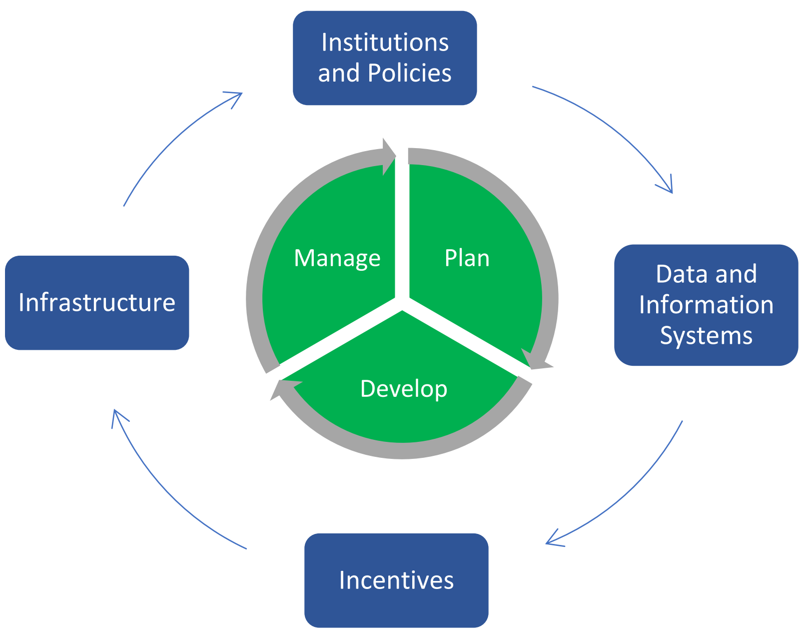
2.24 The WRM component of PDISA represents a missed opportunity for creating synergies across WRM and water supply that could build resilience for climate change. The rehabilitation of hydrological stations failed to integrate the data collected from these stations with the operational needs of utility companies. The selection and rehabilitation of hydrological stations were narrowly focused, prioritizing proximity to Luanda while disregarding the broader potential for supporting comprehensive water management. This lack of integration and strategic foresight in the WRM efforts under PDISA resulted in underused investments and reduced the overall impact on WRM. The PPAR found that utility companies in water-scarce areas continued to lack access to the hydrological and meteorological (hydromet) data needed to monitor their water resources. IEG findings indicate that coordinated efforts could have enhanced both resource management and operational efficiencies since utilities with greater proximity to stations could support their maintenance. (More comprehensive analysis of the WRM-related results is provided in the "Has Water Resource Management Improved?" section.)

2.25 Important aspects of water service delivery not covered by PDISA included water quality and wastewater treatment. While water quality is included in INRH's mandate, the institution currently does not have the bandwidth to address this issue, and water quality has not been the focus of the World Bank's engagement so far. The water supply component financed some laboratories and related equipment intended to track water quality, but wastewater treatment was not covered by PDISA, even though wastewater treatment capacity in Angola is almost nonexistent. A World Bank assessment found that about 10 percent of urban households have sewer connections, and less than 1 percent of the fecal sludge and wastewater collected is adequately treated (Lombana Cordoba et al. 2021). Wastewater is a potential resource that can—with simple treatment—be used for irrigation (Mishra et al. 2023) or energy production (Rani et al. 2022) and presents an opportunity for more comprehensive water management in the future with wide-reaching potential benefits. Building on lessons from PDISA, PDISA II has included financing of wastewater treatment infrastructure and TA on the institutional and regulatory aspects.

3. Has Water Resource Management Improved?

3.1 This section is a deep dive focusing on the impacts of PDISA as they relate to WRM.[14] According to the World Bank, WRM is defined as "the process of planning, developing, and managing water resources, in terms of both water quantity and quality, across all water uses. It includes the institutions, infrastructure, incentives, and information systems that support and guide water management"[15] (see figure 3.1). The stated objective of the WRM component of PDISA was to strengthen the institutional framework for WRM by (i) creating a dedicated WRM institution and defining its structure, responsibilities, and resources; (ii) developing WRM systems, including piloting an integrated basin management plan and (iii) rehabilitating WRM systems by reestablishing hydrometric stations to support sector planning (World Bank 2008; 2020). The impact of these "core WRM" activities is assessed under the subsections on Institutions and Policies and Data and Information Systems. Beyond the core WRM activities, PDISA also affected WRM through investments in water supply, which relates to infrastructure, and influenced incentives through the institutional reforms and establishment of utility companies and a water regulator. As such, all four "contributions" to WRM, as per the World Bank definition, are discussed in this section. PDISAs contribution to WRM is illustrated in a theory of change, included in appendix C.

Figure 3.1. Contribution to Water Resource Management



Source: Independent Evaluation Group.

Institutions and Policies

Institutions

3.2 PDISA supported the creation of INRH and helped define its structure, responsibilities, staffing, and financial arrangements, but due to capacity and resource constraints, INRH has been unable to carry out its mandate effectively. Moving the

WRM function out of the National Directorate of Water (Direcção Nacional das Águas) and establishing INRH as an institution with more operational autonomy under the directives and oversight of the Ministry of Energy and Water (Ministério da Energia e Águas)[16] was an important first step. Under this decree, INRH was delegated a comprehensive mandate around the management of water resources at both the national and basin levels, with the relationship between INRH and the Hydrographic Basin Administration Office that manages resources at the basin level described in the decree. INRH's role requires collaboration with many institutions in the water resources space to fulfill its mandate effectively. INRH currently operates in three key areas: developing water resources plans and data management, creating a cadastre of water resources and users, and overseeing dam safety and maintaining a dam database. However, it has a very limited work scope and operational reach for several reasons. First, INRH is underfunded and has only 8 employees, although the sanctioned number is 130 staff. Second, only one Hydrographic Basin Administration Office exists—the Office for the Administration of the Cunene, Cubango, and Cuvelai River Basins (Gabinete para Administração da Bacia Hidrográfica do Rio Cunene; GABHIC)—and this office is not operating under the supervision of INRH as envisioned in the decree, which limits INRH's operational reach at the basin level to a significant extent. Third, INRH has limited convening power, especially outside the water supply sector. While PDISA emphasized INRH's institutional setup and capacity, project documentation provided no explicit mention of efforts to enhance its convening power. The absence of this capability, combined with significant staffing shortfalls, constrains INRH's ability to manage water resources effectively.

3.3 The relationship between INRH and GABHIC resulted in the duplication of responsibilities. INRH was established in addition to the country's only existing subnational river basin administration, GABHIC. Despite GABHIC's subnational focus, it maintains its primary offices and staff in Luanda. This dynamic may stem from GABHIC's historical precedence over INRH, owing to Angola's transboundary river basin commitments dating back to the colonial period. GABHIC therefore operates autonomously from INRH because of its larger staff and their involvement in projects like the Permanent Okavango River Basin Water Commission,[17] in addition to other transboundary initiatives funded by big donors.[18] Several interviewees expressed confusion about the relationship between these two institutions. While the institutions collaborate on certain topics, such as hydrologic data collection, they also follow separate processes for the same tasks, such as in the implementation of the new water extraction fee and the water-user cadastre. An institutional assessment commissioned by the World Bank under PDISA II concluded that the coexistence of the two institutions under the current framework results in inefficiencies such as (i) unclear and overlapping functions, (ii) resource allocation inefficiencies, and (iii) fragmented planning and policy implementation. The assessment suggested a merger of the two institutions (CESCO Development Consultants 2020). However, the recently approved World Bank project RECLIMA will work directly with GABHIC for its interventions in the southern part of the country and with INRH in the rest of the country, supporting the current institutional setup. This PPAR supports the conclusion of the assessment that reconsidering the relationship between these institutions could benefit WRM in Angola.

3.4 Within Angola's Ministry of Energy and Water, WRM remains isolated, which reflects the World Bank's engagement as well. The IEG mission found that INRH's existing synergies primarily revolve around collaborations with entities such as the National Institute of Meteorology and Geophysics (Instituto Nacional de Meteorologia e Geofísica; INAMET) for flood alerts and with PRODEL, the national electricity company, for hydrologic data collection. However, broader synergies beyond the Ministry of Energy and Water remain limited, particularly for other large water-using sectors, such as agriculture and industry. Agriculture in Angola has a historical legacy of WRM through the organization of farmers around irrigation and water-user associations. The Ministry of Agriculture and Forestry includes the National Institute of Agriculture Hydraulics and Rural Engineering (Instituto Nacional de Hidráulica Agricola) under its umbrella and includes expertise in irrigation system management, which is relevant for improved WRM governance. World Bank–financed projects such as the Market Oriented Smallholder Agriculture Project (MOSAP I, P093699), the Smallholder Agriculture Development and Commercialization Project (MOSAP II, P154447), and the Angola Commercial Agriculture Development Project (PDAC, P159052) overlooked the potential role of the INRH, suggesting missed opportunities for synergy between ministries on water rights and raw water extraction, dam safety, and hydrological monitoring. However, it is worth noting that recently approved World Bank projects have started to address this gap. For example, RECLIMA supports the establishment of a water and agriculture coordination platform to be led by the Ministry of Energy and Water and the Ministry of Agriculture and Forestry to ensure synergies with the Smallholder Agricultural Transformation Project (MOSAP 3, P177305).

Policies

3.5 The Kwanza River Basin Management Plan (2017), piloted under PDISA,[19] provided insight into water availability and water use at the basin level that informed the rollout of the water-user cadastre. The plan was completed in 2018 and approved in Presidential Decree no. 122/22 in 2022. To assess the plan, IEG interviewed representatives from INRH, and stakeholders affected by the plan in the Kwanza River Basin. IEG concluded that the plan included many of the elements that make for a robust river basin management plan, including relevant data on and analysis of water quantity and quality; environmental, social, and economic indicators; a review of policies and plans affecting the implementation of the plan; financing needs; a monitoring framework; and organizational planning and plans for stakeholder engagement in implementation (World Bank 2006a, 2006b). The IEG mission found that the main contributions of the report itself were the results of a diagnostic analysis and particularly the water balance assessment of the river basin and water-use analysis, which INRH is now using to inform the rollout of the water-user cadastre and raw water extraction fee collection.

3.6 However, beyond providing some useful information on water availability and water use at the basin level, the activity has not achieved its intended objectives of establishing a WRM framework. The piloting of the Kwanza River Basin Management Plan was intended to help establish the necessary systems, institutional arrangements, policies, regulations, and financing for managing the country's many basins, in line with the systems envisaged under the 2002 Water Law. However, this was not achieved due to several shortcomings. First, basin-level institutions responsible for implementing river basin plans have not been established. As a result, the Kwanza River Basin Management Plan lacked locally anchored partners that could manage the implementation. The activity also lacked strategic partnerships nationally. For example, INRH or the World Bank team could have better incorporated lessons learned from the design and implementation of other river basin management plans in the country, particularly those of GABHIC.[20] In addition, the IEG mission found that key stakeholders had not been adequately consulted in the process of preparing the Kwanza River Basin Management Plan. The most important water users in the region are the utility companies, and the IEG mission found that the companies were not familiar with the plan. Similarly, the plan was not disseminated to relevant stakeholders, and there had been no follow up on the monitoring framework laid out in the plan. As such, the objective of this activity to establish necessary systems for managing the country's river basins was not achieved. The result also indicates a lack of integration between the WRM and the water supply–focused interventions of PDISA.

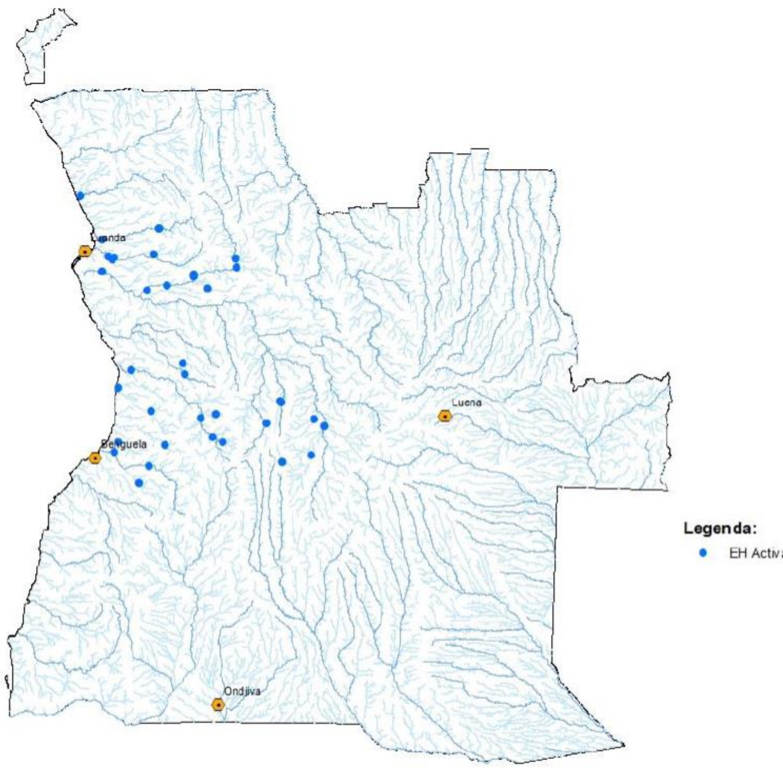
Data and Information Systems

3.7 PDISA financed the rehabilitation of 35 hydrological stations to support WRM monitoring and planning for the sector. At appraisal, 35 of the country's hydrological stations were functional (World Bank 2008). These stations were managed by GABHIC and PRODEL, the national electricity company. The project initially planned to support the rehabilitation of all 189 abandoned hydrological stations. However, during an initial evaluation of the state of the stations after the project had become effective, the team realized that it would require higher-than-anticipated costs. Consequently, this number was reduced to 35 stations at the project's restructuring in 2016. According to the ICR, there were 60 stations recording data at project closing, including the 35 financed by PDISA (World Bank 2020).

3.8 INRH has not been able to maintain the stations, and many stopped working shortly after project closing. The IEG mission found that INRH is only capturing data from 24 stations. According to INRH, this number included stations under GABHIC's and PRODEL's management as well. The stations financed under PDISA had technology that enabled automated transmission of data. This technology stopped working shortly after installation, so the team must travel to each of these stations (17 in total) twice per year to retrieve the data stored on the hard drive. For the other stations, the data are retrieved in other ways, such as through partnerships.

3.9 The engagement on the rehabilitation of the hydrological stations was not guided by clear strategic objectives and engagement with potential partners, missing opportunities for synergies. The objective of the hydrological data collection was not well defined and was only expressed in general terms such as "to support management of water resources." Due to the postconflict situation in Angola, the team was not able to assess the inventory of existing stations or the strategic importance of the different stations for the overall system. However, the project also did not clarify the end-user or the purpose of the data collection. For example, there was a missed opportunity to align the selection of stations with the needs of utility companies in the provinces and the management of dams used for irrigation, which typically do not have their own stations (in contrast to PRODEL's hydro dams). Instead, the selection of stations to rehabilitate was based on proximity to Luanda, ease of access, and availability of historic data from the site (INRH 2018). As a result, the stations financed by PDISA are concentrated around Luanda (see map 3.1), leaving the rest of the country unmonitored. The IEG mission found that even utility companies located in areas with active hydrological stations financed under the project are unaware of the stations' existence, again indicating that these two components were not well integrated. Improved buy-in from more local actors could have supported local ownership and use of the data, which also could have benefited maintenance of the stations.

Map 3.1. Location of Hydrological Stations Managed by the National Water Resources Institute



Source: INRH 2018.

3.10 The World Bank project team overestimated the technical capacity of INRH to collect and manage the data, as well as the operation and maintenance needs associated with station maintenance, and the TA provided to INRH was not able to bridge these gaps. The nature and rigor of the TA provided to INRH is unclear, but evidence suggests that the institute received insufficient support and training for setting up the monitoring systems and managing hydrological data. INRH's ability to maintain the stations is extremely limited due to lack of budget and capacity. The rapid deterioration of stations was therefore driven by a lack of maintenance, as well as by vandalization (INRH 2018). However, the IEG mission also found reports of stations in seemingly good condition that are not in use, suggesting the need to take stock of existing stations. In addition, the rapid deterioration of the transmission technology of the stations indicates the presence of installation errors.

3.11 The IEG mission did not find any clear evidence that the hydrologic data was actively used for decision-making. In the ICR the team wrote, "[T]hese data... [have] been used to inform the PNA [National Water Plan] (Presidential Decree 126/17, June 2017), the National Emergency Plan for Water (Presidential Decree 9/13, January 2013), and the General Plan for Development and Use of Water Resources of the Kwanza River

Basin (approved in February 2018)" (World Bank 2020, 13). However, after reviewing these documents, it is not clear how the data collected from the stations financed under the program have been used.[21]

3.12 When more fit-for-purpose technology and approaches are used, INRH can carry out its mandate. The IEG mission identified a partnership between INRH, INAMET, and the National Civil Protection Authority (Comissão Nacional de Protecção Civil) to support an early-warning system focused on flooding. As part of this partnership, INRH provides daily updates via email on river water volume, calculated using manual readings from river-depth gauges that are collected by five local custodians and communicated to INRH via cell phones. This information is then sent to a team at INAMET that combines the water levels with rainfall projections, information that is subsequently shared with National Civil Protection Authority as a simple yet effective flood risk monitoring system. The activity is supported by a partnership between INAMET and Meteo France International, while the flow charts and manual monitoring system were developed by INRH with support from the Norwegian Water Resources and Energy Directorate (Norges vassdrags- og energidirektorat). Since PDISA II also plans to invest in telemetric stations, which will face the same issues, this is an opportune time for the World Bank team to think strategically about the placement of these stations and how to support locally anchored and practically oriented partnerships linked to these stations. It is also good practice to complement telemetric technology with manually readable river-depth gauges.

Incentives

3.13 The institutional reforms supported under PDISA, such as the creation of the utility companies and a regulator, have supported a model based on cost recovery. Thanks to these reforms, the water sector is in a better position to have the price of water reflect its value, leading to a more efficient delivery model that can promote more sustainable use of water resources. The utility companies contribute to this model of cost recovery by improving billing and collection efficiency, as well as through community sensitization. One utility company technician said, "People believe water is free" and mentioned that the government's slogan "Water for All" has reinforced this idea. Community sensitization campaigns are used to communicate the cost of service delivery. Some utilities even produced songs to communicate this message to citizens. IRSEA is contributing to this effort by promoting a pricing model based on cost recovery that enables utilities to charge a price for water that is more closely related to the cost of water production and service provision (capital expenditures are currently covered by the central government).

3.14 In addition, PDISA and the establishment of and support to INRH have helped develop regulations that mandate INRH (and GABHIC) to charge a fee for raw water extraction. The law underpinning this regulation was designed to promote sustainable use of water resources while helping to finance integrated WRM (Presidential Decree no. 41/21). The approval of this law is a positive development for WRM in Angola but raises new questions about how the WRM institutions will carry out their mandate in practice. INRH and GABHIC have both started to register large water users. Low-hanging fruit for water charges include the utility companies; the Luanda public utility company is the first to pay the raw water extraction fee to INRH. Meanwhile, utility companies at the provincial level want to see the WRM institutions enforce the raw water extraction fee to dissuade the proliferation of unregulated wells. However, beyond the utility companies, it is not clear how the WRM institutions will be able to monitor water extraction and enforce the fee, considering their limited resources in relation to the large number of water users who are subject to the law. Even if they create local administrations, the challenge is enormous, and the institutions have limited leverage over these water users.

3.15 Finally, as previously discussed, future projects could do more to strengthen the utilities' incentives to reduce water losses, a major WRM concern. Although some activities under PDISA may have supported NRW reduction, such as metering, rehabilitation of pipes, and technical capacity building, PDISA was not designed to address NRW, and progress was not monitored through the project. Reducing NRW of the water supply system is a major WRM concern and future engagements in the water sector should support utilities to address NRW in a more comprehensive way.

Infrastructure

3.16 The investments in water supply made under PDISA did not fully consider the principles of sustainable WRM, though experiences from PDISA emphasize the growing importance of WRM in water supply. The PPAR found that investments in household connections were made with insufficient consideration for existing bulk water production capacity or NRW reduction. As noted already, the IEG mission found evidence of at least one case in which World Bank investment in water production may have negatively affected the ability of local water resources to replenish the exhausted aquifer. The lack of consideration for WRM in the water supply interventions mirrors the findings, also discussed in the previous section, regarding the lack of integration of WRM-related activities with those related to the water supply. This lack of consideration for WRM may also reflect a shift, driven by increased climate risk and climate awareness, away from an approach that assumes that water resources will be readily available to one in which the sustainable management of water resources is needed for the country to achieve its development goals, such as improved access to water in the case of PDISA. This approach aims to enhance access to water without compromising vital objectives such as agricultural development, biodiversity conservation, and climate resilience strengthening. To achieve the goal of enhanced access to water, the government of Angola needs to recognize the importance of INRH in achieving improved WRM and allocate sufficient funding for this institution to carry out its mandate.

4. Lessons

1. **Effective WRM requires a strong institutional framework with adequate capacity and resources.** The project demonstrated that without sufficient capacity, resources, and technical support, INRH struggled to carry out its WRM mandate effectively. This limitation resulted in significant gaps in data collection, analysis, and infrastructure maintenance, hindering INRH's ability to implement WRM effectively. Moreover, although INRH was acknowledged as a WRM authority within the water supply sector, the evaluation found lack of demonstrated evidence of its convening power beyond this sector, limiting its ability to unify and coordinate various institutions and interests. However, the relationship between INRH and the Office for the Administration of the Cunene, Cubango, and Cuvelai River Basins (Gabinete para Administração da Bacia Hidrográfica do Rio Cunene; GABHIC) complicated effective coordination due to overlapping responsibilities and resource allocation inefficiencies. External assistance needs explicit and persistent engagement from technical experts to develop the relevant institutions and improve their ability to effectively manage water resources.

2. **Effective WRM requires accurate, timely data and fit-for-purpose hydrological and meteorological (hydromet) infrastructure.** The project demonstrated that sustainable water management hinges on reliable hydrological data, often unavailable to the stakeholders who rely on these data for decision-making due to inadequate integration between WRM and supply components. The location of hydrological stations and technology choices led to challenges, including equipment failure due to lack of maintenance and insufficient local training, as well as vandalism. Simpler, more sustainable technologies, like manual gauge readings reported via cell phones, proved more effective and sustainable. Ensuring the availability of relevant data for decision-making requires not only fit-for-purpose and cost-effective technology coupled with local training and support systems but also hydromet infrastructure that is integrated well with the water supply sector, as well as other sectors reliant on these data.

3. **Not addressing NRW undermines the benefits of investments in water supply and WRM and negatively affects financial and environmental outcomes.** While the project included activities that could have contributed to NRW reduction through measures like metering and pipe rehabilitation, reducing NRW was not an objective of PDISA. The TA-based service contracts did not hold the TA provider accountable for whether performance was enhanced, and NRW was not monitored through the contracts. As such, these contracts did not create stronger incentives for TA providers to monitor NRW, understand what drives NRW, and help the utilities reduce water losses directly. The creation of robust incentive structures to encourage utilities to minimize water losses alongside investments in physical infrastructure that reduce losses are important contributions to effective WRM.

4. **Network expansion needs to be aligned with production development and cost management for reliable service provision.** The project prioritized network expansion over bulk water production capacity and NRW reduction, adding to water shortages that contributed to unreliable service, which undermined the benefits of the network investment. This project's experience also underlined the crucial importance of establishing adequate water storage facilities to maintain a consistent and reliable service. This project also demonstrated the need to ensure that utilities can absorb the operating costs from new production facilities by securing enough new clients.

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[1] Improved drinking water sources are defined as those that are likely to be protected from external contamination, especially from fecal matter (WHO 2024).

[2] With respect to WRM, the Water Law envisaged water resources to be managed at the basin level, and the Strategy for Water Sector Development (2003) highlighted the need to identify and quantify water uses, identify water resources, and establish a water balance.

[3] The project was implemented by the Ministry of Energy and Water (Ministério da Energia e Águas;) and the National Directorate of Water (Direcção Nacional das Águas; DNA).

[4] The Emergency Multi-Sector Recovery Program Project I (P083333) and II (P095229) included, among other things, support for the rehabilitation of urban water supply systems after the war.

[5] In addition, the World Bank approved the first ever World Bank guarantee of a water supply project in Angola—Luanda Bita Water Supply Guarantee Project (P163610, US$500 million) in 2019, building on the long and strong relationships between the World Bank and the water sector.

[6] The African Development Bank designed an intervention in 2015 that was highly influenced by PDISA and included capital investments in water supply and sanitation and TA to the provinces that were not covered by PDISA.

[7] This ratio is slightly lower than a comparison group of utilities, not supported by the project, that had an average of 7 workers per 1,000 connections in 2022.

[8] Average cost recovery for the three (out of six) PDISA-supported utilities for which data were available in 2023 was 70 percent. For a comparison group of utilities, average cost recovery was also 70 percent.

[9] Data from 2023 show a slight improvement in the average hours of supply (13 hours), which can be accredited to a new production site opening in Malanje that enabled 24 hours of supply in that area, as well as the ongoing TA of PDISA II. Unfortunately, there are no data on hours of supply available for non-PDISA-supported provinces.

[10] In a context like Angola, where water losses are very high, limiting NRW may be as important as increasing bulk water production to satisfy the demand for water.

[11] Providing TA via on-the-job training through management contracts produced some positive results, but questions remain regarding how much of the knowledge was transferred. The TA was provided by international experts who operated alongside the utility companies, allowing staff to learn on the job. Many interviewees from civil society, utility companies, and the PDISA project management team raised concerns about the overdependence on foreign experts. Finding ways to strengthen local capacity and professionalization remains a challenge and a priority.

[12] This omission is notable, as NRW was flagged as a major concern in the Project Appraisal Document (World Bank 2008, 33, 79) but was not mentioned in the ICR.

[13] The activity focused on hydrological rather than hydrometeorological data collection. Some of the installed stations may have capacity to capture hydrometeorological information, but this was not the focus. As such, all stations were placed near bodies of water.

[14] Since previous sections of this report assess the entire project, some of the aspects related to WRM will be repeated in this section.

[15] This definition comes from the World Bank Group's Water Resources Management website at https://www.worldbank.org/en/topic/waterresourcesmanagement#2.

[16] As mandated by Presidential Decree 205/14 and later replaced by Presidential Decree no. 118/21

[17] For more information about the Permanent Okavango River Basin Water Commission, see the website at https://www.okacom.org/.

[18] These donors include the European Union, the Global Environment Facility, the Swedish International Development Cooperation Agency, and National Geographic.

[19] At appraisal, the Cubango and Kwanza rivers were considered for the pilot. In 2011, as part of the project's restructuring, the Cubango River was replaced by Cubal da Hanha-Catumbela-

Cavaco-Coporol watersheds. In the 2016 restructuring, the PDISA team decided to only support the Kwanza River Basin Management Plan, as the Cubango River Basin Plan was developed using government funds.

[20] The Plan for Integrated Use of Water Resources in the Cunene Hydrographic Basin (Plano para Utilização Integrada dos Recursos Hídricos da Bacia Hidrográfica do Cunene) was approved in 2002. The General Plan for the Integrated Use of Water Resources in the Cubango Hydrographic Basin (Plano Geral de Utilização Integrada dos Recursos Hídricos da Bacia Hidrográfica do Cubango) was approved in 2016.

[21] The emergency plan was issued in 2013, before any of the stations were built. The PNA (2017) refers to PDISA, and states that none of the stations were working yet so it cannot have been informed by data produced by these stations. Finally, the Kwanza River Basin Management Plan was finalized around the same time as the PNA, so the stations were likely not online yet. It is much more likely that the surface-level water assessments, presented in these documents, were based on historical data rather than data from the PDISA-financed stations. In addition, credible reports from a team that worked with INRH advised IEG that they could not locate any hydrological data from before 2018.

Bibliography

Andrés, Luis Alberto, Gustavo Saltiel, Smita Misra, George Joseph, Camilo Lombana Cordoba, Michael David Thibert, and Crystal Fenwick. 2021. *Troubled Tariffs: Revisiting Water Pricing for Affordable and Sustainable Water Services.* World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/568291635871410812/troubled-tariffs-revisiting-water-pricing-for-affordable-and-sustainable-water-services.

Angola, Consultoria de Serviços Estudos e Presquisas - COSEP - Consultoria Lda, Consultoria de Gestão e Administração em Saúde - Consaúde Lda, and Macro International. 2007. *Angola Malaria Indicator Survey 2006–07* [Dataset]. COSEP Consultoria de Gestão e Administra ção em Saúde – Consaúde Lda and Macro International. Available at http://dhsprogram.com/pubs/pdf/MIS2/MIS2.pdf.

Angola, Instituto Nacional de Estatística and ICF International. 2016. *Angola Demographic and Health Survey 2015/2016* [Dataset]. https://dhsprogram.com/data/dataset/Angola_Standard-DHS_2015.cfm?flag=0.

Angola, Instituto Nacional de Estatística, Ministério da Economia e Planeamento. 2021. *Inquérito Sobre Despesas, Receitas e Emprego em Angola (IDREA) 2018–2019* (database). https://andine.ine.gov.ao/nada/index.php/catalog/6/study-description.

Angola, Ministério da Energia e Águas. n.d. "Boletim Trimestral—Quarterly Reports." Governo de Angola Ministério da Energia e Águas. https://www.minea.gov.ao/index.php/epas/category/210-boltri.

Angola, Ministério do Planeamento. 2007. *Angola 2025. Angola um País com Futuro. Estratégia de Desenvolvimento a Longo Prazo para Angola (2025).* Governo de Angola Ministério do Planeamento.

Cain, Allan, and Afonso Cupi Baptista. 2020. "Community Management and the Demand for 'Water for All' in Angola's Musseques." *Water* 12 (6): 1592. https://doi.org/10.3390/w12061592.

Cain, Allan. 2020. *Community-Managed Water and Building Social Capital in Angola*. Development Workshop Angola. https://dw.angonet.org/forum/dw-2020-community-managed-water-and-building-social-capital-angola/

CESCO Development Consultants. 2020. "Review of the Legal and Institutional Frameworks of the Angola Water Sector." Technical Report 3: Strategic Plan for Water Sector Institutional Reform. CESCO Development Consultants.

COWI. 2022. *Independent Verification Agent Audit of Malanje, Huambo, Uíge, Bié, Cuanza Norte, and Huíla for the Project Implementation Unit Financial and Contract and Management Unit and Ministério da Energia e Águas de Angola.* COWI.

COWI. 2023. *Independent Verification Agent Audit of Malanje, Huambo, Uíge, Bié, Cuanza Norte, and Huíla for the Project Implementation Unit Financial and Contract and Management Unit and Ministério da Energia e Águas de Angola.* COWI.

Instituto Nacional de Recursos Hídricos (INRH). 2018. *Programa Estratégico de Expansão da Rede Hidrométrica Nacional.* INRH.

Jenkins, Matthew. 2017. "The Impact of Corruption on Access to Safe Water and Sanitation for People Living in Poverty." Transparency International. https://knowledgehub.transparency.org/assets/uploads/helpdesk/Impact-of-corruption-in-water-and-sanitation-on-poor-2017.pdf

Kingdom, Bill, Roland Liemberger, and Philippe Marin. 2006. "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries—How the Private Sector Can Help: A Look at Performance-Based Service Contracting." Water Supply and Sanitation Sector Board Discussion Paper Series No. 8, World Bank.

Kingdom, Bill, Jemima Sy, and Gerhardus Soppe. 2018. *The Use of Performance-Based Contracts for Nonrevenue Water Reduction: Output of the Global Program on Developing Good PBC Practices for Managing NRW.* World Bank.

Lombana Cordoba, Camilo, Luis A. Andrés, Lucrécio A. M. da Costa, and Crystal Fenwick, C. 2021. Diagnosing Angola's W*ASH Sector: An Urgent Call to Action.* World Bank.

Mishra, Soma, Rakensh Kumar, and Manish Kumar. 2023. "Use of Treated Sewage or Wastewater as an Irrigation Water for Agricultural Purposes: Environmental, Health, and Economic Impacts." *Total Environment Research Themes* 6: 100051. https://doi.org/10.1016/j.totert.2023.100051.

New IBNET (New International Benchmarking Network for Water and Sanitation Services). n.d. "Utility dashboard." https://newibnet.org/utility-dashboard.

Rani, Aishwarya, Seth W. Snyder, Hyunook Kim, Zhongfang Lei, and Shu-Yuan Pan. 2022. Pathways to a Net-Zero-Carbon Water Sector Through Energy-Extracting Wastewater Technologies. *npj Clean Water* 5 (1): Article 49. https://www.nature.com/articles/s41545-022-00197-8.

Serrat-Capdevila, Aleix, Natalia Limones, Javier Marzo-Artigas, Marcus Wijnen, and Bruno Petrucci. 2022. *Water Security and Drought Resilience in the South of Angola.* World Bank. https://openknowledge.worldbank.org/entities/publication/36d2c17b-c68a-5d8a-9f0e-4dcc2c6b8e69.

UNDP. 2016. *Post-Disaster Needs Assessment (PDNA)—Angola 2016: Report 1.* UNICEF.

UNICEF. 2023. *Bottleneck Diagnostic for the WASH Sector in Angola.* UNICEF.

World Bank. 2006a. "Briefing Note 1: An Introduction to Integrated River Basin Management." Integrated River Basin Management: From Concepts to Practice. World Bank.

World Bank. 2006b. "Briefing Note 7: River Basin Planning and Management." Integrated River Basin Management: From Concepts to Practice. World Bank.

World Bank. 2008. "Angola—Water Sector Institutional Development Project." Project Appraisal Document 42864, World Bank.

World Bank. 2016. "Angola—Smallholder Agriculture Development and Commercialization Project." Project Appraisal Document PAD1432, World Bank.

World Bank. 2017. "Angola—Second Water Sector Institutional Development Project." Project Appraisal Document PAD1942, World Bank.

World Bank. 2018. "Angola—Commercial Agriculture Development Project." Project Appraisal Document, PAD2029, World Bank.

World Bank. 2019a. "Creating Markets in Angola—Opportunities for Development Through the Private Sector." Country Private Sector Diagnostic 136519, World Bank.

World Bank. 2019b. "Angola—Luanda Bita Water Supply Guarantee Project." Project Appraisal Document 137066, World Bank.

World Bank. 2020. "Angola—Water Sector Institutional Development Project." Implementation Completion and Results Report ICR4814, World Bank.

World Bank. 2022. "Angola—Climate Resilience and Water Security in Angola (RECLIMA) Project." Project Appraisal Document, PAD4721, World Bank.

World Food Programme. 2021. "Drought in South-Western Angola Drives Severe Hunger." *WFP News Releases*, September 24, 2021. https://www.wfp.org/news/drought-south-western-angola-drives-severe-hunger.

Wyatt, Alan, Jennifer Richkus, and Jemima Sy. 2016. *Using Performance-Based Contracts to Reduce Non-Revenue Water.* World Bank.

Appendix A. Fiduciary, Environmental, and Social Aspects

Financial Management

Nothing in addition to the Implementation Completion and Results Report.

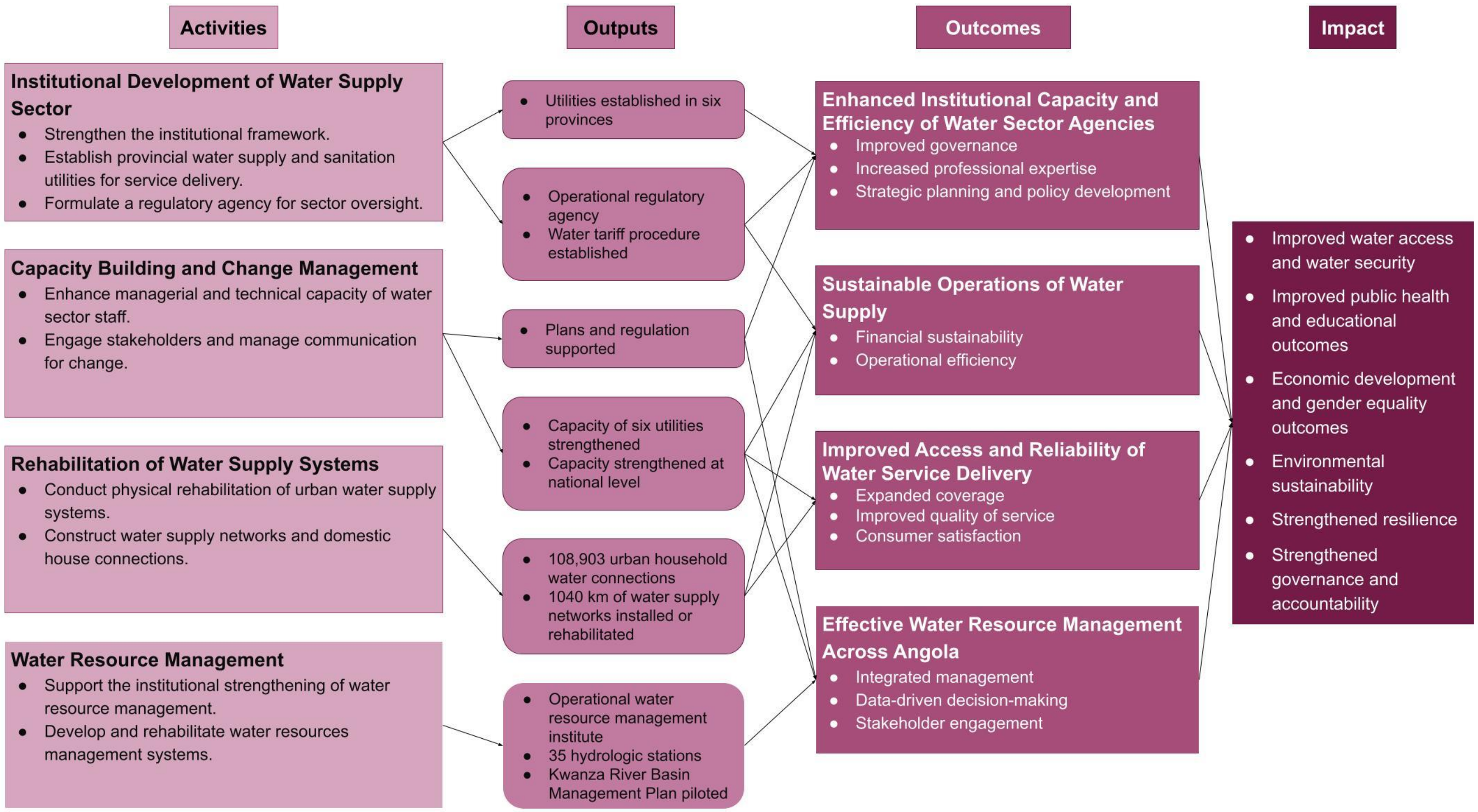
Procurement

Nothing in addition to the Implementation Completion and Results Report.

Environmental and Social Safeguards

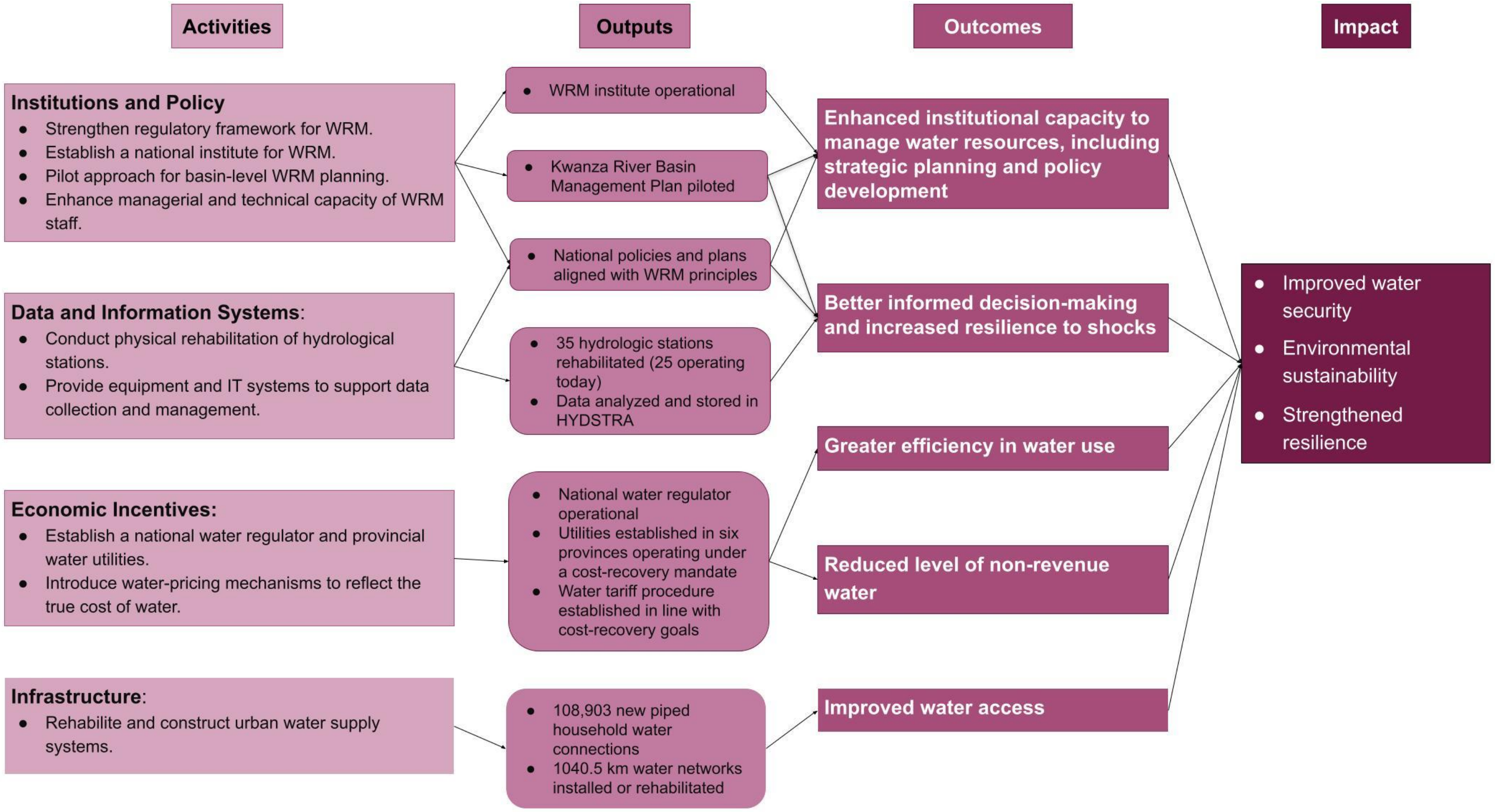
Nothing in addition to the Implementation Completion and Results Report.

Appendix B. Water Sector Institutional Development Project Theory of Change PDISA (Entire Project)



Source: Water Sector Institutional Development Project (Projecto de Desenvolvimento Institucional do Sector de Água, PDISA) theory of change (arranged by Independent Evaluation Group).
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project)

Appendix C. Theory of Change PDISA (WRM Only)



Source: Water resource management theory of change focus (arranged by Independent Evaluation Group).
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project); WRM = water resource management; HYDSTRA = a software for water data management.

Appendix D. Methods and Evidence

The Project Performance Assessment Report (PPAR) is the field-based evaluation instrument of the Independent Evaluation Group. The PPAR assesses projects financed by the World Bank for two purposes: (i) to improve the performance of World Bank projects by identifying lessons from experience, and (ii) to ensure the integrity of the World Bank's self-evaluation process and verify that the World Bank's work is producing the expected results.

This PPAR is part of a cluster of PPARs designed to identify lessons about the World Bank's engagement in water resource management (WRM). Due to the focus area of the cluster and since the project's Implementation Completion and Results Report (ICR) mainly focused on results related to water supply, this PPAR initially mainly focused on WRM (World Bank 2020). Regarding WRM, stakeholder interviews focused on three areas: (i) collection and management of data on water quantity, quality, and use; (ii) implementation status of the river basin management plans, focusing on the Kwanza River Basin Management Plan; and (iii) the link between the management of water resources and service delivery. However, during the field mission, additional evidence related to water supply was identified that had not been covered in the ICR. This evidence was complemented with data analysis (described in the following section).

The PPAR is based largely on interviews with project stakeholders in Luanda and three provincial capital cities during a field mission in February 2024, as well as on interviews with World Bank staff and experts from other international organizations. Over 30 interviews were carried out, including with over 50 stakeholders. The PPAR is also based on a review of project documentation and relevant literature. Finally, data analysis was carried out using information provided by the project implementation unit and data downloaded from the National Directorate of Water's (Direcção Nacional das Águas; DNA) website.

The mission included meetings in Luanda with relevant national institutions involved in the project and with nongovernmental and international organizations active in the water sector. The mission traveled to three of the six provinces that benefited from capital investments in the water supply system under the Water Sector Institutional Development Project (Projecto de Desenvolvimento Institucional do Sector de Água; PDISA) and met with the director and technical and financial officers of each of the utility companies. The field team interviewed both beneficiaries and nonbeneficiaries while in the province. The mission included a visit to an irrigation dam governed by the Ministry of Agriculture and Forestry for interviews with dam operators and water users.

Data Analysis

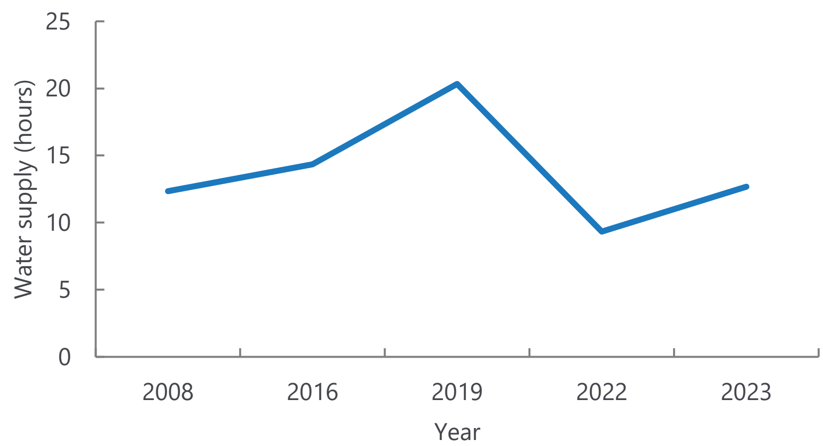
The PPAR used several data sources to assess the performance of utility companies and, where available and relevant, compared results with comparable utility companies in Angola that were not covered by PDISA. The data, methods, and results are described in the following sections.

Continuity of Supply

To assess reliability, the PPAR used continuity of supply as a proxy for reliability of service. Continuity of supply measures the hours of water service provided by the utility company. It provides a quantifiable metric that reflects service interruptions and allows for easy comparison across time. However, it has limitations, as it does not account for other aspects of reliability, such as water quality and pressure. As such, even in places with high continuity of supply, many households may have very limited access to water due to their location (for example, elevation, distance to influx) and the condition of the pipes leading to the household. That said, continuity of supply is the best proxy available to the PPAR for assessing reliability.

Continuity of supply is monitored at the utility level, and the information has been collected from project documentation. Information is only available for the utilities supported by PDISA. The PPAR was able to find data from 2008, 2016, 2019, 2022, and 2023 from the relevant utilities. The data from 2008 are from the Project Appraisal Document (PAD; World Bank 2008, 90). The data for 2016 and 2019 are from the ICR (World Bank 2020, 57). The data from 2022 (only data from the fourth quarter of 2022 were available) and 2023 (only data from the first through third quarters of 2023 were available, so an average value was used) are drawn from audited reports collected as part of the Second Water Sector Institutional Development Project (PDISA II). The data have issues. The data from the PAD have no source, so it is unclear how they were collected. The data from the ICR were collected under the project as part of the management contracts, but they were not audited, and the numbers seem quite high compared with the other data points, as well as with information gathered from the interviews with utility companies. The most reliable data are from the audited reports. Using these data, the PPAR found that continuity of supply was nine hours on average in 2022, which is lower than before the PDISA-financed investments (figure D.1). Improvements after 2022 cannot be credited to PDISA but are a result of efforts under PDISA II.

Figure D.1. Continuity of Water Supply (Hours), Average for the Utilities Supported by PDISA

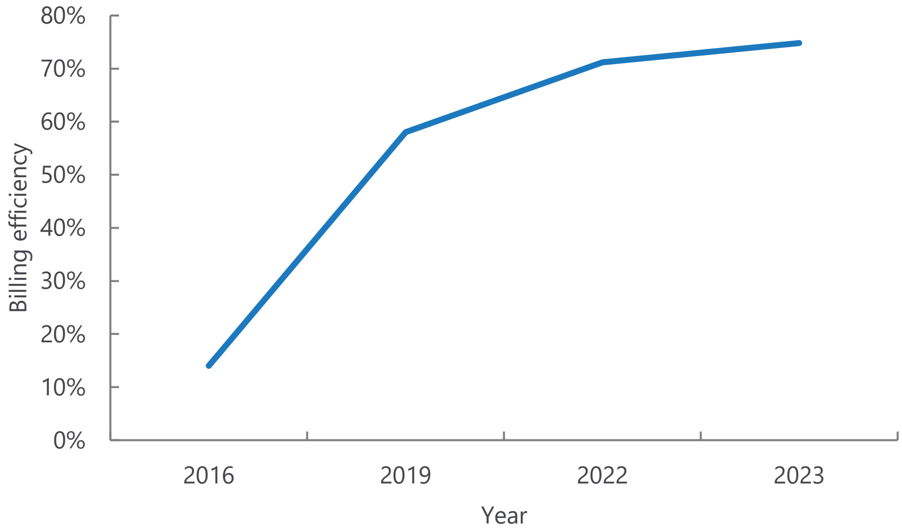


Source; World Bank 2008, 2020; COWI 2022, 2023.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project).

Billing Efficiency

Billing efficiency was calculated in the same way as continuity of supply, combining data from the ICR (for the years 2016 and 2019) with information from the audited reports produced under PDISA II (based on information available for the fourth quarter of 2022 and the first three-quarters of 2023). See figure D.2 to see the change in billing efficiency over time.

Figure D.2. Billing Efficiency for Utilities Supported by PDISA



Source: World Bank 2020; COWI 2022, 2023.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project).

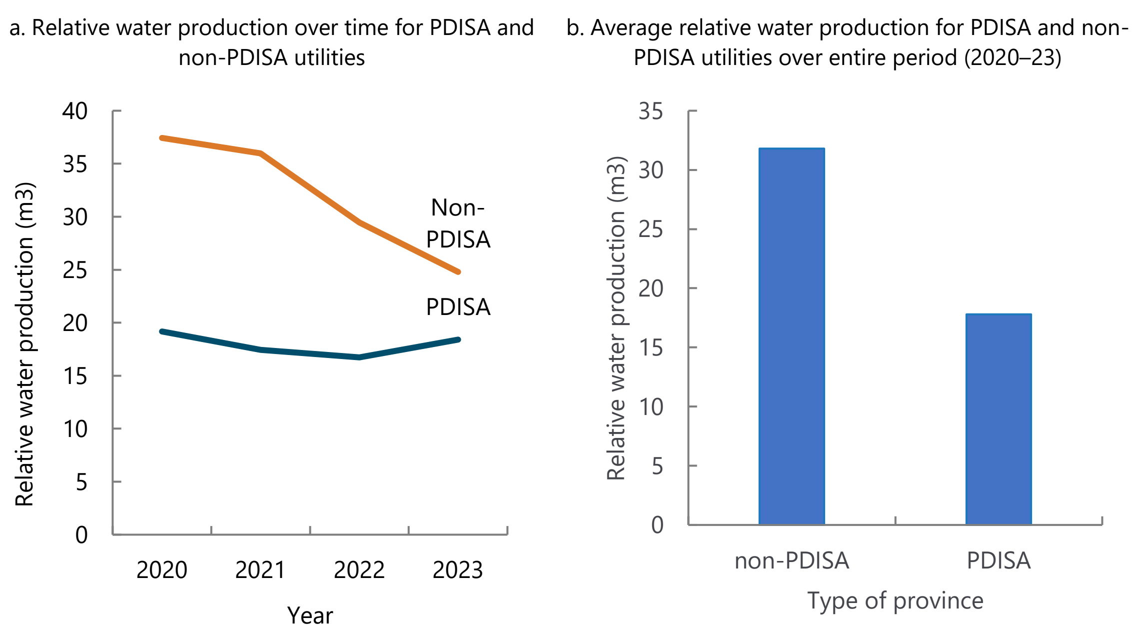
Comparative Data Analysis of Bulk Water Production

In the PAD, the World Bank project team flagged the potential risk of overwhelming water production by extending the network: "The key challenge is to maximize the use of the network by increasing the number of household connections with adequate quantities of water (that is, without additional investment in bulk supply) to produce the economies of scale required to generate adequate revenues" (World Bank 2008, 8). The project team decided to focus on Huambo, Uíge, Malanje, N'dalatando, and Kuito for the first wave of utilities because their water supply systems were being rehabilitated at the time. China and another World Bank project financed those investments in water supply.[1]

However, interviews with utility companies indicated that investments in expanding the network were not matched by investments in production. To assess the balance of supply and demand of water at the utility level, the PPAR looked at the volume of water produced per water connection and compared the relative production volume of utilities supported by PDISA with that of a comparable group of utilities not covered by the program (called "non-PDISA" utilities henceforth).[2] The data were drawn from quarterly reports prepared by the utilities and shared with DNA. They were downloaded on the Ministry of Energy and Water's (Ministério da Energia e Águas) website and covered the fourth quarter of 2020 through the third quarter of 2023.[3] The reports contained the volume of monthly production, averaged over the quarter, as well as the number of connections (public standposts are counted as one connection).

By comparing average relative water production over the entire period (2020–23), IEG found that PDISA provinces only produced 58 percent of what the comparison group produced (see figure D.3, panel b).[4] A contributing factor to this outcome could be PDISA's focus on household connections over public standpipes. If the utilities in the comparison group invested in public standpipes over private connections, it is possible that doing so would affect the volume of production per connection, which would be significantly higher for public standpipes. The fact that there is no significant difference in the number of connections between the groups does not support that theory, however. A standpipe-dependent model would result in a lower relative number of connections. Figure D.3, panel a, illustrates the annual value of relative water production and show a decreasing trend for non-PDISA, and a more stable trend for PDISA provinces.

Figure D.3. Relative Volume of Water Production per Connection per Month (Q4 2020–Q3 2023)



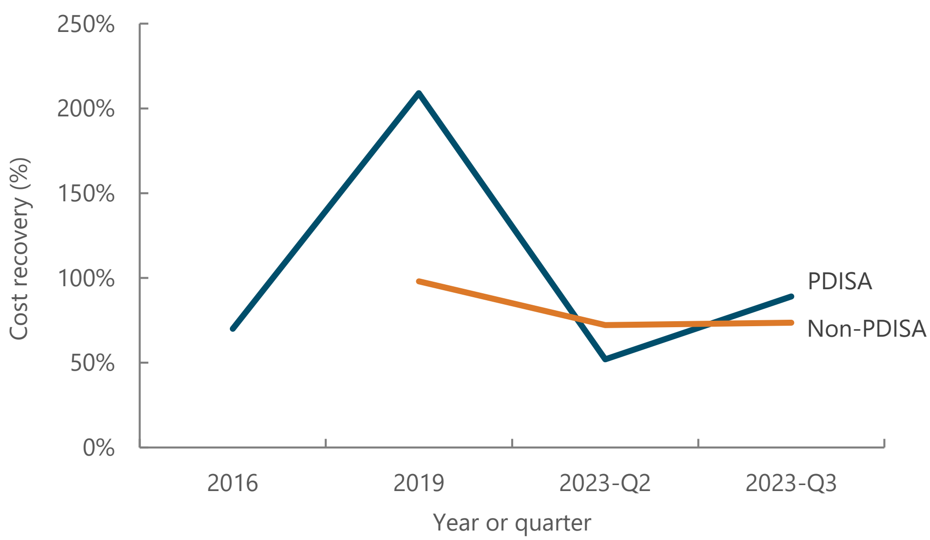
Source: Ministério da Energia e Águas. n.d.
Note: M^3 = cubic meter; PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project); Q3 = third quarter; Q4 = fourth quarter.

This simple assessment indicates that the intended phasing of investments in connections with other investments in water supply systems has not been enough to satisfy the growing needs of the water system generated by the expansion of the network. This could be a contributing factor to the lack of reliability in water service observed in the field. However, without information on continuity of supply from non-PDISA provinces, preproject data on production, information on the breakdown of standpipe and household connections by province, and information about the nature of investments in water production, it is difficult to understand what is driving this result and the role that PDISA may have played.

Cost Recovery

Cost recovery was drawn from the ICR (for 2016 and 2019) and the quarterly reports (World Bank 2020; Ministério da Energia e Águas. n.d.). However, the utilities did not start reporting cost recovery in the quarterly reports until the second quarter of 2023. Also, even then, information is missing for 7 of the 18 utilities, including half of the PDISA utilities. As such, information shown in figure D.4 should be interpreted with caution.

Figure D.4. Cost Recovery for PDISA and Non-PDISA Utilities Using Available Data

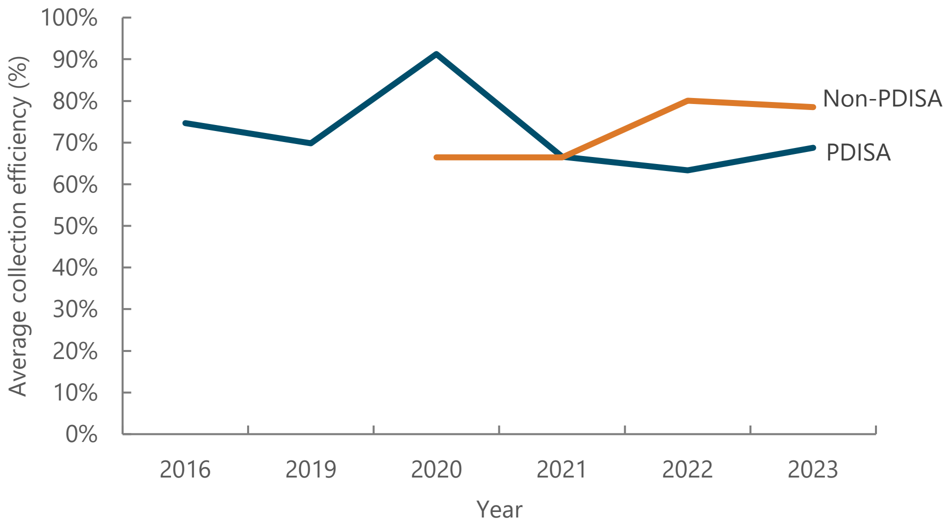


Source: World Bank 2020; Ministério da Energia e Águas. n.d.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project); Q2 = second quarter; Q3 = third quarter.

Collection Efficiency

Collection efficiency data were drawn from both the ICR (for the years 2016 and 2019) and the DNA quarterly reports (see figure D.5). Collection efficiency was reported both in the quarterly reports (2020–23) and in the audited reports from PDISA II (Ministério da Energia e Águas. n.d.; COWI 2022, 2023). Since the quarterly reports contained more data points and the values only deviated marginally from the audited reports, the PPAR team decided to use the quarterly reports in its analysis. It is worth noting that the values in 2020 are high due to large numbers reported in Bié in the third and fourth quarters of 2020.

Figure D.5. Average Collection Efficiency for PDISA and Non-PDISA Utilities

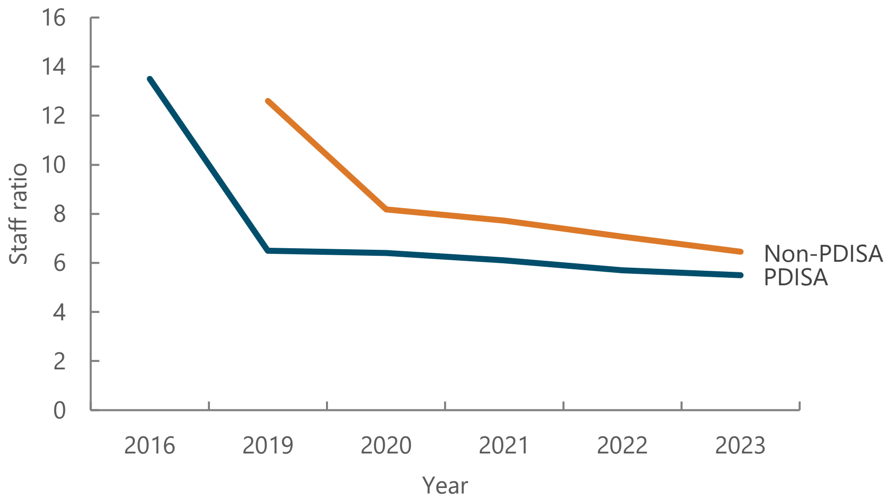


Source: World Bank 2020; Ministério da Energia e Águas. n.d.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project).

Staff Ratio (number of staff per 1,000 connections)

Staff ratio was also calculated by combining data from the ICR (for the years 2016 and 2019) with the quarterly reports (for years 2020–23) published by DNA. As such, staff ratio can be compared with non-PDISA utilities. Staff ratio has improved faster for PDISA utilities compared with non-PDISA utilities (see figure D.6).

Figure D.6. Staff Ratio Comparison Between PDISA and Non-PDISA Utilities

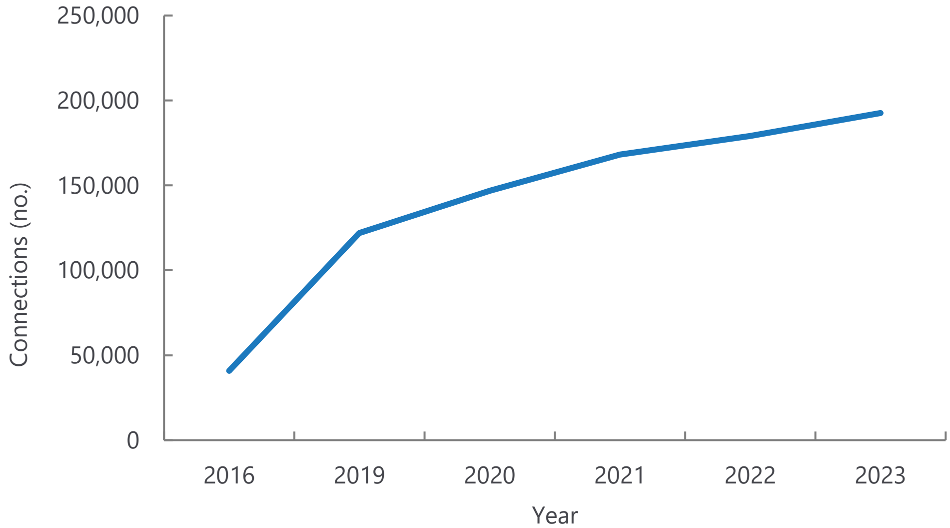


Source: World Bank 2020; Ministério da Energia e Águas. n.d.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project).

Number of Cadastre Connections

The number of cadastre connections was also calculated by combining data from the ICR (for the years 2016 and 2019) and the quarterly reports (for years 2020–23) published by DNA (see figure D.7). The number presented in figure D.7 is the sum of connections across all PDISA provinces. The number of cadastre connections is available for non-PDISA utilities as well, but since no preproject data are available for these utilities, a comparison is not informative. Instead, a comparison of relative coverage is discussed in the next section.

Figure D.7. Total Number of Cadastre Connections in PDISA Utilities, 2016–23

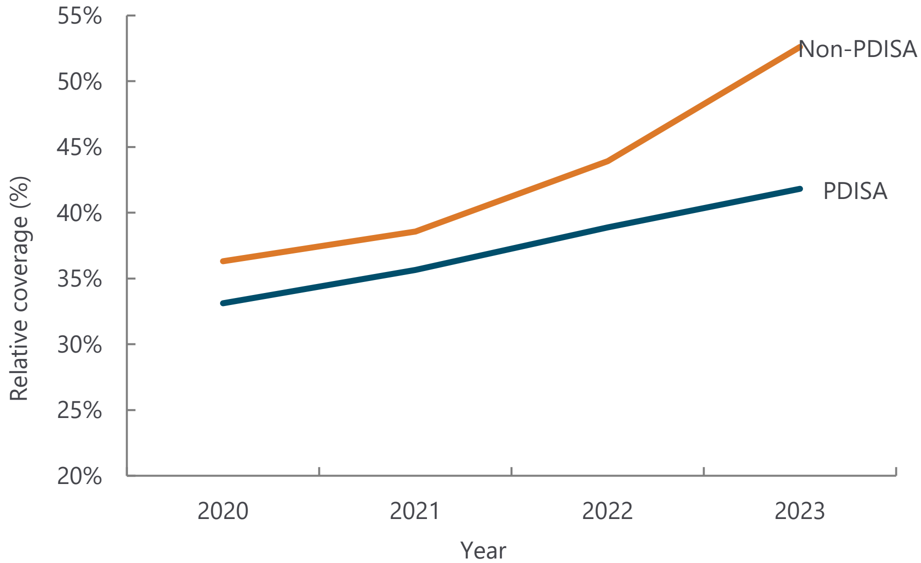


Source: World Bank 2020; Ministério da Energia e Águas. n.d.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project).

Relative Coverage

By combining the number of cadastre connections with city population data (drawn from Wikipedia in the absence of a better source), the PPAR team calculated coverage. There was no significant difference between PDISA and non-PDISA utilities in terms of city-level coverage at the completion of PDISA (see figure D.8). However, it seems like coverage has increased somewhat faster in the non-PDISA utilities, perhaps thanks to the engagement of the African Development Bank in those utilities. This statistic was not discussed in the main report but is included here for reference.

Figure D.8. Relative Coverage for PDISA and Non-PDISA Utilities, 2020–23



Source: World Bank 2020; Ministério da Energia e Águas. n.d.
Note: PDISA = Projecto de Desenvolvimento Institucional do Sector de Água (Water Sector Institutional Development Project). Relative Coverage is the total number of connections across all provinces, divided by the population in the provinces.

Presidential Decrees of Key Policies and Plans

Below is a list of presidential decrees covering key policies and plans related to the water sector that have been reviewed as part of this PPAR:

- Presidential Decree 6/02. 2002. The water law. Retrieved from https://www.fao.org/faolex/results/details/en/c/LEX-FAOC063753/
- Presidential Decree 9/13. 2013. National water plan. Retrieved from https://www.fao.org/faolex/results/details/en/c/LEX-FAOC120753/
- Presidential Decree 82/14. 2014. Regulation of general use of water resources. Retrieved from https://www.fao.org/faolex/results/details/en/c/LEX-FAOC132816/#:~:text=Angola-,Presidential%20Decree%20No.,General%20Use%20of%20Water%20Resources
- Presidential Decree no. 59/16. 2016. IRSEA established. Retrieved from https://lex.ao/docs/presidente-da-republica/2016/decreto-presidencial-n-o-59-16-de-16-de-marco/
- Presidential Decree 126/17. 2017. National water plan. Retrieved from: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC168058/

- Presidential Decree no. 230/18. 2018. Water tariff regulation. Retrieved from: https://lex.ao/docs/presidente-da-republica/2018/decreto-presidencial-n-o-230-18-de-03-de-outubro/
- Presidential Decree no. 255/20. 2020. Updated water tariff regulation. Retrieved from: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC198190/
- Presidential Decree no. 41/21. 2021. Raw water extraction fee. Retrieved from: https://leap.unep.org/en/countries/ao/national-legislation/presidential-decree-no-4121-approving-legal-regime-water
- Presidential Decree no. 118/21. 2021. Statute of the National Institute of Water Resources (INRH). Retrieved from: https://leap.unep.org/en/countries/ao/national-legislation/presidential-decree-no-11821-approving-statute-national-institute
- Presidential Decree 122/22. 2022. General plan for the development and use of water resources in the Kwanza hydrographic basin. Retrieved from: https://leap.unep.org/en/countries/ao/national-legislation/presidential-decree-no-12222-approving-general-plan-development

References

Angola, Ministério da Energia e Águas. n.d. "Boletim Trimestral—Quarterly Reports." Governo de Angola Ministério da Energia e Águas. https://www.minea.gov.ao/index.php/epas/category/210-boltri.

COWI. 2022. *Independent Verification Agent Audit of Malanje, Huambo, Uíge, Bié, Cuanza Norte, and Huíla for the Project Implementation Unit Financial and Contract and Management Unit and Ministério da Energia e Águas de Angola.* COWI.

COWI. 2023. *Independent Verification Agent Audit of Malanje, Huambo, Uíge, Bié, Cuanza Norte, and Huíla for the Project Implementation Unit Financial and Contract and Management Unit and Ministério da Energia e Águas de Angola.* COWI.

World Bank. 2008. "Angola—Water Sector Institutional Development Project." Project Appraisal Document 42864, World Bank.

World Bank. 2020. "Angola—Water Sector Institutional Development Project." Implementation Completion and Results Report ICR4814, World Bank.

[1] The World Bank's Emergency Multi-Sector Recovery Program Project was the other project that provided financing.

[2] This excludes the smallest cities, in terms of connections (none of which are covered by the program), as well as Luanda (because it is an outlier) and Lobito (because the utilities in the province merged with Benguela's utilities in 2022). As such, there are six utilities not covered by PDISA and six utilities that are covered, and these groups are comparable in terms of average population size and other relevant variables.

[3] Reports can be downloaded from the website at https://www.minea.gov.ao/index.php/epas/category/210-boltri.

[4] There were 17,7907 m^3 per connection per month for the PDISA-supported utilities, compared with 30,927 m^3 per connection per month for the comparison group.