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Report No: PAD00150

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT
ON A
PROPOSED CREDIT

IN THE AMOUNT OF EUR186.5 MILLION
(US$200.0 MILLION EQUIVALENT)

TO THE

REPUBLIC OF SENEGAL

FOR AN

INTEGRATED WATER SECURITY AND SANITATION PROJECT

AS PHASE 1 OF THE MULTI-PHASE PROGRAMMATIC APPROACH
INTEGRATED WATER SECURITY AND SANITATION PROGRAM

WITH AN OVERALL FINANCING ENVELOPE OF US$800 MILLION

MAY 31, 2024

Water Global Practice
Western and Central Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2024)

Currency Unit =	EURO (EUR)
US$ 1 =	EUR 0.93
US$ 1 =	XOF 611

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Ousmane Diagana
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ABBREVIATIONS AND ACRONYMS

AFD	French Development Agency (*Agence Française de Développement*)
AfDB	African Development Bank
AM	Accountability Mechanism
ANSD	National Statistics and Demography Agency (*Agence Nationale de la Statistique et de la Démographie*)
CBA	Cost-Benefit Analysis
CBR	Cost-Benefit Ratio
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CPCSP	Program Planning, Coordination, and Monitoring Unit (*Cellule de Planification, de Coordination et de Suivi des Programmes*)
CPF	Country Partnership Framework
CSI	Corporate Scorecard Indicator
DBRLA	Directorate of Retention Basins and Artificial Lakes (*Direction des Bassins de Rétention et des Lacs Artificiels*)
DFBOT	Design-Finance-Build-Operate-Transfer
DGPRE	General Directorate for Water Resources Planning and Management (*Direction Générale de la Planification et de la Gestion des Ressources en Eau*)
DHORT	Directorate of Horticulture (*Direction de l'Horticulture*)
DMT	Dakar-Mbour-Thiès
DODP	Public Expenditure Authorization Directorate (*Direction de l'Ordonnancement des Dépenses Publiques*)
E&S	Environmental and Social
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ERR	Economic Rate of Return
ESCP	Environment and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESS	Environmental and Social Standards
FIRR	Financial Internal Rate of Return
FM	Financial Management
GBV	Gender-Based Violence
GCA	Global Center for Adaptation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoS	Government of Senegal
GRID	Green, Resilient and Inclusive Development
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
GWSP	Global Water Security and Sanitation Program
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFC	International Finance Corporation
IFR	Internal Financial Report
IMF	International Monetary Fund
IPF	Investment Project Financing
ISP	Implementation Support Plan

IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
MFB	Ministry of Finance and Budget (*Ministère des Finances et du Budget*)
MFD	Maximizing Finance for Development
MHA	Ministry of Hydraulics and Sanitation (*Ministère de l'Hydraulique et de l'Assainissement*)
MIGA	Multilateral Investment Guarantee Agency
MPA	Multiphase Programmatic Approach
NBS	Nature-Based Solutions
NDC	Nationally Determined Contribution
NRW	Nonrevenue Water
NWSP	National Water Security Program
OFOR	Rural Boreholes Agency (*Office des Forages Ruraux*)
OLAC	Lakes and Rivers Agency (*Office des Lacs et des Cours d'Eau*)
OMVG	Gambia River Basin Development Organization (*Organisation de Mise en Valeur du Fleuve Gambie*)
OMVS	Senegal River Basin Development Organization (*Organisation de Mise en Valeur du Fleuve Sénégal*)
ONAS	Senegal National Sanitation Agency (*Office National de l'Assainissement du Sénégal*)
PAGEP	Sanitation and Drainage Management Project (*Programme d'Assainissement et de Gestion des Eaux Pluviales*)
PAGIRE	Integrated Water Resources Management Action Plan (*Plan d'Action de Gestion Intégrée des Ressources en Eau*)
PCE	Private Capital Enabled
PCM	Private Capital Mobilized
PCU	Project Coordination Unit
PDO	Project Development Objective
PEAMIR	Rural Water Supply and Sanitation Project (*Projet d'Eau et d'Assainissement en Milieu Rural*)
PEAMU	Urban Water and Sanitation Project (*Projet d'Eau et d'Assainissement en Milieu Urbain*)
PEPAM	Water and Sanitation Millennium Program (*Programme d'Eau Potable et d'Assainissement du Millénaire)*
PFM	Public Finance Management
PforR	Program for Results
PIM	Project Implementation Manual
PISEA	Integrated Water Security and Sanitation Project (*Projet Intégré de Sécurité de l'Eau et de l'Assainissement*)
PPP	Public-Private Partnership
PPSD	Project Procurement Strategy for Development
PrDO	Program Development Objective
PROGEP	Stormwater. Management and Climate Change Adaptation Project (*Projet de Gestion des Eaux Pluviales et d'Adaptation au Changement Climatique*)
PSC	Project Steering Committee
PTF	Technical and Financial Partner *(Partenaire Technique et Financier)*
SDAGE	Water Planning and Management Master Plan (*Schéma Directeur d'Aménagement et de Gestion de l'Eau*)
SDGs	Sustainable Development Goals
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SIIP	Sahel Irrigation Initiative Support Project
SONES	Senegal National Water Utility (*Société Nationale des Eaux de Sénégal*)
STEP	Systematic Tracking of Exchanges in Procurement

SYSCOHADA	Accounting System of the Organization for the Harmonization of Business Law in Africa (*Système Comptable de l' Organisation pour l'harmonisation en Afrique du Droit des Affaires*)
TA	Technical Assistance
UGP	Planning and Management Unit (*Unité de Gestion et Planification*)
VAT	Value Added Tax
VGF	Viability Gap Fund
WBG	World Bank Group
WICER	Water in Circular Economy and Resilience
WRM	Water Resources Management
WWTP	Wastewater Treatment Plant

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DATASHEET

BASIC INFORMATION

Project Beneficiary(ies)	Operation Name		
Senegal	Senegal: Integrated Water Security and Sanitation Project		
Operation ID	Financing Instrument	Environmental and Social Risk Classification	
P178673	Investment Project Financing (IPF)	High	

Financing & Implementation Modalities

[✓] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternative Procurement Arrangements (APA)	[ ] Hands-on Expanded Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date	Expected Program Closing Date
21-Jun-2024	29-Jun-2029	30-Jun-2034
Bank/IFC Collaboration	Joint Level	
Yes	Complementary or Interdependent project requiring active coordination	

MPA Program Development Objective

The Program Development Objective (PrDO) is to improve access to safe water supply and sanitation, and to increase resilience to flood and drought risks.

MPA FINANCING DATA (US$, Millions)

MPA Program Financing Envelope	800.00

Components

Component Name	Cost (US$)
Component 1: Water resources management and protection	22,200,000.00
Component 2: Improving sanitation within a circular economy	207,700,000.00
Component 3: Improving water supply services	16,400,000.00
Component 4: Strengthening citizen engagement, sector reforms and project management	13,700,000.00

Organizations

Borrower:	Republic of Senegal
Implementing Agency:	Cellule de Planification MHA, DGPRE, OLAC, ONAS, SONES

MPA FINANCING DETAILS (US$, Millions)

MPA Financing Envelope:	800.00
of which Bank Financing (IBRD):	0.00
of which Bank Financing (IDA):	800.00
of which Other Financing sources:	0.00

PROJECT FINANCING DATA (US$, Millions)

Maximizing Finance for Development

Is this an MFD-Enabling Project (MFD-EP)?	Yes
Is this project Private Capital Enabling (PCE)?	Yes

SUMMARY

Total Operation Cost	**260.00**
Total Financing	**260.00**
of which IBRD/IDA	**200.00**
Financing Gap	**0.00**

DETAILS

Private Sector Investors/Shareholders

Equity	Amount	Debt	Amount
Non-Government Contribution	12.00	IFI Debt	200.00
Private sector Equity	12.00	IDA	200.00
		Commercial Debt	48.00
		Unguaranteed	48.00
Total	**12.00**		**248.00**

IDA Resources (US$, Millions)

	Credit Amount	Grant Amount	SML Amount	Guarantee Amount	Total Amount
Scale-Up Window (SUW)	200.00	0.00	0.00	0.00	200.00
Total	**200.00**	**0.00**	**0.00**	**0.00**	**200.00**

Expected Disbursements (US$, Millions)

WB Fiscal Year	2024	2025	2026	2027	2028	2029	2030
Annual	0.20	16.00	30.00	103.00	35.00	14.00	1.80
Cumulative	0.20	16.20	46.20	149.20	184.20	198.20	200.00

PRACTICE AREA(S)

Practice Area (Lead)

Water

Contributing Practice Areas

Agriculture and Food; Environment, Natural Resources & the Blue Economy; Climate Change

CLIMATE

Climate Change and Disaster Screening

Yes, it has been screened and the results are discussed in the Operation Document

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary Financial Management Risk rating from Specialist: Moderate as of 2024-05-04T20:51:09Z Procurement Risk rating from Specialist: Substantial as of 2024-05-17T00:00:00Z	Moderate
7. Environment and Social Environment Risk rating from Specialist: High as of 2024-05-08T22:15:47Z Social Risk rating from Specialist: Substantial as of 2024-05-08T22:15:47Z	High
8. Stakeholders	Low
9. Overall	High
Overall MPA Program Risk	Substantial

POLICY COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

ENVIRONMENTAL AND SOCIAL

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Relevant
ESS 10: Stakeholder Engagement and Information Disclosure	Relevant
ESS 2: Labor and Working Conditions	Relevant
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant
ESS 4: Community Health and Safety	Relevant
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
ESS 8: Cultural Heritage	Relevant
ESS 9: Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

LEGAL

Legal Covenants

Sections and Description
Schedule 2, section I.A.1.(a) of the Financing Agreement. The Recipient shall establish, no later than one (1) month after the Effective Date, and thereafter maintain, throughout the period of implementation of the Project, a committee (the "Project Steering Committee") with terms of reference, composition and resources acceptable to the Association.
Schedule 2, section I.A.2.(a) of the Financing Agreement. The Recipient shall maintain, throughout the period of implementation of the Project, MHA's unit responsible for programs planification, coordination and monitoring ("Project Management Unit") with terms of reference, composition and resources acceptable to the Association.
Schedule 2, section I.A.2.(b) ii. of the Financing Agreement. The Project Management Unit shall maintain the following key staff for the Project (and ensure that such positions will remain filled throughout the period of implementation of the Project): a Project coordinator, a procurement specialist, a financial management specialist, an operation manager, a monitoring and evaluation specialist, as well as, from a date not later than two (2) months from the Effective Date, a health and security at work specialist and, thereafter, any staff in charge of the identification and mitigation of the environmental and social impacts of the Project which may be further described in the ESCP, each selected on the basis of terms of reference, qualification and reference acceptable to the Association

Schedule 2, section I.A.3.(b) i. of the Financing Agreement. The Recipient shall, prior to starting the carry out of an activity under the Project by an Public Agency, ensure that such Public Agency has the resources and expertise required to ensure compliance with the Recipient's obligations in connection with the use of the Financing.
Schedule 2, section I.A.3.(b) ii. of the Financing Agreement. The Recipient shall, without limitation to the generality of Section I.A.3(b)(i) of this Schedule, ensure that OLAC has recruited a social safeguard specialist, with terms of reference, qualifications, and experience acceptable to the Association, no later than one month after the Effective Date.
Schedule 2, section I.B.1.(a) of the Financing Agreement. The Recipient shall develop and adopt, no later than one (1) month after the Effective Date a manual or set of manuals for the Project (referred to, collectively or individually, as the "Project Implementation Manual" or "PIM") in form and substance acceptable to the Association.
Section 1.1 of the Environment and Social Commitment Plan (ESCP). The Project Coordination Unit shall recruit an Occupational Health and Safety no later than two (2) months after the Effective Date.
Section 1.1 of the ESCP. OLAC shall recruit a social specialist not later than one (1) month after the Effective Date.
Annex 1, Table 1.1 of the PAD. Not later than four (4) months after effectiveness, the Project Coordination Unit shall (i) update the project financial and administrative manual to take in account the specificities of the PISEA, (ii) customize the accounting software to segregate the PISEA accounting, and (iii) hire an external auditor with qualification satisfactory for the bank.

Conditions

Type	Citation	Description	Financing Source

I. STRATEGIC CONTEXT

A. Country Context

1. **Senegal has emerged as one of the fastest-growing economies in Sub-Saharan Africa, but growth is characterized by slow poverty reduction and persistent inequalities.** Real gross domestic product (GDP) growth surged to over 6 percent between 2014 and 2019, up from the 2008–13 average of 2.5 percent.[1] This period coincided with more favorable external conditions, marked by a decline in global prices for oil, commodities, and food. Growth has been largely driven by strong performance by both industry and agriculture, supported by strong exports and prudent fiscal policies, political stability, and sound macroeconomic policy. Poverty has declined steadily, stabilizing between 2019 and 2021 at 37.5 percent despite the multitude of shocks facing the global economy since 2020. Poverty in Senegal is concentrated in rural areas, where three out of four poor people live. Besides large regional disparities, Senegal suffers from a high level of income inequality. In 2018, the consumption share of the wealthiest 10 percent of the population was 46 percent higher than the share of the poorest 40 percent.

2. **External shocks and rising global and domestic uncertainties weigh heavily on growth prospects.** The global economic shocks that followed the onset of the COVID-19 pandemic, Russia's invasion of Ukraine in 2022, and the conflict in the Middle East have led to tightening financing conditions, rising uncertainties, heightened geopolitical tensions, and a slowdown in the global economic recovery. The global situation, coupled with rising domestic political uncertainty and regional instability, led to growth deceleration to 3.8 percent over the 2020–2023 period,[2] exacerbating structural vulnerabilities such as low productivity, limited human capital, high informality, and youth emigration. Increased fiscal deficits and unfavorable terms of trade for oil-importing economies such as Senegal have worsened external accounts, exacerbating macroeconomic imbalances that might jeopardize crucial productivity-enhancing investments and policies. Projected higher temperatures, decreased annual rainfall, increases in the intensity and frequency of heavy rainfall events, and a rise in sea level will significantly affect Senegal's socioeconomic and environmental resources, affecting water quality and threatening major service infrastructure. Driven by hydrocarbon production, economic activity is set to rebound in the medium term at average 7.5 percent, but political uncertainty, additional delays in hydrocarbon production, and geopolitical tensions cloud the outlook.

3. **Women's participation will be a determining factor in this recovery and future development.** While women represent most of the active population, their participation in employment is low (32 percent, compared to 61 percent for men). The government of Senegal's new program identifies key measures for women to play a determining role in the dynamization of the economy. Women are particularly engaged in agricultural and livestock activities in rural areas through part-time or informal work.[3] When employed, they are more likely than men to be below the international poverty line,[4] earn less regardless of type of work, and work less hours due to domestic responsibilities.[5] While girls are more likely to finish secondary school than boys, adult literacy rates show a disparity, with women 23 percentage points behind men.[6] Senegal's 2022 report to the Convention on the Elimination of All

[1] World Bank.2021. Senegal Country Economic Memorandum: From Strong Growth to Growing Stronger. Washington, D.C.: World Bank Group. https://documentsinternal.worldbank.org/search/34063556
[2] World Bank. 2024. Seizing the Opportunity. Senegal Economic Update, June 2024 (forthcoming). Washington, D.C.: World Bank Group.
[3] Women's Environment & Development Organization. Case Study: Gender, Human Security and Climate Change in Senegal. Accessed April 26, 2024. https://wedo.org/wp-content/uploads/senegal-case-study.pdf and World Bank. 2024. Gender Disparities in Senegal.
[4] UN Women. *Women Count Data Hub*. Senegal. Accessed April 28, 2023. https://data.unwomen.org/country/senegal.
[5] ANSD. 2021. Enquête harmonisée sur les Conditions de Vie des Ménages (EHCVM) au Sénégal. https://www.ansd.sn/sites/default/files/2022-11/Rapport-final-EHCVM-vf-Senegal.pdf.
[6] World Bank. *Gender Data Portal*. Senegal. Accessed April 28, 2023. https://genderdata.worldbank.org/countries/senegal/.

Forms of Discrimination Against Women (CEDAW) noted an imbalance in women's representation in all decision-making bodies.[7]

B. Sectoral and Institutional Context

Water security,[8] the bedrock of Senegal's development, is threatened by demographic growth and climate change

4. **Water is a key contributor to the country's economy.** It is strongly linked to domains that are critical for economic growth, such as agriculture, energy, and poverty alleviation. It is also essential for ensuring public health and hygiene, which has become even more evident in the face of stressors such as the COVID-19 pandemic and recurrent floods. Water management also provides a wide range of environmental and disaster mitigation benefits, such as flood protection, pollution abatement, and biodiversity conservation. Agriculture, representing 30 percent of employment, is by far the main consumer (83 percent),[9] followed by drinking water supply (14 percent). Surface water represents about 90 percent of renewable resources. Groundwater resources play a strategic role in the country's water security, representing 85 percent of potable water and industrial uses.[10]

5. **Historically, Senegal enjoyed abundant water resources, but demographic growth and uneven geographic and temporal water distribution now challenge the country's water security.** Since the 1960s, per capita renewable freshwater availability has been divided by five due to demographic growth. It now stands below the threshold of 1,700 m^3 per capita per year, under which a country experiences periodic water stress.[11] By 2050, with climate change, it is expected to approach the threshold of 500 m^3 per capita per year, below which coverage of basic needs may prove difficult. Due to major geographic and temporal variations, water availability does not coincide with demand patterns, and meeting the growing water needs will become increasingly difficult and expensive. Salinity in the coastal areas and the largely transboundary nature of water resources complicate access to water resources. Surface water is already insufficient to meet needs in dry years and aquifers are threatened by overuse.

6. **Water stress is compounded by the degradation of water quality.** Water resources contamination is due to drainage water discharge containing fertilizer and phytosanitary product residues, unregulated gold mining, and inadequate management of the waste produced by riparian communities. This is affecting the water quality of Lac de Guiers, a strategic resource that supplies water to nearly 4 million inhabitants, mainly in Greater Dakar**.**

7. **Senegal is highly vulnerable to climate variability and change,** entailing increased coastal erosion, droughts, floods, saltwater intrusion, extreme heat, and locust infestations.[12] The arid and semi-arid regions are experiencing more frequent and longer droughts[13] while the southern regions are experiencing changing rain patterns, leading to droughts and more frequent floods, which both affect water security. Extreme climate variability since the 1970s has resulted in agricultural losses and environmental degradation due to droughts and floods. Crops and livestock—an important base for livelihoods and GDP—face increasing heat stress and variability in rainfall, including more frequent and damaging heavy rainfall events and diminishing rainfall since the early 1970s.

[7] Equal measures 2030. https://equalmeasures2030.org/fr/story/comment-le-senegal-peut-continuer-a-progresser-vers-legalite-des-genres/.
[8] Water security is defined as "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies."
[9] https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=SN.
[10] World Bank. 2022. *Challenges and Recommendations for Water Security in Senegal at National Level and in the Dakar-Mbour-Thiès Triangle*.
[11] World Bank. 2022. *Challenges and Recommendations for Water Security in Senegal at National Level and in the Dakar-Mbour-Thiès Triangle*.
[12] USAID 2018. https://www.climatelinks.org/resources/climate-risk-profile-west-africa; and Casado-Asensio, J., H. Shin, and T. Kato. 2021. *Lessons on Engaging with the Private Sector to Strengthen Climate Resilience in Senegal*. Paris: OECD Publishing. https://oe.cd/climate-resilience. USAID. 2017. *Climate Change Risk Profile: Senegal*, https://www.climatelinks.org/resources/climate-risk-profile-senegal.Think Hazard.
[13] FAO. 2016. *Resilience Analysis in Senegal: Matam 2016*, *FAO*. http://www.fao.org/resilience/resources/resources-detail/en/c/1027630/.

8. **The effects of climate change are expected to exacerbate water stress.** Projected increases in temperature between 1°C and 2°C by 2050, coupled with an increase in the number of hot days per year under all climate scenarios, are likely to enhance water demand and increase evapotranspiration, affecting water resources availability.[14] While uncertainties exist about projected precipitation trends, the rainfall pattern is expected to become increasingly erratic, with, on average, a decline in runoff due to increased evapotranspiration losses. The number of heavy rainfall events may increase, creating prospects for increased flooding given the lack of drainage infrastructure and damaged watersheds.[15] Moreover, with sea-level rise, salinity intrusion of aquifers will affect the habitability of rapidly expanding, densely populated coastal areas, where one-third of the country's population live.

9. **Water insecurity poses serious constraints on the country's economic growth.** It limits the nation's booming private sector development, especially agribusiness, mining, and tourism. Climate change-exacerbated extreme hydrological events and pollution already impact more than 10 percent of Senegal's GDP. Associated flooding costs have been estimated at over US$1 billion (6.3 percent of GDP), while the cost of a one-year drought represents US$500 million.[16] Impacts on health and the environment from untreated wastewater discharges reach 3.8 percent of GDP, well above the order of magnitude for middle-income countries (2.5 percent of GDP).

10. **Eight priority water security areas bring together both heightened water security risks and critical socioeconomic activities.**[17] These are the *Dakar-Mbour-Thiès* (DMT) triangle, Niayes and Littoral Nord, the Horst de Diass, Lac de Guiers and the Senegal River Delta, the salted and fluorinated central band, the lower Casamance valley, the gold panning area, and the recession crops area. Water security issues are particularly prevalent in the first four, which account for more than one-third of the Senegalese population and one-half of economic activity. DMT faces the most critical challenges, including overexploited and polluted aquifers and endangered ecosystems. Lac de Guiers provides 50 percent of the DMT's water supply, and both its quality and security of access are threatened.[18] In the Horst de Diass, which provides one-third of DMT's water supply, aquifers are overexploited. Competition between horticulture and industry is growing for water use along the Niayes and Littoral Nord areas.

11. **Climate change is expected to further exacerbate flooding in the first four of the priority water security areas listed in the previous paragraph**. A 28 percent increase in precipitation is projected for the Dakar area, along with changes in interannual variability and intensification of extreme precipitation, leading to a higher likelihood of intense floods.[19] As demand for drinking water and irrigation already exceeds available resources, it is essential to diversify sources of water while focusing on water loss reduction, enhancing efficiency measures, ensuring fit-for-purpose source allocation, and developing nonconventional resources such as wastewater reuse or desalination. This project will aim to incorporate the above activities to fortify the resilience of the project area to rising climatic (droughts, floods, extreme temperatures, and salinity intrusion) and non-climatic vulnerabilities.

Improving water resources management (WRM) is critical in a context of dwindling water resources and increasing competition between users

12. **The allocation of WRM responsibilities is governed by a clear legal and institutional framework**. The Directorate of Water Resources Management and Planning (*Direction de la Gestion et de la Planification des Ressources en Eau*, DGPRE), under the supervision of the Ministry of Hydraulics and Sanitation (*Ministère de*

[14] USAID. 2017. *Senegal: Climate Change Risk Profile*.
[15] Climate and disaster risk screening carried out for the project.
[16] Croitoru, Lelia, Juan José Miranda, and Maria Sarraf. 2019. *The Cost of Coastal Zone Degradation in West Africa: Benin, Côte d'Ivoire, Senegal, and Togo*. Washington, DC: World Bank.
[17] World Bank 2022.
[18] For example, 26 percent of the area of Lac de Guiers is colonized by Typha.
[19] Climate and disaster risk screening carried out for the project. In fact, Dakar has experienced floods because of a recent increase in rainfall, inefficient rainwater drainage systems, rising groundwater, uncontrolled urban sprawl, and the occupation of depressions and wetlands areas (source: GFDRR. 2021. *Climate Risk and Adaptation Country Profile – Senegal*).

l'Hydraulique et de l'Assainissement, MHA), is the main body in charge of WRM. DGPRE functions include planning, abstractions and discharges management, knowledge development, and water policing. It is also in charge of supervising the performance contracts of the Lakes and Waterways Office (*Office des Lacs et Cours d'Eau*, OLAC), which is responsible for the management of surface water not subject to international transboundary agreements.

13. **Despite considerable recent progress, governance arrangements need to be strengthened to ensure good stewardship of water resources.** Recent achievements include the adoption of the National Integrated Water Resources Management Plan (*Plan d'Action de Gestion Intégrée des Ressources en Eau*, PAGIRE), the establishment of the Water Police, the issuance of groundwater abstraction authorizations, and the improved collection of the abstraction tax. Yet, the implementation of WRM functions as defined in the legal framework is insufficient. DGPRE lacks the autonomy and resources to fulfill its missions, including the establishment of water management committees at Planning and Management Unit (*Unité de Gestion et Planification*, UGP) and sub-UGP levels. The draft Water Code (yet to be promulgated) proposes the establishment of protection zones in sensitive areas through the Water Planning and Management Master Plan (*Schémas directeurs d'aménagement et de gestion des ressources en eau,* SDAGE). It also aims to set up a regulatory system consistent with integrated water resources management (IWRM) principles and create decentralized advisory committees (SDAGE committees) for decision-making on the allocation of water resources. Preliminary analysis shows that women's participation in these executive boards would be 7 percent if created without support, compared to the 30 percent threshold for meaningful participation.

Water and sanitation services suffer due to water scarcity, which could be alleviated by circular economy approaches

14. **Senegal's water sector is among the top performers in the region, but water shortages are looming.** About 96 percent of the urban population has access to at least basic water supply services compared to 77 percent in rural areas (41 percent and 13 percent to safe water supply services, respectively).[20] Service continuity varies in urban areas, with some vulnerable neighborhoods receiving intermittent supply. Fecal contamination is an issue, particularly in rural areas, while the country's central regions face high fluoride concentrations, and the coastal areas contend with high salinity due to overabstraction and sea-level rise. The national urban water utility is one of the most efficient in the region, with nonrevenue water (NRW) at 20 percent. Keeping up with the doubling of water needs between 2020 and 2035 will require massive development of new sources.

15. **In Senegal's sanitation sector, access gaps remain, posing a threat to public health and the environment.** About 69 percent of the urban population has access to at least basic sanitation services compared to 51 percent in rural areas (14 percent to safely managed sanitation in both cases).[21] Access gaps disproportionally affect the poor, with lowest revenue quintile households three times more likely to rely on unimproved sanitation than the rest of the population.[22] The lack of wastewater treatment and poor management of stagnant waters contribute to a high prevalence of waterborne diseases. In 2017, diarrhea led to the death of nearly 40,000 children under five years old.[23] Although the main urban centers in Greater Dakar have sewerage networks, on-site sanitation systems are most widely used. Only 25 percent of the wastewater collected is treated. Public services for on-site sanitation are mostly nonexistent. Private operators are estimated to remove mechanically half of domestic septage, with the rest being buried on-site or emptied manually.[24] An estimated 30 percent of the collected sludge is dumped illegally.

16. **A key driver for the sector's performance has been its comprehensive institutional, legal, and regulatory framework.** The MHA has overall policy and oversight responsibility for water and sanitation. The National Water Company (*Société Nationale des Eaux du Sénégal*, SONES) develops urban water infrastructure under a concession agreement with the government and a performance-based affermage with a private operator (currently *Eau du*

[20] Source: https://washdata.org/data/household#!/table?geo0=country&geo1=SEN. Accessed on 4/12/2024.
[21] World Health Organization and United Nations Children's Fund Joint Monitoring Programme. 2022. Households Data. https://washdata.org/
[22] World Bank CLEAR Water Dashboard.
[23] Croitoru et al. 2019.
[24] Water and Sanitation Program. 2015. *A Review of Fecal Sludge Management in 12 Cities*. Washington, DC.

Sénégal, SEN'EAU). The National Sanitation Agency (*Office National de l'Assainissement du Sénégal*, ONAS) develops and manages urban sanitation, and it has recently been mandated to expand responsibilities to rural sanitation. The government of Senegal (GoS) delegated rural water supply services to the Rural Drilling Agency (*Office des Forages Ruraux*, OFOR), which signed affermage contracts with six private operators for water distribution services.

17. **Despite these positive strides, there is unrealized potential to apply circular economy principles, particularly in the Greater Dakar area.** ONAS already has positive but limited experiences in the treatment and reuse of sanitation byproducts (treated wastewater for irrigation, biogas production from sludge, and soil amendment from processed sludge). As wastewater systems expand toward the periphery of Dakar and closer to irrigation areas, the potential for scale-up increases. Managed aquifer recharge remains minimal. With the increase in marginal costs for water production, these solutions are becoming more justified economically.

In a context of water stress, irrigation can help sustain agricultural activities critical to food security and the economy

18. **Irrigation remains limited in Senegal due to severe constrains on water resources availability.** Only 5 percent of land cultivated is equipped for irrigation (100,000 ha), with a country potential of 340,000 ha.[25] Horticulture in DMT and Niayes accounts for 60 percent of national production and 80 percent of Senegal's fruit and vegetable exports. Horticulture depends largely on small producers, and farm surfaces are shrinking due to competition for water with growing mining industries and urban hubs. Responsibility for sector policy and regulation falls under the Ministry of Agriculture, Food Sovereignty, and Livestock through the Directorate of Horticulture (DHORT), with technical support from the Directorate of Retention Basins and Artificial Lakes (*Direction des Bassins de Rétention et des Lacs Artificiels*, DBRLA).

19. **Treated wastewater reuse in agriculture could help reduce withdrawals from overexploited local aquifers.** The strategy for irrigation entails reactivating water supply boreholes, reusing treated wastewater, and progressively disconnecting farmers from SONES's network. Reuse could foster climate adaptation by limiting reliance on finite groundwater. The 2009 National Sanitation Code allows treated wastewater reuse for agriculture.

Addressing emerging water security challenges will require sector reforms at several levels

20. **In the urban water sector, mobilizing private capital will be critical to massively invest in production infrastructure.** SONES's debt service coverage ratio exceeds 1.1, but it still relies heavily on concessional funding for capital investments. With the need to access more distant, deeper, or more polluted water sources, the marginal cost of water production has tripled since the 1990s. To meet a water demand growing by almost 4 percent per year in DMT, the addition of seawater desalination or another large interbasin water transfer to the production mix will drive further cost increases. This will prompt a careful review of SONES's financial model, additional operational efficiency efforts (including NRW reduction), and increased revenues without compromising service affordability.

21. **The precarious financial situation of urban sanitation will require a new sector economic and technical model.** Sanitation fees are not sufficient to fund operating costs, whose coverage requires public subsidies. This situation, and the need to massify investments, make a new sector economic and technical model imperative.

Government vision and strategies

22. **Consistent with the Sustainable Development Goals (SDG) agenda, the overarching sector objective is to achieve universal access to water supply and sanitation by 2030 while ensuring IWRM.** The GoS's economic and social policy framework—the "Systemic Transformation Project of Senegal"—emphasizes the importance of water security by focusing on universal access to clean water, water scarcity and WRM governance. In line with this vision,

[25] CIAT; BFS/USAID. 2016. Climate-Smart Agriculture in Senegal. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); Bureau for Food Security, United States Agency for International Development (BFS/USAID), Washington, DC 20 p.; and AfDB. 2003. *Project to Support Local Small-Scale Irrigation Support. Project Appraisal Document*. Abidjan.

Senegal's Sector Development Policy Letter defines four specific objectives: (a) promoting a performance-based, transparent, and efficient sector governance; (b) strengthening the IWRM institutional and operational framework; (c) achieving universal water supply coverage by 2025; and (d) improving sustainable wastewater and fecal sludge management by 2025.

23. **The GoS is committed to promoting public-private partnerships (PPP), enhancing the efficiency of water and sanitation services, and contributing to the financing of investments.** This is highlighted in its 2014 Framework Note and illustrated by the 2018 renewal of the affermage contract and by the delegation of rural water services to private operators since 2015. In urban sanitation, the GoS envisions a greater role for the private sector in operational activities as reflected in the 2020 sector reform action plan. In the Niayes area, the GoS envisions the setup of an entity to regulate water management, with a possible delegation of operations to private operators.

24. **The proposed Multiphase Programmatic Approach (MPA) will support the implementation of the GoS's National Water Security Program (NWSP)**, whose cost is estimated at US$2.8 billion for the 2022–50 period. The NWSP aims to ensure the long-term availability of sufficient water resources for all uses in alignment with the objectives of the SDGs.[26] While its core focus is on the DMT, it provides detailed analyses and recommendations for all priority water security areas, and more generally at the national level. These long-term visions are collectively supported by several development agencies organized in a group of technical and financial partners. As promoted in the NWSP, the MPA will support private capital mobilization (PCM) to finance selected large investments.

25. **The MHA is committed to promoting gender** equity and equality within the sector. Gender is institutionalized in strategic orientations and operational measures and the recently created Gender Unit. The 2016 gender audit revealed gender gaps, with 1 woman out of 15 people at the strategic level and 28 percent women in technical directorates. Women represent 36 percent of the staff in para-public and private structures, and SONES has the most female representation among managers (44 percent) and the only female director. The governance of water and sanitation in rural areas is strongly influenced by sociocultural norms and women's low level of education. Women earn less money than men (77 percent of men's salaries at SONES). Facilities in the workplace are gender-disaggregated and well equipped but not always inclusive, and policies against sexual harassment are lacking.[27]

C. Relevance to Higher Level Objectives

26. **The proposed project is aligned with the World Bank Group (WBG) Country Partnership Framework (CPF) for Senegal for FY20–24** (Report No. 143333-SN), which reflects a commitment to ensure access to water and sanitation in the most vulnerable areas and acknowledges it as key to achieving the twin goals of the WBG. The CPF was guided in particular by the 2018 Systematic Country Diagnostic. Under its third pillar focused on 'increasing resilience and sustainability in the context of growing risks,' the project will contribute to outcome 3.1 (promote and protect resilient livelihoods, ecosystems, and infrastructures in the face of climate change) in the context of water shortages aggravated by extreme temperatures and droughts, as well as the climate change-aggravated flood risk, and outcome 3.2 (ensure access to water and sanitation in the most vulnerable areas).

27. **The proposed project is Paris-aligned in terms of both adaptation and mitigation, in line with Senegal's goal to improve climate resilience, and will support the achievement of the GoS socioeconomic development goals.** The Nationally Determined Contribution (NDC) identifies that water resources availability will be affected by climate change and recognizes the vulnerability of ecosystems and natural resources as a key area for adaptation and

[26] The NWSP includes five pillars: WRM (US$145 million); provision of drinking water (US$1,043 million); wastewater treatment (US$1,171 million); rainwater drainage (US$444 million); and irrigation water ($50 million). Each is structured around: (i) providing institutional support and strengthening the institutional and regulatory framework for the sub-sector; (ii) rehabilitating and improving the efficiency of service delivery; (iii) strengthening and extending infrastructures; and (iv) developing innovative techniques and strengthening actors' capacities.
[27] Based on entities' responses to the Equal Aqua questionnaire on gender and human resources filled out by SONES, Program Planning, Coordination, and Monitoring Unit and DGPRE.

mitigation.[28] The project will support several of its adaptation measures, such as the development of alternative water sources, the promotion of nature-based solutions (NBS), the development of sanitation, and the implementation of IWRM.[29] In terms of mitigation measures identified in the NDC, the project will contribute to increasing renewable energy capacity through biogas generation and improved septage management (including the use of treated sludge for soil amendment). Hence, the project is consistent with the country's climate commitments.

28. **The project will help meet the WBG mission of ending poverty and boosting prosperity on a livable planet**. It is also consistent with the WBG's Green, Resilient, and Inclusive Development (GRID) approach and Climate Change Action Plan[30] by addressing sustainability, resilience, and inclusiveness. By focusing on the differential needs of women and men, it aligns with the WBG's Gender Strategy.

D. Multiphase Programmatic Approach

(i) Rationale for using MPA

29. **The MPA is the most appropriate modality to support a transformative shift in Senegal's institutional, technical, and financial solutions in the water sector, in response to the emergence of new water security challenges**, such as increasing climate and demographic pressures on the sector. As highlighted in the NWSP, this transition requires a combination of: (a) deep reforms, such as in WRM and urban sanitation, to improve subsectors' efficiency in a context of dwindling water resources; (b) massive investments to mobilize new water sources and continue the expansion of services coverage; (c) new infrastructure financing solutions, including with PCM; (d) new water resources and sanitation by-product management solutions following circular economy principles, such as wastewater reuse for irrigation and groundwater recharge; and (e) a shift in social norms to embrace circular economy principles such as reducing water use, reusing, recycling, and so on. The scale of this effort is not only financial (estimated in the NWSP at US$2.8 billion by 2050); it also entails long-term institutional transformations and the incremental testing and adoption by all sector stakeholders of scalable technological and financial solutions, which could not be supported in a stand-alone operation.

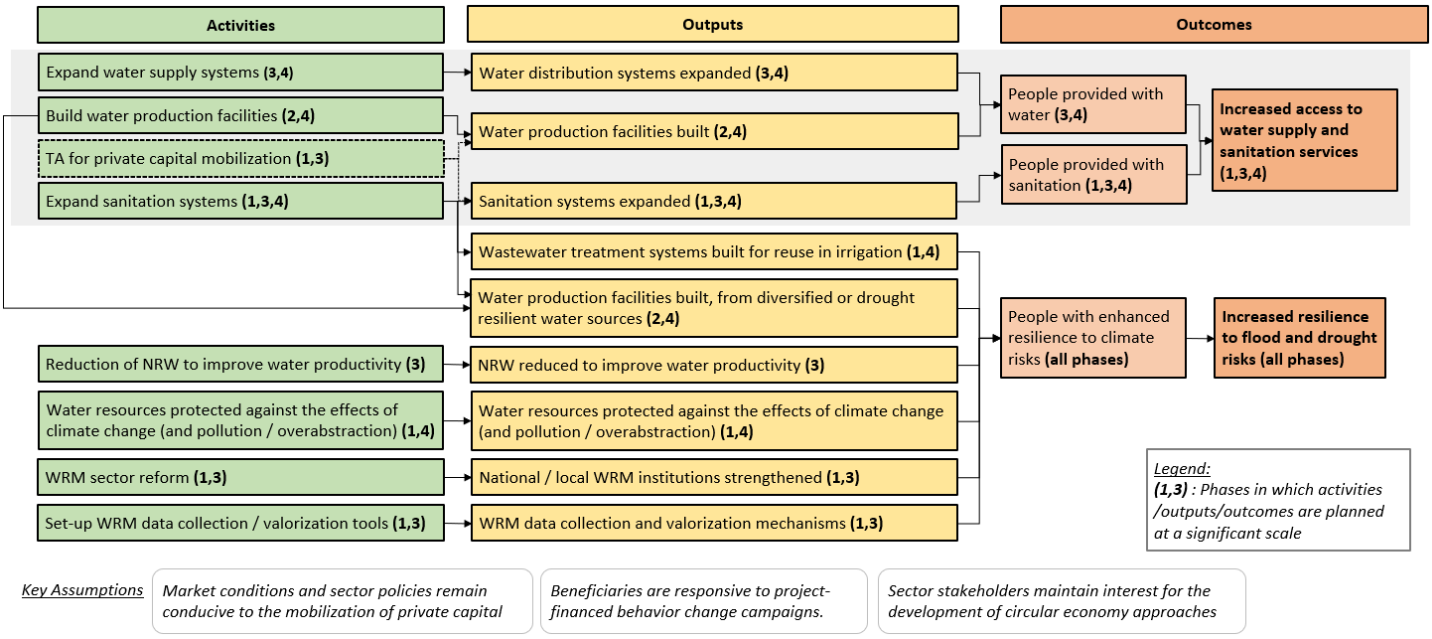
30. **The MPA will offer the GoS a one-stop shop instrument combining a full range of WBG financing solutions to strengthen water security**. The GoS has formally requested US$1 billion in financing from the World Bank to help Senegal implement the NWSP. In addition to the proposed US$800 million financial envelope, the MPA will enable the development of PPP solutions for bulk water and wastewater investments and help mobilize substantial private capital funding over its first two phases, with potentially more in later ones, as summarized in Table 3. The MPA will also be leveraged as a long-term engagement platform to attract interest and funding from other partners.

(ii) Program theory of change

31. The Program Results Chain is presented in figure 1. To achieve its goal to increase water security, defined as "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies," the program considers two key areas of focus: (a) achieving universal access to safe water supply and sanitation; and (b) reducing flood and drought risks through sustainable WRM. The MPA will support the first area of focus by expanding access to water supply and sanitation services. The second one will be supported through the development of IWRM mechanisms, the protection and diversification of water resources to reduce water supply services' vulnerability to the effects of climate change, and the improvement of water productivity.

[28] Government of Senegal. 2015. *Ministry of Environment and Sustainable Development*. Nationally Determined Contribution.
[29] World Bank. 2022. Climate and Economic Analyses for Resilience in Water (CLEAR Water) – NDC Dashboard. Priorities in Adaptation and Mitigation by Country. Water, Economy, and Climate Change Global Solutions Group.
[30] World Bank Group. 2021. World Bank Group Climate Change Action Plan 2021–2025: Supporting Green, Resilient, and Inclusive Development. © World Bank, Washington, DC. http://hdl.handle.net/10986/35799 License: CC BY 3.0 IGO.

Figure 1: Program theory of change



(iii) Program development objective (PrDO)

32. **The PrDO** is to improve access to safe water supply and sanitation and to increase resilience to flood and drought risks. The PrDO level indicators are as follows (the first two are corporate scorecard indicators):

- People provided with safe water supply services. *Indicative target: 2.0 million.*[31]
- People provided with safely managed sanitation. *Indicative target: 1.7 million.*[32]
- People with enhanced resilience to climate risks (includes flood and drought risks).[33] *Indicative target: 6 million.*

(iv) Program framework.

33. **Program scope.** The Program's structure is described in Table 1 below.

Table 1: Overall MPA structure (US$, millions)

Phase #	Sequential or simul-taneous	Proposed Phase DO	IPF or PforR	Estimated amount	IDA amount	Other (private capital)	Estimated approval year	Estimated social & environmental risk level
1		Improved access to safely managed sanitation and WRM capability in priority water security areas	IPF	260	200	60[34]	2024	High
2	Simul-taneous	Improved quality of water supply services in the DMT	IPF	To be defined	200	To be defined	2026	High
3	Simul-taneous	Improved access to safe water supply and safely managed sanitation services, and WRM capability	PforR	200	200	0	2028	Substantial

[31] With 2 million people gaining access to safe water supply services, that is, a 10-percentage point access rate increase (now at 41 percent).
[32] With 1.7 million people gaining access to safely managed sanitation, that is, an 8-percentage point access rate increase (now at 14 percent).
[33] Includes people (i) relying on diversified water resources; (ii) accessing water-related services from desalination or treated wastewater reuse; (iii) relying on water resources protected considering climate-related risks; and (iv) accessing sanitation services in areas subject to flood risks.
[34] Potentially US$12 million as private sector equity and US$48 million as commercial debt.

4	Simul-taneous	Improved access to safe water supply services and availability of strategic water resources	IPF	200	200	0	2030	High
			Estimated financing for the MPA Program	**> 1 billion**	**800**			

34. **To achieve the PrDO and support the shift in the sector's institutional, technical, and financial paradigm** required by the new water security challenges, the MPA is designed based on the principles described below. The following presentation of phases 2 to 4 is indicative, as the flexibility of the MPA will allow for adjustments reflecting the learning agenda and evolving priorities within the framework of the NWSP.

35. **The proposed timing and scope of each phase takes into account the readiness of activities, the added-value of the World Bank's financing instruments, and the learning agenda**: (a) Phases 1 and 2 cannot be bundled into a single operation because Phase 2, mostly dedicated to a bulk water production system (e.g. interbasin water transfer), cannot be approved before preparatory activities are completed, which is expected in late 2025; (b) as a PforR focused on sector reforms and services expansion, Phase 3 cannot be combined with other IPF phases; and (c) activities requiring significant preparatory technical and safeguards studies are deferred to Phase 4 IPF.

36. **The MPA's geographic focus will expand along phases from priority water security areas to nationwide.** Phase 1 will focus on the four priority water security areas identified in the NWSP as most vulnerable to water insecurity: DMT, Horst de Diass, Littoral Nord, and Lac de Guiers. Phase 2 would also be dedicated largely to the DMT, through the implementation of critical bulk water production systems. In Phase 3, investments will expand nationwide for urban water services and rural water supply and sanitation services in the country's underserved central (Matam, Louga, and Kaffrine) and southern areas (Sédhiou, Kolda, and Tambacounda). Phase 4 will scale up investments undertaken in Phase 1 in Lac de Guiers area and in the DMT and target additional priority water security areas, such as the Groundnut Basin or the Casamance Lower Valley for water supply investments.

37. **Phase 1 (US$200 million) will directly contribute to the achievement of the PrDO** by expanding sewerage services to 600,000 persons in Dakar, and by reducing flood and drought risks through (a) the partial diking of Lac de Guiers to reduce flood risk in agricultural areas; (b) aquifer recharge activities through NBS to restore aquifers in the Horst de Dias area that contribute to more than 30 percent of DMT's water supply; (c) improving WRM systems and data valorization and institutionalizing IWRM mechanisms in priority water management basins that host more than 7 million people; (d) replacing on-site sanitation (mostly unsafely managed) by house sewerage connections, addressing a public health hazard during flooding events in areas are particularly vulnerable due to high water tables; and (e) delivering treated wastewater reuse for irrigation to about 3,000 farmers in the Niayes area, thus increasing the resilience of the agricultural sector to the effects of droughts and saline intrusion on water availability.

38. **It will thereby support several transformational shifts critical in the water security agenda**. At the institutional level, Phase 1 will support the preparation of the urban sanitation and WRM sector reforms, test the effectiveness of the IWRM model in priority water security areas, and operationalize key principles of the NWSP through the preparation of a circular economy strategy in the DMT. Phase 1 will support SONES and ONAS in the PCM for infrastructure development, with preparation support and potential debt financing from the International Financing Corporation (IFC). These first experiences will make it easier for each utility to access commercial financing for future investments. At a technical level, enhanced aquifer recharge and reuse experiences will inform the replicability at a large scale of these key solutions in the country's new water security toolbox. Finally, it will finance preparatory studies for investments planned in subsequent phases.

39. **Phase 2 (US$200 million) will contribute to the PrDO by improving access to water supply services in the DMT and increasing their resilience to droughts.** If confirmed by due diligence reviews, investments will focus on the implementation under PPP arrangements and hybrid financing of critical elements, e.g. Thiès water treatment plant for an interbasin water transfer from Lac de Guiers to Dakar. The system will increase SONES's water production capacity in the DMT, addressing the emergence of water shortages fueled by demographic growth in a

drought-prone area. By 2034, this would improve the resilience to droughts for about 5.5 million dwellers currently in the DMT and allow for the connection of an additional 2 million people expected to settle by then in the area. Subject to satisfactory due diligence and GoS priorities, IDA guarantees may be deployed for SONES and ONAS PPPs.

40. **As a PforR, Phase 3 (US$200 million) will promote the expansion of water supply and sanitation services and strengthen sector institutions** by: (a) providing access to safely managed sanitation to 1,100,000 people in rural areas around Lac de Guiers and Saint-Louis and in the regions of Matam, Louga, and Kaffrine; (b) connecting 500,000 people to rural water supply systems in the regions of Tambacounda, Sédhiou, and Kolda; and (c) providing access to urban water services to 160,000 people in the DMT and to 120,000 people in secondary towns. WRM tools tested under Phase 1 will be deployed nationwide. Institutional reforms efforts will focus on WRM (strengthening institutions and decentralizing IWRM), urban sanitation (enhancing efficiency through service delegation), rural water (reviewing the service delegation model), and irrigation in the Niayes area (setting up a regulation entity).

41. **Phase 4 (US$200 million) will be dedicated to the scale-up of technical innovations and to the implementation of complex water resources protection investments, both prepared and piloted under the previous phases.** Efforts to protect, and improve the resilience of strategic water resources to climate change-exacerbated droughts and coastal saline intrusion will include: (a) the rehabilitation of Taouey Canal, which together with the diking of the lake, will increase the system's hydraulic transit capacity and increase water availability and quality in DMT and in the Ferlo region; (b) the restoration of water bodies upstream of Saint-Louis to improve water security; (c) the scale-up of enhanced aquifer recharge activities in the DMT and in the Niayes; and (d) the expansion of treated wastewater reuse in irrigation in the Niayes area, potentially through farmer-led irrigation development. Sewerage services will benefit 190,000 people in Dakar, and water supply services will be provided to 500,000 people in secondary cities, including in priority water security areas (Groundnut Basin and Casamance Lower Valley).

42. **The MPA will feature PCM opportunities, which can be supported by diverse WBG instruments and solutions**, including IFC and the Multilateral Investment Guarantees Agency (MIGA), as shown below.

Table 2: Potential Contribution of World Bank Group Instruments and Solutions*

Investment PPP	Estimated amount (US$, millions)	Potential role for the World Bank	Potential role for IFC	Potential role for MIGA
Wastewater treatment plant	110	Preparatory studies, viability gap funding (Phase 1), IDA Guarantees (Phase 2)	Structuring, tendering support, and debt financing (Phase 1)	MIGA guarantees
Bulk water production system for Dakar	To be confirmed (likely exceeding 2,000)	Preparatory studies, transaction advisory services (Phases 1 and 2). Viability gap funding, IDA guarantees (Phase 2)	Structuring and tendering support, and debt financing (Phase 2)	

** all elements subject to confirmation by GoS of sector priorities and satisfactory due diligence*

43. **In parallel to the MPA, several major programs representing more than US$1 billion will contribute to the water security agenda.** With regards to the protection and management of water resources, this will include a Project to Strengthen the Resilience of Ferlo Ecosystems (Eximbank China, US$416 million) and the European Union (EU)-funded Regional Program to Improve Water Quality of Lac de Guiers (€15 million)—both contributing to the restoration of Lac de Guiers—and a Groundwater Protection Program in Pout (€6 million) in the DMT, funded by the French Development Agency (AFD). A desalination project in the Mamelles Area of Dakar (Japanese International Cooperation Agency, US$228 million) will complement water resources mobilization under the MPA. The EU and European Investment Bank (EIB) will fund water supply improvement in Saint-Louis, Kaolack, and Kolda (€73.6 million) and USAID will support the rural water sector (US$13 million). Programs in the sanitation sector will include: a sanitation project in 10 cities (West African Development Bank, US$100 million), an on-site sanitation project in Dakar (AFD, US$27 million), and a water and sanitation project (African Development Bank [AfDB], US$38 million).

44. The MPA framework and program of activities is presented in Table 3 overleaf.

Table 3: Program Framework with Main Activities

		Phase 1: 2024–2029 (IPF)	Phase 2: 2025–2030 (IPF)	Phase 3: 2026–2031 (PforR)	Phase 4: 2028–2034 (IPF)
Geographic focus		***Four priority water security areas (DMT, Diass, Niayes, Lac de Guiers)***	***DMT***	***Nationwide***	***Nationwide***
PrDO 1: Improved access to water supply services	Access to urban water supply	Improvements in secondary towns		Expansion of water supply services	Improvements in secondary towns
	Access to rural water supply	Design of rural water supply investments		Expansion of water supply services	
	Water production systems development *	Feasibility study for Dakar bulk water production system	Bulk water production system (TA and VGF), with potential IDA guarantee **		
	Improving rural water sector performance	Preparatory studies		Support to public service delegation	
PrDO 2: Improved access to sanitation services	Access to urban sanitation	Dakar sewerage (part 1) and wastewater treatment	Potential IDA guarantee for Phase 1 plant		Dakar sewerage (part 2)
	Access to rural sanitation	Design of on-site sanitation investments		Expansion of on-site sanitation facilities	
	Improving sector performance	Reform preparatory studies		Support to public service delegation	
PrDO 3: Increased resilience to flood and drought risks	Protection of strategic water resources	Lac de Guiers modernization and pollution management	Lac de Guiers modernization		Bango reserve modernization
	Typha valorization			Typha valorization pilot	Scale-up of valorization
	Aquifers recharge	Aquifer recharge pilots			Scale-up of aquifer recharge
	Wastewater reuse for irrigation	Treated wastewater reuse (part 1)			Treated wastewater reuse (part 2)
	Reducing NRW	Sectorization		NRW reduction	
	WRM mechanisms	Territorial IWRM, monitoring tools		Scale-up of Phase 1	SDAGE implementation
	WRM reform	Preparatory studies		TA, capacity building	

Notes: IPF = Investment Project Financing; PforR = Program for Results.
* also relevant to PrDO 3
** subject to confirmation of GoS priority and satisfactory due diligence

(v) **Learning agenda**

45. The phased approach using diverse instruments permits earlier phases to fund preparatory studies and pilots to generate lessons that can inform the scale-up of activities at a later MPA stage, as illustrated in Table 4. All hypotheses will be captured through a specific results indicator, enabling a regular and high-level monitoring of the solutions' effectiveness. For more detailed evaluations, a budget will be provisioned in each phase of the MPA.

Table 4: Key Features of the Learning Agenda

Topic	Hypothesis	Method
WRM data management	Hydrological and hydrogeological data collection systems can be operated and evaluated for decision-making.	Phase 1: Develop WRM data management system in priority water security areas, assess value added for decision-making. Phases 2: Scale up nationwide.
Decentralized IWRM	IWRM can be institutionalized through the operationalization of SDAGE management committees at the level of the Planning and Management Units (PMUs) and sub-PMUs.	Phase 1: Set up selected SDAGE management committees in selected PMUs and sub-PMUs and assess their effectiveness. Phases 2 and 3: Scale up the approach across PMUs and sub-PMUs.
Typha valorization	The valorization of typha into biochar and biogas can generate revenue and stimulate their removal to protect water resources.	Phase 3: Pilot typha valorization into biochar and biogas and assess systems' effectiveness and profitability. Phase 4: Scale up successful pilot(s).
Aquifer recharge	Through NBS, aquifer recharge can improve groundwater availability and/or quality.	Phase 1: Pilot aquifer recharge infrastructure and assess impact on groundwater quality. Phase 4: Scale up aquifer recharge systems.
Treated wastewater reuse for irrigation	Treated wastewater is a viable water resource for irrigation.	Phase 1: Reuse for irrigation based on treated, assess users' acceptance and financial viability. Phase 4: Scale up based on additional effluents.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

46. The PDO is to improve access to safely managed sanitation and water resources management capability in priority water security areas.[35]

47. The key indicators used to track progress toward the PDO will include the following:

- PrDO indicator: People provided with safely managed sanitation*
- PrDO indicator: People with enhanced resilience to climate risks (includes flood and drought risks)
- Volume of treated wastewater delivered for reuse in irrigation in areas that are vulnerable to droughts and saltwater intrusion
- Population living in WRM basins/sub-basins whose management committees are operational and where water resources data is available in real time to the general public

* Corporate scorecard indicator.

[35] WRM capability relates to sector stakeholders' capability to make sound WRM decisions through participatory and inclusive deliberative mechanisms, informed by comprehensive, up-to-date, and valorized water resources information.

48. **The proposed project will be aligned with the recommendations of the GoS's NWSP,** aiming to ensure the availability of sufficient water resources for all uses by 2030. Phase 1 will finance a portion of the government's program and mostly focus on the priority water security areas identified in the NWSP where livelihoods and the economy are most at risk due to water insecurity: the DMT, the Niayes area, Horst de Diass, and Lac de Guiers. The project will be implemented over five years. Infrastructure design will be made consistently with the principles of the Resilient Water Infrastructure Design Brief.

B. Project Components

49. Project activities are organized around four components as detailed below (and in Annex 2).

Component 1: Water resources management and protection (US$22.2 million equivalent)

50. This component will promote water security and resilience to climate change-exacerbated droughts and floods through the restoration of depleted or polluted sources and improved management.

Subcomponent 1.1: Restoring strategic water resources of Lac de Guiers (US$11.2 million equivalent)

51. **This subcomponent will aim to improve the security of water supply in areas relying on Lac de Guiers**. It will finance design, construction, and works supervision aiming to improve the lake's flooding and pollution control. The activities will include: (a) the rehabilitation of equipment on the Richard Toll intake; (b) the rehabilitation, raising and strengthening of dikes around parts of Lac de Guiers; (c) associated engineering and environmental and social studies, and works supervision; (d) the update of the 2005 Lac de Guiers pollution management plan; and (d) feasibility studies including a review of options. including through PPP, to valorize typha into biochar and biogas. The subcomponent will also support the preparation of feasibility studies for the improvement of Bango and Mbakhana water system upstream of Saint-Louis.

Subcomponent 1.2: Improving Diass and Littoral Nord groundwater recharge and management (US$3.7 million equivalent)

52. **This subcomponent will support the recharge of the Diass and Littoral Nord water tables** through: (a) the identification and implementation of aquifer recharge systems including hydrogeological monitoring equipment and NBS, such as retention systems, soil restoration, construction of terraces, and bunds along contour lines; (b) the rehabilitation of the Panthior small dam and nature-based landscaping solutions to enhance groundwater recharge; and (c) design and supervision activities, as well as technical assistance for their management and maintenance.

Subcomponent 1.3: Strengthening WRM governance and developing new water sources in the Niayes area and in the Groundnut Basin. (US$6.9 million equivalent)

53. **Strengthening WRM governance will include TA** to (a) strengthen DGPRE's capacity, knowledge, resources, and management tools so it can become the leading water resources authority and (b) institutionalize the IWRM participatory mechanism through the establishment and operation of SDAGE management committees in a gender--inclusive way, as well as the operationalization of DGPRE's decentralized consultation framework at the UGP and sub-UGP levels in selected priority water security areas (DMT, Diass, Littoral Nord and Lac de Guiers areas). Activities will also include the preparation of feasibility studies for investments selected from those areas.

54. **This subcomponent will support studies to improve water security with a focus on water resources development in the Niayes area and in the Groundnut basin**. These upstream studies will integrate climate change considerations to enhance stakeholders' preparedness to climate change and natural hazards that could affect water sources availability or accessibility and will strengthen their decision-making in the face of such uncertainties. It will also support exploratory hydrogeological studies in the Sebikhotane area.

Component 2: Improving sanitation in a circular economy (US$207.7 million equivalent, of which US$60 million in private capital)

55. This component aims to develop access to sanitation services and to promote treated wastewater reuse and water losses reduction to limit the demand of new water resources in a spirit of circular economy.

Subcomponent 2.1: Improving access to urban sanitation (US$200.1 million equivalent)

56. **This subcomponent will support improved sanitation services in Dakar** through the design, construction, and works supervision of 75 percent of Dakar's Eastern sewerage system,[36] in an area marked by high population density in climate change-exacerbated flood-prone areas. The subcomponent will also finance the implementation of a wastewater treatment plant (WWTP) with a capacity of 39,000 m^3 per day to cover the needs of the constructed sewerage system, including of its remaining portion to be constructed in Phase 4. The WWTP will include sludge anaerobic digestors and desiccators to allow for valorization in agriculture. Biogas generated will be used to cover most of the WWTP's power need, leading to further reduction in methane emissions. Behavior change and communication TA will be provided to promote the adoption of sewerage services and shifts in hygiene practices.

57. **The subcomponent will also include the construction of tertiary treatment facilities**, such as an 18-km treated wastewater conveyance system to the Niayes area for irrigation and aquifer recharge. Hygiene awareness and behavior change campaigns will support the transition to improved sanitation.

58. **An early-stage and high-level market sounding analysis suggests the opportunity for PCM.** Feasibility studies and transaction advisory services will be provided to ONAS to prepare PPP arrangements to implement the WWTP, following the Scaling ReWater approach. It is assumed at this stage that private capital will cover just over half of the US$100 million WWTP, the rest being funded by the project through a VGF. Under the proposed PPP arrangement, the WWTP will be implemented through a design-finance-build-operate-transfer (DFBOT) contract with ONAS, with potential IFC debt financing. The subcomponent will support the preparation of feasibility study and bidding documents and the provision of transaction advisory services. An IDA guarantee (for example, a payment guarantee) may be deployed under Phase 2, subject to due diligence and market interest at that time.

Subcomponent 2.2: Strengthening Irrigation Systems (US$7.4 million equivalent)

59. **This subcomponent will finance the implementation of an irrigation pilot relying on treated wastewater reuse in Diender Valley** (Niayes) through preparatory studies, construction, works supervision and associated communication and outreach, and limited intrants to develop irrigation systems with solar PV pumping. It will also: (a) assess wastewater reuse demand and acceptance; (b) engage with stakeholders involved in treated wastewater reuse and raise awareness on associated benefits and safety measures; (c) build capacity of market gardeners in management, climate-resilient and water-saving agricultural practices, and irrigation techniques through gender-sensitive trainings; and (d) supply of agricultural intrants, including equipment, fertilizers and horticultural seeds. This subcomponent will also support the restructuring of irrigation networks, associated TA, and the setup of an affermage contract to manage the hydraulic installations supplied by SONES's *Thiaroye* and *Beer Thialane* wellfields.

Subcomponent 2.3: Improving access to rural sanitation (US$0.2 million equivalent).

60. **This subcomponent will finance preparatory activities for the expansion of on-site sanitation facilities planned under Phase 3**, including a mapping of sanitation needs around Lac de Guiers and the study of technologies suitable for the area's high water table.

[36] The Dakar Liquid Sanitation Master Plan has identified four homogeneous sanitation systems for the development of sanitation. The Eastern system has an estimated 56 percent of the population of the Dakar agglomeration. It recommends developing sewerage systems in this area due to the high water table and vulnerability to flooding and to protect a shallow aquifer used for urban agriculture and local traditional uses.

Component 3: Improving water supply services (US$16.4 million equivalent)

Subcomponent 3.1: Improving urban water supply services (US$14.8 million equivalent)

61. **In preparation of NRW reduction activities planned in Phase 3**, the component will finance the sectorization of SONES's water supply network in Dakar, enabling the establishment of clear NRW baseline, targets, and investment programs. Demand management measures to reduce water wastage among large institutional and industrial water users will be identified, for implementation in this and future phases.

62. **The subcomponent will fund engineering studies and TA for SONES to foster the PCM for the development of its water supply systems.** This will include a feasibility study related to a PPP for an interbasin water transfer, for a total amount exceeding US$2 billion (with potential IFC financing for selected infrastructure) and transaction advisory services related to a PPP for a desalination plant in Dakar. Subject to satisfactory due diligence, Phase 2 may provide a viability gap fund for the construction of selected infrastructure of a bulk water production system for Dakar and possibly an IDA guarantee (for example, a payment guarantee). The subcomponent will finance engineering designs and safeguards studies, considering present and future climate scenarios as well as the Resilient Water Infrastructure Design Brief for infrastructure investment activities to be carried out in future phases (including distribution systems expansion).

63. **The subcomponent will fund engineering studies, works, and supervision activities for the development and rehabilitation of secondary towns' water supply systems**. Site prioritization will be carried out during the first year of project implementation based on criteria to be described in the project implementation manual (PIM) such as economic efficiency, complementarity with other investment programs and readiness, and vulnerability to climate change-related water shocks. Infrastructures to be financed may include production systems, pumping stations, reservoirs, and transmission and distribution pipelines.

Subcomponent 3.2: Improving rural water supply services (US$1.6 million equivalent)

64. **This subcomponent will finance preparatory activities for the expansion and efficiency improvement of rural water supply services planned under Phase 3**, aiming to improve services for more than 500,000 people. This will include the preparation of: (i) feasibility, design, and safeguards studies taking into consideration climate considerations for the construction of multi-village water supply systems in the regions of Sédhiou, Tambacounda, and Kolda; and (b) engineering and safeguards studies for NRW reduction in the Tambacounda.

Component 4: Sectors reforms, strengthening citizen engagement, and project management (US$13.7 million equivalent)

65. This component focuses on fostering sector reforms, strengthening the participation and consultation of citizens in the realization of water security objectives and supporting project management.

Subcomponent 4.1: Sector reforms (US$2.4 million equivalent)

66. **The subcomponent will support the preparation of a circular economy strategy.** This will include: (a) a review of sector decarbonation opportunities, such as through energy efficiency optimization and renewable energy; (b) a review of treated wastewater reuse opportunities and of biogas generation and reutilization by ONAS; and (c) the identification of potential markets for treated sludge reuse. TA support by the Global Center for Adaptation (GCA) will help understand climate risks to urban and surrounding areas, identify suitable options for the reuse of treated wastewater in a resilient manner, and document lessons learned for replication in future MPA phases. TA will also help leverage the MPA's climate mitigation potential for climate finance mobilization.

67. **For sector agencies already engaged in various forms of PPPs, a TA will strengthen their capacity to identify PPP opportunities, structure contracts, and manage their transactions.** With SONES, the main focus will be on

capacity for PCM. OFOR will be assisted with the formulation of second-generation water supply services delegation contracts based on an assessment of the first affermage contracts, set to close in 2025. TA will support the Directorate of Hydraulics (DH) in the review of concession, affermage, and performance-based contracts. It will also support implementation of the urban sanitation reform roadmap, geared toward the delegation of services to the private sector. A technical-financial model sector will be set up to review the sector's tariffs and financial viability.

68. **The subcomponent will finance the review of WRM sector reform options**, with the definition of an organizational framework to remove bottlenecks and overlaps between sector entities and improve the functionality of national WRM consultative mechanisms. These activities will support the achievement of International Monetary Fund (IMF)-funded Resilience and Sustainability Facility's Resilience Measure 8 to define the roles and responsibilities and the procedures allowing each actor to assume their role and responsibilities for water.

69. **Finally, it will finance TA for the definition of an entity in charge of agricultural water management in the Niayes area,** a prerequisite to the future Lac de Guiers-Dakar water transfer which will supply the area.

Subcomponent 4.2: Citizen engagement and project management (US$11.3 million equivalent)

70. **This subcomponent will support citizen involvement in SONES and ONAS** by: (a) developing consultations and feedback mechanisms such as customer surveys, focus groups (including local associations), and grievance redress mechanisms (GRMs); and (b) ensuring that consultation results are affecting service deliver and are publicly available through a project website. Joint capacity building, based on needs assessments, will promote cross-institutional and gender sensitivity. It will also support the development of hygiene promotion campaigns, leveraging World Bank knowledge like the Handwashing Initiative, to reduce public health risks exacerbated by climate change, such as vector-borne diseases.

71. **It will support activities (including staffing and other resources) needed to implement the project**. Activities to be financed include the operational costs of the project coordination unit (PCU) and of any needed resources in the implementing agencies (operational costs, training, and so on), audits, preparation and implementation of safeguards instruments, M&E, implementation support such as field missions and data collection, and outreach and communications on the government's and implementing agencies' roles in the project.

C. Project Beneficiaries

72. **The main project beneficiaries are households living in the selected priority water security areas, including vulnerable groups such as women and youth and those most vulnerable to climate change impacts, such as smallholder farmers.** Categories of beneficiaries include (a) 600,000 beneficiaries with access to safely managed sanitation services in Dakar; (b) more than 7 million people living in areas where water resources information is accessible and valorized through improved WRM governance; (c) more than 3,000 farmers exploiting 600 ha of farmland supplied by treated wastewater; and (d) in the long term, improvements in the Lac de Guiers hydraulic system that will contribute to enhancing water supply reliability for all SONES customers in DMT (up to 4 million) and water users in the Niayes, Lac de Guiers, and Bas-Ferlo region. The number of beneficiaries from improved water supply in secondary cities will be known based on the prioritization of investments by SONES.

73. **At the national level, key sector stakeholders will directly benefit from TA under the project.** This includes for SONES, ONAS, and OFOR, with enhanced capacity to structure PPPs (including for PCM), ONAS's operational efficiency through the delegation of services to a private operator, DGPRE's enhanced human and material capacity to lead WRM, and so on. Other agencies and institutions at national and local levels will directly and indirectly benefit from the project through coordination, supervision missions, and capacity-building activities.

D. Rationale for World Bank Involvement and Role of Partners

74. **The World Bank, with its global experience in the water sector, will be able to focus on funding the most cost-effective investments.** This project will build on the World Bank's experience expanding water supply and sanitation services in low-income and peri urban areas, structuring irrigation services, and improving the performance of water supply and sewerage services, including through PPP and citywide inclusive sanitation.

75. **For more than 20 years, the World Bank has been a leading partner of the GoS in the development of water and sanitation services and WRM through IDA lending and knowledge,** including more recently (a) the Water and Sanitation Millennium Program (*Programme d'Eau Potable et d'Assainissement du Millénaire,* PEPAM, P109986), closed in 2015; (b) the Urban Water and Sanitation Project (*Projet d'Eau et d'Assainissement en Milieu Urbain*, PEAMU, P150351) closed in 2021; and (c) the 2022 Water Security Study (P172233). Under these operations, more than 2.7 million people gained access to improved water services and 1.1 million people to improved sanitation. The World Bank is currently financing the Rural Water Supply and Sanitation Project (*Projet d'Eau et d'Assainissement en Milieu Rural,* PEAMIR, P164262), which aims to scale up access to water supply and sanitation services to an additional 1.0 million people. These projects also supported key reforms in the urban and rural water sectors.

76. **The project reflects the World Bank's Maximizing Finance for Development (MFD) strategy and promotes private capital mobilization (PCM) and private capital enabled (PCE).** Under Component 2, a VGF of US$50 million is expected to leverage about US$60 million in private equity and commercial loans for the WWTP investment, which will enable treated wastewater reuse in irrigation. PPP preparation is underway, and financial closing is expected during the second year of project implementation. Also, PCE activities will be carried out through TA helping SONES, ONAS, and OFOR to pursue PPP options for infrastructure development investments such as an interbasin water transfer from Lac de Guiers to Dakar. PCE contribution will be measured through the non-monetary indicator "Water supply PPP project bid out as a result of project-financed technical assistance."

77. **Collaboration with development partners along a common vision of sector modernization will be essential given the large financial needs.** Implementation of the NWSP is estimated to cost more than US$2.8 billion by 2050. The World Bank will continue collaborating with key donors to ensure the complementarity of interventions.

E. Lessons Learned and Reflected in the Project Design

78. **Addressing water security challenges requires a holistic approach, working across services, resource management, and risk mitigation, embedded within a circular economy.** The project design builds on the World Bank Water Security Diagnostic Framework, which has been applied globally and informed the 2022 Water Security Study. Through this lens, activities were considered in eight priority water security areas, of which four are targeted through the proposed operation. The project will also follow the principles outlined through the Water in Circular Economy and Resilience (WICER) Initiative to deliver resilient and inclusive services, design out waste and pollution, and regenerate natural systems.[37] Preparing a circular economy strategy will enable upstream and continuous stakeholder engagement, which has proved to foster ownership and acceptance of such measures.

79. **Continuity in engagement allows more ambitious objectives to be set and achieved, including supporting sector reforms.** Through long-standing engagement in the sector, the World Bank was able to support the GoS in defining a vision and development plan for the sector. This continuity was reflected in the establishment of a long-term PCU, which was empowered to design, implement, and coordinate complex and long-term sector reforms, and is leading project preparation. Key PEAMU achievements that have influenced project design include establishing a

[37] Delgado, Anna, Diego J. Rodriguez, Carlo A. Amadei and Midori Makino. 2021. "Water in Circular Economy and Resilience (WICER)." World Bank, Washington, DC.

financial model accepted by all stakeholders, which helps balance investments with financial sustainability based on politically and socially acceptable tariffs, and continuous investment in TA for WRM studies.

80. **Promoting the reuse of treated wastewater requires a holistic and inclusive approach along the sanitation service chain.** Experiences documented by WICER highlight the importance of working with an entity in charge of ensuring sanitation services at all stages of the sanitation service chain to control the quality of products entering the treatment stage and promote their reuse. Having the right enabling environment, with regulatory tools encouraging reuse, and an institutional champion to promote reuse are also crucial to success.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

81. **Given the multisectoral nature of the project, the Ministry of Hydraulics and Sanitation will host the PCU**, replicating the implementation arrangements of previous IDA-financed projects. The PCU will coordinate project implementation across components, ensure timely availability of fund transfers, maintain project accounts, produce financial reports, monitor and evaluate the program, carry out communication campaigns, and ensure compliance with project requirements. It will be responsible for the implementation of Subcomponent 2.2, supported by DHORT; Subcomponent 2.3, supported by the Directorate of Sanitation (DS); Subcomponent 3.2, supported by OFOR; and Component 4. For these activities, the PCU will retain administrative, financial, procurement, and safeguards responsibilities. A PIM will provide clear guidelines for the agencies.

82. **Four other entities will act as implementing agencies**, retaining procurement and safeguards responsibility: OLAC for Subcomponent 1.1; DGPRE for Subcomponents 1.2 and 1.3; ONAS for Subcomponents 2.1; and SONES for Subcomponent 3.1. They will benefit from high-level procurement and safeguards support from the PCU, particularly OLAC, which lacks experience implementing World Bank-financed projects. SONES, DGPRE, and ONAS have previous successful implementation records with World Bank-financed projects (PEAMU and PEAMIR).

83. **A project steering committee (PSC) will provide strategic guidance for the project, with the support of a technical committee within the PSC**. It will ensure the coherence of activities with sector strategies and guarantee intersectoral coordination with other ministerial departments. The PSC will include representatives appointed by ministries relevant for sector activities. It will meet twice a year and the technical committee four times per year.

B. Results Monitoring and Evaluation Arrangements

84. **The PCU will be responsible for overall project M&E** and will collect data from participating agencies. Indicators on climate change, citizen engagement, and gender have been included in the Results Framework. Monitoring will be based on the performance indicators of the implementing agencies, which the project will help to improve for monitoring, and surveys. To the extent possible, these results will be disaggregated by gender.

85. **The PCU will build on its existing M&E platforms SenENWISIS and e-ProcurManager**. It will integrate a financial tracking module for payments at all stages and develop an external project portal to enhance citizen engagement, inform, and receive feedback from beneficiaries on project activities.

C. Sustainability

86. **The project will enhance the sustainability of water resources through improved IWRM.** The provision of monitoring tools and the capacity building of DGPRE to collect and analyze water data will improve the availability

of water information and ensure that it is used for climate-informed decision-making. The project will strengthen the legal framework for WRM and better equip DGPRE to implement its functions beyond the project timeline.

87. **The development of sanitation services along the whole service chain will set the stage for a sustainable circular economy approach.** By promoting the reuse of sanitation byproducts, the project will emphasize capacity building of ONAS staff to ensure the quality of these byproducts and of farmers in their use and application in crop irrigation and fertilization. Through TA focused on demand identification, behavior change, and communication, customers and farmers will participate in the design and long-term implementation of these activities.

88. **The financial sustainability of the water sector will be at the center of project activities.** TA will be provided to build PCM capacity within SONES, ONAS, and OFOR. It will also help ONAS implement the urban sanitation reform, exploring possibilities for the participation of private operators in the management of services, with an eye to maximizing cost efficiency. Since sanitation tariffs do not allow ONAS to fully cover its operation and maintenance costs, the project will support the set up of a technical-financial model to review revenue generation mechanisms (including tariff), to enhance investments' bankability (including through VGF and guarantees), and to ensure the sector's financial viability. Finally, through a clearer institutional setup, a financial mechanism for operation and maintenance could be designed in the Niayes to ensure irrigation services are sustainable beyond the project life.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic, and Financial Analysis

(i) Economic and financial analysis

89. **Economic analysis.** The economic costs and benefits of project interventions have been assessed based on the following development impacts: (i) increased access to safely managed sewerage and wastewater treatment services; and (ii) additional water for socioeconomic uses, electricity, and fertilizer through the implementation of the WICER principles[38] in the project intervention areas. The economic and financial analysis follows the World Bank guidance for economic analysis of investment project financing (IPF) and the guidelines on carbon accounting and the social value of carbon in project appraisal. It covers US$222.05 million, or 86.4 percent of the total project cost, related to investments under Components 2.1 and 2.2 that have quantifiable benefits and are amenable to a cost-benefit analysis (CBA).

90. **Key parametric assumptions for the CBA.** The rate of discount used for the CBA is 6 percent, the opportunity cost of capital for investment projects comprising water and wastewater activities. The time horizon for the CBA is 30 years, including the project implementation period, and the life of investment infrastructure is assumed to be 25 years. The economic analysis uses 2023 constant prices for both cost and benefits.

91. **The project is expected to generate significant quantifiable benefits.** The project's deployment of a sewerage network will benefit a population of about 600,000 people by reducing their exposure to untreated wastewater that has adverse health effects. At the same time, as households get connected to the sewerage network, shallow aquifers in the project intervention area will benefit from reduced household wastewater releases carrying pollutants that cause environmental degradation. The circular economy approach applied in the project aims to result in water reuse for irrigation, electricity generation, and fertilizer production.

92. **The project is found to be economically viable.** With an estimated US$211.66 million economic net present value (ENPV) and a 14.72 percent economic internal rate of return (EIRR), the project is found to be economically

[38]World Bank Water Global Practice, 2021. "Water in Circular Economy and Resilience (WICER) – The Case of Dakar, Senegal." The World Bank, Washington, DC.

viable (see Table 5 and Annex 3). Such estimated ENPV means that the proposed project's benefits would exceed by US$211.66 million the benefits of other alternative projects were the investment resources channeled to other public investment projects, generating a 6 percent return. This is confirmed by the project's estimated 14.72 percent EIRR—well above the 6 percent EIRR of the alternative project (reflected in the discount rate).

Table 5: Economic Analysis Indicators

		Estimates not including SPC	Shadow price of carbon (SPC)	
			Lower bound	Upper bound
Project ENPV (@ 6 percent discount rate), US$, millions		211.66	239.70	267.81
EIRR	Percent	14.72	15.62	16.49

93. **The project contributes to the mitigation of greenhouse gas (GHG) emissions.** The assessment of impact of project activities on GHG shows that the project will contribute to GHG net emission reductions of about 955,025 tCO_2eq during the life of the project, equivalent to -31,834 tCO_2eq per year. Gross GHG emissions by project activities during the life is estimated at 433,345 tCO_2eq (see details in Annex 3).

94. **Economic viability of the project is enhanced considering the contribution of the project to reduced GHG emissions.** Using shadow prices of carbon (SPC), the project's ENPV will rise from US$211.66 million to between US$239.70 and US$267.81 million, which indicates that the project is not only economically viable from the Senegalese perspective but even more so from the global community perspective. Such enhanced economic viability is reflected in the EIRR, which rises from 14.72 percent to between 15.62 and 16.49 percent, as shown in Table 5.

95. **Sensitivity analysis shows that the project economic viability is more sensitive to cost overruns compared to time overruns.** With a 10 percent cost overrun or a one-year time overrun, the project's ENPV falls 8.33 percent and 5.78 percent, respectively; taking a 20 percent cost overrun or a two-year time overrun, the project's ENPV falls 16.67 percent and 11.63 percent, respectively. The project economic viability is sensitive to the possibility of a lower market price of fertilizer produced by the WWTP, that is, a 10 percent fall in market price results in a 12 percent fall in the project's ENPV, and a 20 percent fall in market price results in a 24 percent fall in the project's ENPV.

96. **Financial analysis.** ONAS's revenues covered 72 percent of its operation and maintenance costs in 2022 and relied on operating grants from the national government. The PPP preparation TA will review revenue generation mechanisms (including tariff) based on a sector technical-financial model to ensure the sector's financial viability, assess fiscal impacts, and enhance ONAS's capacity to mobilize private capital. For the PPP contractor, the analysis estimated an 11 percent financial internal rate of return, which is too low to attract PPP contractors to fully finance the WWTP; a DFBOT PPP contract could be financially viable with adequate VGF and possibly IDA guarantees.

97. **Rationale for public sector financing.** Public sector financing is justified by the public good health benefits and environmental positive externalities of the project interventions. In addition, public sector financing is justified by the current economic context, where sanitation tariffs do not allow full cost recovery at this stage.

(ii) Technical analysis

98. **The project design represents a technically viable approach to improve water security in the selected priority water security areas.** Engineering designs build on past studies, including the 2022 National Water Security Strategy and the 2024 Dakar-Thiès-Petite Côte Water Supply Master Plan. Sanitation works are consistent with the 2012 Dakar Sanitation Master Plan and its subsequent design studies (2018–2020), and like the irrigation and treated wastewater reuse schemes, the technologies considered are proven and well-established.

99. **The project will follow the principles outlined through the WICER initiative to deliver resilient and inclusive services, design out waste and pollution, and regenerate natural systems.** Project activities are directed by the

principles of diversification of water resources and the protection or restoration of existing sources; planning for climate and non-climate uncertainties; fit-for-purpose water allocation; resource recovery throughout the water cycle; the use of NBS; and improved management of water demand, water-saving irrigation techniques, and efficiency of water systems. These principles will be promoted through conducive institutional, regulatory, and contractual frameworks and awareness-raising campaigns to foster a paradigm shift in water management.

100. **The project is aligned with the goals of the Paris Agreement on mitigation and adaptation.** Senegal's NDC identifies water resources availability as an area strongly affected by climate change. The vulnerability of ecosystems and natural resources is recognized as a key area for adaptation and mitigation, since the livelihoods of 60 percent of the population depend on them and the water supply and sanitation sector has huge mitigation potential.

101. **Assessment and reduction of adaptation risks.** The climate and disaster risk screening indicates a Moderate risk. The main climate risks with a possible impact on the operation and its PDO are droughts, floods, rising temperatures, and saltwater intrusion. The project design considered the above climate risks to design adaptation-related activities that will raise the project areas' resilience, including: expanding sustainable sanitation and irrigation services; strengthening dikes around Lac de Guiers; protecting agricultural land from floods risks; undertaking aquifer recharge through NBS to reduce saltwater intrusion and act as a buffer during droughts; treating wastewater at the tertiary level and reusing it in irrigation to reduce pressure on groundwater resources; improving data collection for climate-informed water planning; and promoting IWRM at the basin level. To enhance the resilience of the DMT Water Supply Master Plan, the World Bank will conduct, with Global Water Security and Sanitation Program (GWSP) funding, stress tests of the proposed investment plan based on its decision tree framework. Studies for the automation of the Richard Toll intake, dikes work on Lac de Guiers, and the rehabilitation of Panthior dam will consider the magnitude of projected flooding and drought risks in relevant areas to maximize the resilience of these infrastructures to future risks. Studies for the sewerage infrastructure will incorporate resilience measures to future flooding and sea-level rise in coastal areas to ensure facilities are designed with appropriate modularity, protection from flooding impacts, and alternate energy sources, as needed. Irrigation infrastructure in the Niayes will be exposed to drought risk, which is mitigated through the provision of treated wastewater. All preparatory studies under Phase 1 will consider climate risks. Thus, climate risks have been reduced to an acceptable level and are not likely to have a material impact on the operation and its PDO.

102. **Assessment and reduction of mitigation risks:** The operation is not at material risk of having a negative impact on the country's low-GHG emissions development pathways. All project activities are universally aligned: rehabilitation of infrastructure and protection of Lac de Guiers and groundwater recharge under Component 1; sewer system expansion, biogas capture, wastewater reuse, and renewable energy-based irrigation systems under Component 2; and water supply sectorization under Component 3. GHG emissions will be reduced mainly from (a) capturing methane gas generated during anaerobic wastewater treatment for power generation and (b) avoiding methane emissions from latrines and septic systems. The project will adopt NBS to recharge aquifers, providing a combination of both adaptation and mitigation benefits by reducing runoff and erosion while also reducing GHG emissions by increasing soil carbon sequestration.

103. **An investment program representing 27 percent of the project amount will be ready to enter procurement activities after Board approval.** Bidding documents for investments in Lac de Guiers (US$10 million) and in the Dakar sewerage system (US$43 million) are expected to be available by mid-2024.[39]

B. Fiduciary

[39] For Phase 2, Board approval will be subject to the satisfactory due diligence of the desalination plant associated facilities. More than 90 percent of the phase's amount will thus be ready to be committed as VGF as soon as that phase becomes effective.

(i) Financial Management (FM)

104. **FM assessment.** The assessment complied with the Financial Management Manual for World Bank-Financed Investment Operations, which became effective on March 1, 2010, as last revised in September 2021. These arrangements would ensure that the implementing entity: (a) uses project funds only for the intended purposes in an efficient and economical way; (b) prepares accurate and reliable accounts as well as timely periodic financial reports; (c) safeguards assets of the project; and (d) has acceptable auditing arrangements. The project will rely on the FM arrangements in place under PEAMIR, including: (a) an adequate FM team (administrative and financial officer and accountant) familiar with World Bank procedures; (b) a multi-project accounting software, integrating the proposed project's accounts; (c) a satisfactory administrative and FM manual reflecting project specificities; and (d) internal audit activities carried out by the MHA's internal inspectorate.

105. The overall FM performance of the PEAMIR was Moderately Satisfactory at the review undertaken in January 2024. The 2022 financial statements received a qualified opinion related to the absence of confirmation of the bank balance by the commercial bank. However, this qualification has been cleared during the supervision mission.

106. **Mitigation measures**. The PCU will be required, one month after effectiveness, to update the project financial and administrative manual to take in account the specificities of the project, customize the accounting software to segregate the project accounting, and hire an external auditor with qualifications satisfactory for the World Bank.

107. **In conclusion, the FM arrangements are adequate and satisfy the World Bank's minimum requirements** under the Bank Policy and Directive on IPF effective in 2017. The overall risk for the project is rated as Moderate.

(ii) Procurement

108. **Applicable regulations.** Procurement activities will be carried out in accordance with the World Bank's procedures, as specified in (a) the World Bank's 'Procurement Regulations for IPF Borrowers,' dated September 2023; (b) 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants,' dated October 15, 2006, and revised in January 2011 and July 1, 2016; and (c) other provisions stipulated in the financing agreements, using the standard procurement documents accompanying the regulation. The PCU has an adequate information system (e-Procure Manager) for managing project procurement. SONES, ONAS, and DGPRE have proven experience in procurement activities through their respective committees in charge of quality control of procurement processes. OLAC is not familiar with the World Bank's procurement procedures. The PCU will ensure quality control of the procurement documents and will provide support to the implementation agencies.

109. **The overall procurement risk is Substantial**, but after the implementation of the proposed mitigation measures, the risk will be Moderate. A project procurement strategy for development (PPSD) and a Procurement Plan for the first 18 months of project implementation have been prepared. The PPSD reviews market conditions, client capacity and contracts costs and risks, and proposes measures to optimize procurement implementation.

C. Legal Operational Policies

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Area OP 7.60	No

110. The project triggers OP/BP 7.50 because some of the proposed investments will take place on the Senegal River system, the Senegal-Mauritania Aquifer basin, and the Gambia River system, which are international waterways. In accordance with the policy, other riparian countries were notified, and there were no objections to the project. Based on the outcome of the notification process and the assessment that the project will not cause appreciable harm, the Regional Vice President gave his approval to finalize project preparation on May 10, 2024.

D. Environmental and Social (E&S)

111. **The project is being implemented under the E&S Framework (ESF)** and the following E&S Standards (ESS) were considered relevant for the project: ESS 1: Assessment and Management of E&S Risks and Impacts; ESS 2: Labor and Working Conditions; ESS 3: Resource Efficiency and Pollution Prevention and Management; ESS 4: Community Health and Safety; ESS 5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement; ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; ESS 8: Cultural Heritage; and ESS 10: Stakeholder Engagement and Information Disclosure.

112. **Environmental safeguards.** The E&S assessment carried out during project preparation highlighted potential impacts. Key positive impacts include (a) the promotion of water security at the national level and (b) the improvement of urban sanitation. However, potential environmental risks and adverse impacts associated with project activities are likely to be high due to activities related to the construction of an activated sludge wastewater treatment plant with a total treatment capacity of 39,000 m^3 per day, and technical assistance through studies for high-risk investments planned in the project's other phases. Potential environmental risks are mainly linked to water, soil, and air pollution. These may include: (i) alteration of air quality by dust flights during development, foundation, earthworks, rehabilitation of existing water storage systems for multi-purpose uses (water supply, small-scale irrigation, and livestock) and hydraulic weir, as well as the construction and rehabilitation of sanitation facilities; (ii) degradation of the sound climate due to excavation work, noise, and vibration from moving construction vehicles and machinery; (iii) contamination of surface water by residues of hydrocarbons, lubricants, oils, and suspended solids; (iv) risk of accidents and incidents due to the supply of construction materials to the site, the transport of equipment and personnel during construction work; (v) odor nuisance due to poorly designed, misused, or badly maintained latrines; and (vi) wastewater and fecal sludge generation (from sanitation facilities); and (vii) potential disruption of natural habitats (wetland). There are also risks associated with the hazardous waste (including heavy metals and aquatic and airborne vectors) that may be present in the wastewater.

113. **Social safeguards**. Sewer expansion in dense urban areas entails risks of accident to the communities and children and possible restrictions of access to businesses. Social risks relate to the health and safety of the population and workers, including the potential influx of labor. Disproportionate effects on disadvantaged or vulnerable groups and prejudice or discrimination in accessing project benefits are possible. Some investments will require temporary displacement, and potentially permanent land acquisition could lead to physical and/or economic involuntary displacement, loss (or disruption) of income or of livelihood activities, and restrictions on land use. Other risks include spreading of sexually transmitted diseases such as sexually transmitted infections (STIs), HIV, and AIDS with the arrival of foreign workers; risks of social conflicts in the event of non-local employment; health vulnerability due to poor hygiene, which could lead to infectious diseases; insecurity; sexual exploitation and abuse (SEA) / sexual harassment (SH) that may arise from power relationships in the context of the proximity of female and male workers as well as workers and neighboring communities; and child labor risks.

114. **Management and mitigation of E&S risks.** The borrower identified several mitigation measures reflected in the safeguards instruments and is committed to their implementation. This includes: (a) an E&S Management Framework (ESMF), which includes a GRM and a GBV/ SEA/SH Prevention and Mitigation Plan, disclosed on May 3,

2024;[40] (b) a Resettlement Framework (RF), disclosed on October 3, 2023;[41] (c) the E&S Commitment Plan (ESCP), disclosed on May 3, 2024;[42] and (d) a Stakeholder Engagement Plan (SEP), disclosed on October 3, 2023, which includes the Complaint Management Mechanism and Labor Management Procedures (LMP).[43] Where applicable, ESIAs and E&S management plans will be prepared, consulted, approved, and disclosed before civil works start.

115. **Strong citizen engagement** will strengthen participatory mechanisms around WRM and water services provision. Through improved water information and communication about planned activities and decision-making, sector transparency will be enhanced. In addition to the establishment of a project-specific GRM, support to the customer service of SONES and ONAS will strengthen feedback to service providers. Free and prior-informed consultations will proactively seek user input in design, the identification of vulnerable people, and service delivery. Beneficiaries' feedback will be considered in decision-making processes related to infrastructure design and management. Moreover, the project will ensure an inclusive approach to reuse activities toward building beneficiaries ownership of sustainable water management practices. To ensure inclusive facility design and proper operation and maintenance, accessibility and safety audits will be carried out with representatives from women's groups and disability advocates. Studies on the demand and opportunities for sanitation byproducts and communication campaigns will promote accountability through two-way information flow about project decisions. A related beneficiary feedback indicator will be monitored during implementation.

116. **The project will promote women's empowerment in the water sector decision-making process.** The development of sector management structures (such as SDAGE committees) will consider the gender balance of participants, ensuring that women are in positions of decision-making authority in institutions beyond project support.[44] Building on platforms like Equal Aqua, the project will promote women and youth participation in the workforce of all project institutions. The Equal Aqua questionnaire helped identify measures such as: develop gender strategies, conduct training sessions on sexual harassment, promote hiring and retention measures toward women and youth, and conduct gender-sensitive training. Gender-sensitive actions will include: (a) ensuring women's participation in all aspects of the project; (b) using gender-sensitive approaches, including information events targeted at women; (c) collecting and monitoring gender-disaggregated data on beneficiaries; and (d) assessing the scale of women and female-headed household beneficiaries from project interventions.

V. GRIEVANCE REDRESS SERVICES

117. ***Grievance redress.*** Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the World Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of World Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of World Bank Management and after Management has been given an opportunity to respond. For information on how to submit complaints to the

[40] https://documents1.worldbank.org/curated/en/099050324154033099/pdf/P17867312916a70718ee41a5c252a25c1f.pdf
[41] https://documents1.worldbank.org/curated/en/099100323054035351/pdf/P178673018d1cb03f096cf039480127e631.pdf
[42] https://documents1.worldbank.org/curated/en/099050324161032021/pdf/P17867316795740219c341f4cf97721def.pdf
[43] https://documents1.worldbank.org/curated/en/099100323054015801/pdf/P1786730c8827805b08c5103b91d6798585.pdf
[44] To be monitored through the indicator "Share of women in decision-making positions within SDAGE committees" and through the sex-disaggregated portion of the beneficiary survey indicator.

World Bank's Grievance Redress Service (GRS), visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank's Accountability Mechanism, visit https://accountability.worldbank.org.

VI. KEY RISKS

118. **The overall project risk is considered High**, as the E&S risks are rated High. Political and governance as well as sector strategies and policies risks are currently estimated as Substantial.

119. **Political and governance risks are rated Substantial.** Senegal has historically benefited from a stable and active democratic political process, which has laid the foundation for the emergence of relatively solid formal institutions, making the country one of the best performers in the region in terms of key governance indicators.[45] However, challenges of weak regulatory enforcement, presence of a 'complex web of interlocking interests,' power centralization and politicization of public administration persist and undermine effective policy reforms.[46] Should these factors lead to changes in the mandates and relationships of key sector institutions involved in the project readjustments in project institutional arrangements and policy orientations may be required. This risk will be anticipated and mitigated through continued TA support to the GoS on sector institutional framework questions. Despite these measures, the residual risk remains Substantial.

120. **Sector strategies and policies risks are Substantial** due to the changes that will be promoted to sector-level organization strategies, policies, and governance arrangements. The implementation of the urban sanitation roadmap, the development of a circular economy strategy, and the operationalization of IWRM will lead to possible modifications in associated governance and policies. The project will support PCM, which represents a new strategic direction and will affect the sector's financial equilibrium. To mitigate these risks and ensure full ownership by sector stakeholders, the project will support the preparation of feasibility analyses to confirm the relevance of the various reform options and their alignment with sector efficiency and transparency principles. Despite these project design elements, these factors create uncertainty and lead to a substantial residual risk.

121. **E&S risks are rated High due to the nature of the investments to be undertaken.** Potential E&S risks are mainly linked to land acquisition; restrictions on land use and involuntary resettlement; occupational health and safety; community health and safety; and water, soil, and air pollution. These risks and impacts will be managed through the application of mitigation measures to be provided by comprehensive ESIAs and the implementation of the various ESF instruments prepared and disclosed under the Program. Improved wastewater treatment will reduce risks of contamination to the environment, while the development of circular economy measures will strengthen relevant institutions' resilience by providing local water and energy sources and reducing waste. Climate risks include reduced water availability due to extreme temperatures, droughts, and saline intrusion, which would affect the mobilization of additional water sources and destruction of project infrastructure due to flooding events. To the extent possible, infrastructure design considers these risks and aims to mitigate climate-related risks.

[45] World Bank, 2018. Systematic Country Diagnostic of Senegal. Available at: https://openknowledge.worldbank.org/handle/10986/30852.
[46] Ibid.

VII. RESULTS FRAMEWORK AND MONITORING

PDO Indicators by PDO Outcomes

Baseline	Period 1	Period 2	Period 3	Period 4	Closing Period
Access to safely managed sanitation					
People provided with safely managed sanitation services (MPA indicator) (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	400,000	600,000
➢People provided with safely managed sanitation services - Female (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0.00	0	0	200,000	300,000
Improved water resources management capability					
Volume of treated wastewater delivered daily for reuse in irrigation in areas that are vulnerable to droughts and saltwater intrusion (Cubic Meter(m3))					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	20,000	35,000
Population living in water resources management basins/sub-basins whose management committees are operational, and where water resources data is available in real time to the general public (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	4,400,000	6,800,000	6,950,000	7,100,000	7,150,000
People with enhanced resilience to climate risks (includes flood and drought risks) (MPA indicator) (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	402,000	603,000

Intermediate Indicators by Components

Baseline	Period 1	Period 2	Period 3	Period 4	Closing Period
Component 1: Water resources management and protection					
SDAGE committees supported by the Project (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029

0	2	6	6	6	6
Share of women in decision-making positions within SDAGE committees (Percentage) (Percentage)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
7	15	20	25	30	30
Groundwater salinity at Panthior dam (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
5,000	5,000	5,000	2,500	1,500	800
Component 2: Improving sanitation within a circular economy					
Household sewerage connections constructed (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	5,000	10,000	15,000	21,000
Volume of wastewater treated daily (Cubic Meter(m3))					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	25,000	39,000
Length of sewerage network constructed (Kilometers)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	50	100	250	370	400
Annual power generation from biogas (Megawatt hour(MWh))					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	4,500	7,400
Area provided with irrigation services from treated wastewater reuse (Hectare(Ha))					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	400	600
Farmers provided with irrigation services from treated wastewater reuse (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	0	0	2,000	3,000
Farmers trained with climate-resilient agriculture and irrigation techniques (Number)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
0	0	500	1000	1,500	2,000
Private capital mobilized by ONAS, leveraging World Bank financing under the project (Yes/No)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
No	No	Yes	Yes	Yes	Yes
Component 3: Improving water supply services					
Water supply network macro sectorization effective in Dakar 2 service area (Yes/No)					

Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
No	No	Yes	Yes	Yes	Yes
Water supply PPP project bid out as a result of project-financed technical assistance. (Yes/No)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
No	No	No	Yes	Yes	Yes
Component 4: Strengthening citizen engagement, sector reforms and project management					
Satisfaction of beneficiaries with project activities as demonstrated through beneficiary survey (Percentage)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
	-	-	65	65	75
Circular economy strategy developed and under implementation (Yes/No)					
Apr/2024	Jun/2025	Jun/2026	Jun/2027	Jun/2028	Jun/2029
No	No	Yes	Yes	Yes	Yes

Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

Access to safely managed sanitation	
People provided with safely managed sanitation services (MPA indicator) (Number)	
Description	This indicator monitors the expansion of improved sanitation services that are not shared with other households and where excreta are safely disposed of in situ or treated off site.
Frequency	Twice a year
Data Source	Progress reports by the supervision firm / ONAS and those established by the PCU
Methodology for Data Collection	The supervision firm will document progress made in the construction and commissioning of household sewerage connection. ONAS will communicate the data on a monthly basis and twice a year for the cumulative/aggregate volume. It is considered that one connection serves 3.4 households, with 7.5 people per connection on average.
Responsibility for Data Collection	PCU
➢People provided with safely managed sanitation services – Female (Number)	
Description	This indicator monitors the number of female beneficiaries under the main indicator hereabove.
Frequency	Twice a year
Data Source	Progress reports by the PCU
Methodology for Data Collection	A ratio of 50 percent is applied to the main indicator to which this additional indicator relates.
Responsibility for Data Collection	PCU
Improved water resources management capability	
Volume of treated wastewater delivered for reuse in irrigation in areas that are vulnerable to droughts and saltwater intrusion (Cubic meters/year)	
Description	This indicator monitors the effective treatment of effluents at the tertiary level at the Tivaouane Peulh WWTP, transfer to the Niayes area, and uptake for irrigation services. The entire Diender Valley targeted under this activity is subject to recurrent droughts and saltwater intrusion and is therefore relevant to the proposed indicator.
Frequency	Twice a year
Data Source	DHORT / DBRLA, Irrigation management entity
Methodology for Data Collection	The volumes will be measured at the pumping station that convey treated wastewater from the transfer systems' receiving basin to the irrigation perimeters.
Responsibility for Data Collection	PCU
Population living in water resources management basins/sub-basins whose management committees are operational, and where water resources data is available in real time to the general public (Number)	
Description	This indicator reflects the efforts conducted to strengthen and operationalize decentralized IRWM, with a focus on priority water security areas. In particular, the project will target the following basins/sub-basins: Cap Vert basin (DMT), Somone sub-basin (Horst de Diass, Niayes), Littoral Nord sub-basin, and Delta du Fleuve Sénégal sub-basin (Lac de Guiers).
Frequency	Annual
Data Source	DGPRE
Methodology for Data Collection	DGPRE will collect legal and operational information from the management committees to assess whether the operationalization criteria are met. It will also demonstrate the availability through unrestricted Internet access of water resources data updated at least monthly. "Operational" means that the committees are created by decree, their members are appointed with a clear description of their rights and duties, they receive technical and secretariat support, and they meet regularly (once per year at the basin level and twice per year at the sub-basin level) and issue minutes including decisions on WRM development and implementation, strategies, programs, and projects. Population data will be used based on the information and projections included in the Cap Vert, Senegal River Delta, and Groundnut Basin SDAGE.
Responsibility for Data Collection	PCU
People with enhanced resilience to climate risks (includes flood and drought risks) (MPA indicator) (Number)	
Description	This indicator reflects the efforts conducted to strengthen and operationalize decentralized IRWM, with a focus on

	priority water security areas. The project will target in particular the following basins/sub-basins: Cap Vert basin (DMT), Somone sub-basin (Horst de Diass, Niayes), Littoral Nord sub-basin, and Delta du Fleuve Sénégal sub-basin (Lac de Guiers).
Frequency	Annual
Data Source	DGPRE
Methodology for Data Collection	This indicator monitors people (i) relying on water resources that are diversified as a result of the project, (ii) accessing water-related services from desalination or treated wastewater reuse, (iii) relying on water resources protected considering climate-related risks, and (iv) accessing sanitation services in areas subject to flood risks.
Responsibility for Data Collection	PCU

CSI : Corporate Scorecard Indicator

Monitoring & Evaluation Plan: Intermediate Results Indicators by Components

Component 1: Water resources management and protection	
SDAGE committees supported by the Project (Number)	
Description	This indicator measures project support to the decentralization of WRM functions.
Frequency	Twice a year
Data Source	DGPRE activity report, consolidating WRM TA reports
Methodology for Data Collection	SDAGE committees will be considered supported by the project if the project is providing TA support to set up the committee (preparation of legal documents and bylaws), technical support for the facilitation of the committees' functions, and/or training to its members.
Responsibility for Data Collection	PCU
Share of women in decision-making positions within SDAGE committees (Percentage)	
Description	This indicator measures project support to female representation within local structures for IWRM.
Frequency	Twice a year
Data Source	DGPRE's activity report
Methodology for Data Collection	Given that all members of the SDAGE committees are considered to have equal voting power in decision-making, this indicator will consider the number of women who are representatives of their user group within a given SDAGE committee and have voting powers to participate in decision-making, divided by the total number of voting members for that SDAGE committee.
Responsibility for Data Collection	PCU
Groundwater salinity at Panthior dam (Number)	
Description	This indicator measures the impact on salinity of project activities to rehabilitate Panthior dam and improve local recharge.
Frequency	Annual
Data Source	DGPRE operational monitoring report
Methodology for Data Collection	Measurements taken from salinity sensors installed next to the dam. The values considered will be calculated as the average of all values recorded in the previous 12 months.
Responsibility for Data Collection	PCU
Component 2: Improving sanitation in a circular economy	
Household sewerage connections constructed (Number)	
Description	This indicator monitors the expansion of the Eastern Dakar sewerage system and increased access to sanitation services through the number of household connections implemented.
Frequency	Twice a year
Data Source	Supervision firm's monthly reports to ONAS

Methodology for Data Collection	Sewerage connections considered for this indicator will be those constructed and commissioned by the contractor. If the sewerage system is not yet in service while downstream infrastructure (including in the WWTP) is still under development, those connections will still be counted.
Responsibility for Data Collection	PCU
Volume of wastewater treated (Cubic Meter (m^3))	
Description	This indicator monitors the effective operation of the Tivaouane Peulh WWTP and sewerage system in Eastern Dakar by measuring the volume of effluents treated up to international standards.
Frequency	Twice a year
Data Source	Operational reports by the private operator / ONAS and those established by the PCU.
Methodology for Data Collection	The volume of watewater treated will be measured at the outlet of the WWTP by the bulk meter associated with the treated wastewater transfer system.
Responsibility for Data Collection	PCU
Length of sewerage network constructed (Kilometers)	
Description	This indicator monitors the expansion of the Eastern Dakar sewerage system through the length of sewers implemented.
Frequency	Twice a year
Data Source	Supervision firm's monthly reports to ONAS
Methodology for Data Collection	The sewerage pipelines considered for this indicator will be those constructed and commissioned by the contractor, including both gravity and pressurized sewer lines. If the sewerage system is not yet in services while downstream infrastructure (including in the WWTP) is still under implementation, those pipeline segments will still be counted.
Responsibility for Data Collection	PCU
Annual power generation from biogas (Megawatt hour (MWh))	
Description	This indicator monitors the savings made in thermal electricity consumption (and associated GHG emissions) through the production, digestion, and use of biogas for power production.
Frequency	Annual
Data Source	ONAS's operational report
Methodology for Data Collection	The calculation will add up the electrical energy generated over the previous 12 months at the WWTP, as metered and measured at the output of the cogeneration biogas plant.
Responsibility for Data Collection	PCU
Area provided with irrigation services from treated wastewater reuse (Hectare (Ha))	
Description	This indicator monitors the expansion of irrigation of services through treated wastewater reuse in terms of area covered.
Frequency	Twice a year
Data Source	DHORT / DBRLA and irrigation TA firm's annual report
Methodology for Data Collection	Data on each irrigated plot area will be collected by direct survey of the irrigation services beneficiaries by the TA firm.
Responsibility for Data Collection	PCU
Farmers provided with irrigation services from treated wastewater reuse (Number)	
Description	This indicator monitors the expansion of irrigation of services through treated wastewater reuse in terms of numbers of direct beneficiaries.
Frequency	Annual
Data Source	Irrigation TA firm's annual report
Methodology for Data Collection	Data on the number of farmers will be collected by direct survey of the irrigation services beneficiaries by the TA firm.
Responsibility for Data Collection	PCU
Farmers trained with climate-resilient agriculture and irrigation techniques (Number)	
Description	This indicator monitors the delivery of training on climate-resilient irrigation and farming techniques to farmers benefiting from the expansion of irrigation services through treated wastewater reuse.

Frequency	Annual
Data Source	TA firm's annual report
Methodology for Data Collection	Based on trainers' logs and reports, number of farmers who have attended at least 75 percent of the training program created by the TA firm.
Responsibility for Data Collection	PCU
Private capital mobilized by ONAS, leveraging World Bank financing under the project (Yes/No)	
Description	This indicator relates to the financial sources mobilized for the implementation of the WWTP under Subcomponent 2.1
Frequency	Twice a year
Data Source	ONAS activity report
Methodology for Data Collection	This indicator shifts to Yes when the WWTP contract is signed and entails a private partner's participation to its financing.
Responsibility for Data Collection	PCU
Component 3: Improving water supply services	
Water supply network sectorization effective in Dakar 2 service area (Yes/No)	
Description	This indicator monitors the restructuring of the water supply network and its preparation for NRW reduction activities.
Frequency	Twice a year
Data Source	Sectorization supervision firm's monthly reports to SONES
Methodology for Data Collection	This indicator shifts from No to Yes when the macro-sectorization plan to be designed under the project is fully implemented across Dakar 2, with all distribution zones defined and hydraulically isolated.
Responsibility for Data Collection	PCU
Water supply PPP project bid out as a result of project-financed technical assistance (Yes/No)	
Description	This indicator identifies the project contribution to mobilizing private capital for the water sector in Senegal.
Frequency	Twice a year
Data Source	SONES activity report
Methodology for Data Collection	This indicator shifts to Yes when the bulk water production system, supported by the project's transaction advisory services, is bid out in a PPP arrangement entailing the private partner's participation to contract financing.
Responsibility for Data Collection	PCU
Component 4: Sector Reform, Strengthening citizen engagement, and project management	
Satisfaction of beneficiaries with project activities as demonstrated through beneficiary survey (Percentage)	
Description	This indicator tracks the application of one of the citizen engagement mechanisms under the project, and it reflects the level of satisfaction with the project outcomes and implementation processes. This indicator will disaggregate data by sex of respondent to capture changes in the degree to which decisions influenced by the projects address the needs of both women and men.
Frequency	After project start, at project mid-term and at year 5 of project implementation
Data Source	Beneficiary survey report
Methodology for Data Collection	A representative sample of project beneficiaries accessing project-delivered services will be identified, including representative samples of both youth and women. Following the start of project-delivered services, a survey will measure the level of satisfaction of those services by the representative sample. This first survey will take place shortly after midterm with a target of 65 percent satisfaction reported by respondents. The quantitative and qualitative data captured from the survey will be used to inform improvements and calibrations to program implementation. Information on resulting changes made will be shared with project beneficiaries. A second satisfaction survey will take place in year 5 with a goal of 75 percent satisfaction reported by respondents, representing a 10 percent margin increase in expected satisfaction rates.
Responsibility for Data Collection	PCU
Circular economy strategy developed and under implementation (Yes/No)	
Description	This indicator monitors the adoption and application of circular economy and resilience measures.
Frequency	Twice a year
Data Source	PCU activity report

Methodology for Data Collection	The strategy covering sector decarbonation opportunities, treated wastewater reuse opportunities, potential markets for treated sludge reuse, etc. is completed and adopted by the government, and at least two of its recommendations are being implemented.
Responsibility for Data Collection	PCU

ANNEX 1: Implementation Arrangements and Support Plan

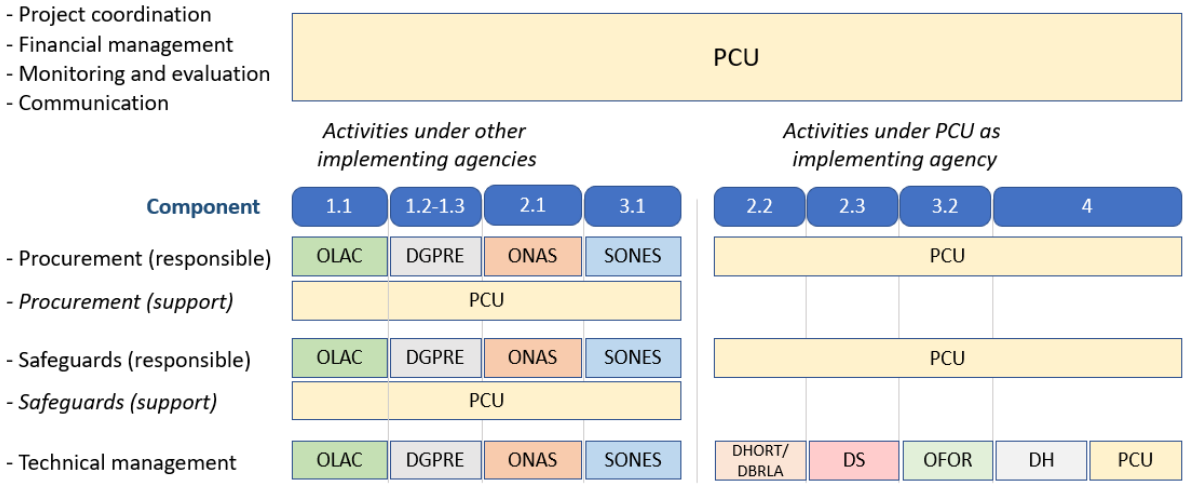
COUNTRY: Republic of Senegal
Senegal: Integrated Water Security and Sanitation Project

Project institutional and implementation arrangements

1. **Given the multisectoral nature of the project and the need for coordination across several institutions, the Ministry of Hydraulics and Sanitation will host the PCU.** This setup will replicate the implementation arrangements of previous IDA-financed projects. The PCU will coordinate the project activities and implement all reforms and citizen engagement activities together with the ministries and the implementing agencies. The PCU will coordinate overall project implementation across components, ensuring timely availability of fund transfers, maintaining project accounts, producing financial reports, monitoring and evaluating program implementation and impacts, carrying out communication campaigns, and ensuring compliance with project requirements such as those associated with FM and audit and M&E.

2. **The PCU and four other entities will share the role of project implementing agencies.** As illustrated in figure 1.1, the PCU will be responsible for the implementation of Subcomponent 2.2, supported technically by the Ministry of Agriculture, Food Sovereignty, and Livestock through DHORT in collaboration with the DBRLA; Subcomponent 2.3, supported technically by the Directorate of Sanitation (DS); Subcomponent 3.2, supported technically by the Rural Boreholes Agency (OFOR, *Office des Forages Ruraux*); and Component 4, supported for certain activities by the Directorate of Hydraulics (DH). For these activities, the PCU will retain the overall administrative, procurement, and safeguards responsibilities. Four other entities will play the role of implementing agencies under the project: OLAC for Subcomponent 1.1; DGPRE for Subcomponents 1.2 and 1.3; ONAS for Subcomponents 2.1; and SONES for Subcomponent 3.1. Those agencies will therefore have procurement and safeguards responsibility for the implementation of the respective subcomponents. They will benefit from high-level procurement and safeguards support from the PCU, in particular OLAC, which does not have experience implementing World Bank-financed projects.

Figure 1.1: Implementation arrangements



3. **The PCU has a long 25-year track record of implementing World Bank projects, while SONES, ONAS, and DGPRE have previous successful implementation records with World Bank-financed projects** (PEAMU and PEAMIR). DGPRE also has experience implementing World Bank-financed project activities through the Sahel Irrigation Initiative Support Project (SIIP, P154482) and PEAMIR. The PCU has an environmental specialist and a social specialist to provide high-level support to relevant government ministries and agencies which will be responsible for managing the E&S risks related to their respective activities. The PCU team will be reinforced by a health and safety expert, a social expert, and an irrigation expert, part-time. Similarly, its fiduciary capacities will be reinforced to support implementing agencies.

4. **A PSC will provide technical oversight and supervision by the Ministry of Finance and Budget (MFB)**. The PSC will be responsible for the overall oversight and the strategic leadership of the proposed project. The PSC will ensure coherence of activities with sector strategies and guarantee intersectoral coordination with other ministerial departments. The PSC will also validate the project's annual budgets and work plans. It will be made up of representatives appointed by relevant ministries, whose roles will be clarified during the project preparation stage.

5. **To further enhance the implementation framework, the PIM used under PEAMIR (P164242) will be updated to provide clear guidelines for the implementing agencies.** The PIM will detail technical implementation measures across all activities to ensure technical soundness. It will set clear procedures to guide the implementing and executing agencies in assessing, managing, and monitoring E&S impacts and resettlement compensation for project-financed activities. The manual will be consistent with all relevant GoS legislative, regulatory, and administrative requirements and with the core principles of World Bank ESF. It will also ensure a robust screening process, including exclusionary criteria, and seek opportunities to include citizen engagement activities. On fiduciary aspects, the manual will lay out flow of funds mechanisms and needed measures as identified through the fiduciary assessments during preparation, in compliance with national and World Bank procedures.

6. **Strengthening institutional operations is essential.** To boost institutional capacity and support to relevant implementing agencies involved in project implementation, the project's budget will provide for the procurement of vehicles, office supplies, and equipment, as needed, as well as tailored capacity building in relevant areas such as E&S safeguards, procurement, and FM. Project staff competency to draft quality work plans, procurement plans, and other reports will be fast-tracked to allow for the PCU to gain familiarity with STEP and other World Bank procedures.

Financial management and disbursement

7. **Internal control and internal auditing arrangements.** For internal controls, the existing manual of administrative and financial procedures will be updated, and specific procedures for PISEA activities will be included. In terms of internal auditing arrangements, the internal inspection of the MHA will oversee the project's internal control activities.

8. **Accounting arrangements.** The SYCEBNL (non-profit entity accounting standards) will be applicable for ongoing World Bank-financed projects starting this fiscal year 2024. Annual financial statements will be prepared by the PCU in accordance with SYCEBNL standards. The existing multi-project accounting software will be customized to allow segregate recording of project operations.

9. **Budgeting arrangements.** The budget monitoring is clearly defined in the Administrative and Accounting Manual of Procedures. The project will prepare an annual budget based on the agreed annual work program. The budget should be adopted before the beginning of the year, and its execution will be monitored on a quarterly

basis. Reports of budget monitoring and variance analysis will be prepared and included in the interim financial report. Annual draft budgets will be submitted to the steering committee and then submitted to the World Bank for its no objection no later than November 30 every year.

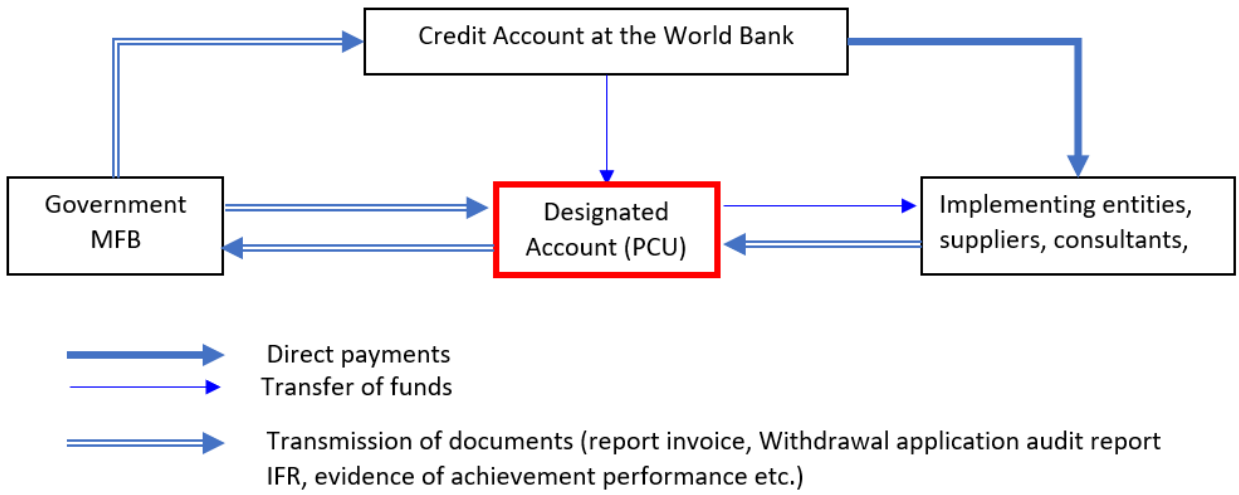
10. **Financial reporting arrangements.** Each quarter, the PCU will prepare an IFR for the project in form and content satisfactory to the World Bank. These IFRs will be submitted to the World Bank within 45 days after the end of the quarter to which they relate. The FM team will prepare the project's financial statements in accordance with SYCEBNL and World Bank requirements.

11. **External auditing arrangements.** The disbursement and financial information letter (DFIL) will require the submission of audited financial statements for the project to IDA within six months after the end of each fiscal year. The audit report should reflect all project activities. An external auditor with qualifications satisfactory for the World Bank will be recruited. In accordance with World Bank policy on access to information, the borrower is required to make its audited financial statements publicly available in a manner acceptable to the Association. Following the World Bank's formal receipt of these statements from the borrower, the World Bank also makes them available to the public.

12. **Flow of funds and disbursement and banking arrangements**

- *Banking arrangements:* A designated account for the project will be opened in commercial banks acceptable to IDA, managed by the public expenditures directorate (DODP), which is the entity assigned with the overall responsibility of payments.
- *Disbursement arrangements:* Disbursements would be IFR-based whereby withdrawal applications will be supported with a statement of expenditures (SOE) for the investment financing. The following disbursement methods may be used under the project: reimbursement, advance, direct payment, and special commitment, as specified in the DFIL and in accordance with the Disbursement Guidelines for Investment Project Financing, dated February 2017. Documentation will be retained at the PCU for review by World Bank staff and auditors. The DFIL provides details of the disbursement methods, required documentation, and designated account ceiling.

Figure 1.2: Flow of funds



13. The following actions need to be taken to enhance the FM arrangements for the project:

Table 1.1: FM Action Plan

	Action	Date due by	Responsible
1	• Agree with the PCU on an IFR template which will allow disbursement based on IFR. • Prepare the external auditor terms of reference of recruitment.	By negotiation (completed)	PCU
2	• Update the project financial and administrative manual to take in account the specificities of the PISEA. • Customize the accounting software to segregate the PISEA accounting. • Hire an external auditor with qualifications satisfactory to the World Bank.	No later than four (4) months after effectiveness	PCU

14. Based on the outcome of the FM risk assessment, the following implementation support plan is proposed. The objective of the implementation support plan is to ensure that the PCU maintains a satisfactory financial management system throughout the project's life.

Table 1.2: FM Implementation Support Plan

FM Activity	Frequency
Desk reviews	
- IFR review	Quarterly
- Audit report review of the project	Annually
- Review of other relevant information such as interim internal control systems reports	Continuous as they become available
On-site visits	
- Review of overall operation of the FM system	Bi-annually for Implementation Support Mission
- Monitoring of actions taken on issues highlighted in audit reports, auditors' management letters, internal audit, and other reports	As needed
- Transaction reviews (if needed)	As needed
Capacity-building support	
- FM training sessions	During implementation and as and when needed

Procurement

15. The Borrower will carry out procurement under the proposed project in accordance with the World Bank Procurement Regulations, the 'Anti-Corruption Guidelines,' and other provisions stipulated in the Financing Agreement.

16. The procuring entity, the bidders, and service providers (that is, suppliers, contractors, and consultants) will observe the highest standard of ethics during the procurement and execution of project-financed contracts in accordance with paragraph 3.32 and Annex IV of the Procurement Regulations.

17. The Borrower will prepare and submit to the World Bank a General Procurement Notice, and the World Bank will arrange for publication of the General Procurement Notice on the United Nations Development Business online platform and on the World Bank's external website. The Borrower may also publish it in at least one national newspaper.

18. The Borrower will publish the Specific Procurement Notice for all goods, non-consulting services, and the requests for expressions of interest on their free-access websites, if available, and in at least one newspaper of national circulation in the borrower's country and in the official gazette. For open international procurement selection of consultants using an international short list, the borrower will also publish the Specific Procurement Notice on the United Nations Development Business online platform and, if possible, in an international newspaper of wide circulation. The World Bank arranges for the simultaneous publication of the Specific Procurement Notice on its external website.

19. **Procurement risk assessment.** Given the multisectoral nature of the project, the PCU will be hosted within the Ministry of Hydraulics and Sanitation, which follows the implementation modalities of previous projects financed by IDA, such as PEAMIR. Four other entities will act as executing agencies, retaining responsibilities relating to procurement and safeguards: OLAC for Subcomponent 1.1; ONAS for Subcomponent 2.1; DGPRE for Subcomponents 1.2 and 1.3; and the SONES for Subcomponent 2.3. The Ministry of Hydraulics will supervise the PCU. OLAC will implement the activities linked to the protection of Lac de Guiers. ONAS will be responsible for the urban and rural sanitation component. SONES will implement all drinking water supply activities (NRW activities and rural water supply). DGPRE will be responsible for all IWRM activities. The Ministry of Agriculture, Food Sovereignty, and Livestock, through DHORT, together with DBRLA, will implement the irrigation activities. The bulk of the project activities will be implemented by SONES and ONAS—public agencies that have previous successful implementation records with the World Bank's PEAMU and PEAMIR projects. DGPRE also has experience implementing World Bank project activities through the SIIP and PEAMIR. The PCU has a long 25-year track record in implementing projects financed by the World Bank and by other donors. The PCU has an information system (e-Procure Manager), which is adequate for managing the procurement of the proposed project.

20. The implementation agencies (SONES, ONAS, and DGPRE) have proven experience in procurement procedures for works, goods, and consulting services through their respective committees and units in charge of quality control of national procurement processes. OLAC is a new implementation agency and is not familiar with the World Bank's procurement procedures. The PCU will ensure quality control of the procurement documents transmitted to IDA and will provide procurement support to the implementation agencies.

21. In line with the World Bank's requirements, the procurement capacity of the PCU was assessed in December 2022 and updated in March 2024. The assessment found that: (a) the procurement team of the PCU is familiar with World Bank procedures and other donors with a heavy workload; (b) the implementation agencies (SONES, ONAS) have proven experience in procurement procedures for works, goods, and consulting services through their respective committees and units in charge of quality control of national procurement processes; (c) OLAC is a new implementation agency which is not familiar with the World Bank's procurement procedures; and (d) the PCU will ensure quality control of the procurement documents transmitted to IDA and closely work with technical stakeholders (OLAC, ONAS, SONES, DGPRE, DHORT/DBRLA, and so on) to ensure better coordination of the procurement process, avoid delays, and provide procurement support to the implementation agencies.

22. **Mitigation measures.** The following measures are proposed to mitigate these risks and reduce their classification from Substantial to Moderate: (a) develop a contract management plan early for the most critical contracts as identified in the PPSD; (b) update the existing PIM; (c) establish an acceptable procurement filing

system (physical and in STEP); (d) train OLAC on World Bank procedures; and (e) the PCU will closely work with technical stakeholders (OLAC, ONAS, SONES, DGPRE, DHORT/DBRLA, and so on) to ensure better coordination of the procurement process and avoid delays. Considering these mitigation measures, the procurement residual risk is assessed to be Moderate.

Table 1.3: Action Plan for Strengthening Procurement Capacity

No.	Key Risks	Mitigation Actions	Responsible Entity	Timeline
1	The PCU, SONES, ONAS, and DGPRE are familiar with World Bank procedures and other donors; they have a heavy workload but there are big contracts that need to be monitored	- Develop a contract management plan early for the most critical contracts as identified in the PPSD. - The PCU will closely work with technical stakeholders (OLAC, ONAS, SONES, DGPRE, DHORT / DBRLA, and so on) to ensure better coordination of the procurement process and avoid delays.	PCU, OLAC, ONAS, SONES, DGPRE	Continue
2	OLAC is new implementation agency which is not familiar with the World Bank's procurement procedures	- Train OLAC on World Bank procedures.	World Bank	As early as possible
3	Delays in procurement processes and contract execution	- Plan activities early. - Use advance procurement. - Avoid delays in procurement processes (evaluation, signature, and approval, etc.).	Implementing agencies	Immediate
4	Quality of the procurement	- The PCU will ensure quality control of the procurement documents transmitted to IDA and closely work with technical stakeholders (OLAC, ONAS, SONES, DGPRE, DHORT/DBRLA, and so on) to ensure better coordination of the procurement process, avoid delays, and provide procurement support to the implementation agencies.	PCU	Continue
5	Poor contract execution and non-compliance with contractual deadlines	- Recruit firms to monitor execution and follow up at IA level. - Develop a contract management plan early for the most critical contracts as identified in the PPSD.	PCU	Before starting works
6	PIM	- Update the PIM.	PCU	Immediate

23. **Procurement manual.** Procurement arrangements, roles and responsibilities, methods, and requirements for carrying out procurement will be elaborated in detail in the procurement manual, which may be a section of the PIM.

24. **Procurement methods.** The borrower will use the procurement methods and market approach in accordance with the procurement regulations and as described in the PPSD.

25. **Procurement documents.** For international competitive procurement of goods, works, and non-consulting and consulting services, the borrower will use the applicable World Bank Standard Procurement Documents with minimum changes, acceptable to the World Bank and as necessary, to address any project-specific conditions. If

agreed with the World Bank, the open national market approach is a competitive bidding procedure normally used for public procurement in the country of the borrower and may be used to procure goods, works, or non-consulting services, provided it meets the requirements of paragraphs 5.3 to 5.6 of the procurement regulations.

26. **Operational costs financed by the project**. If any, such costs would be incremental expenses, including office supplies, communication costs, rental expenses, utilities expenses, consumables, transport and accommodation, per diems, supervision costs, and salaries of locally contracted support staff. Such service needs will be procured using the procurement procedures specified in the PIM accepted and approved by the World Bank.

27. **Procurement supervision.** In addition to the prior review and implementation support mission carried out by the World Bank, it is recommended that at least two missions be carried out each year, with one visit to the field to carry out a post review of procurement actions.

28. **PPSD.** As part of the project preparation, the Borrower has prepared its PPSD, which describes how fit-for-purpose procurement activities will support project operations for the achievement of the PDO and deliver value for money. The PPSD is linked to project implementation. It considers institutional arrangements for procurement; roles and responsibilities; thresholds, procurement methods, and prior review; and the requirements for carrying out procurement. It also includes a detailed assessment and description of the state government's capacity for carrying out procurement and managing contract implementation within an acceptable governance structure and accountability framework. Other issues considered include the behaviors, trends, and capabilities of the market (market analysis) to inform the procurement plan. The PPSD concluded that the operational context allows the transparent and successful execution of the contracts to be undertaken by this project.

29. Market analysis through projects recently financed by the World Bank in the sector (PEAMIR [P164242] and PEPAM [P109986]) shows that the country has companies capable of executing large-scale works contracts awarded by international call for tenders in rural/urban water supply and urban sanitation. However, a large part of the contracts planned as part of this project are for an amount below the threshold, and the method of award planned for these contracts is by national competitive bidding. The country also has enough companies that have had to execute medium-sized contracts in the past.

30. **Procurement Plan.** The Procurement Plan covering the first 18 months of project implementation was prepared and submitted to the World Bank. It was discussed and approved by the World Bank. The Procurement Plan will be updated by the procuring entity on an annual or as-needed basis to reflect actual project implementation needs. Updates to the Procurement Plan will be submitted to the World Bank for its no objection, and the PPSD will be updated accordingly.

31. **Systematic Tracking of Exchanges in Procurement (STEP).** The proposed project will use STEP as a procurement planning and tracking tool to prepare, clear, and update its procurement plans and conduct all procurement transactions. Use of STEP is mandatory for all procurement transactions subject to post and prior review under the project. The contracts will thus be recorded in and processed through STEP. This arrangement will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance. This tool will be used to manage the exchange of information (such as bidding documents, bid evaluation reports, no objections, and so on) between the implementing agencies and the World Bank.

32. The thresholds for market approaches and procurement methods as well as for the World Bank's prior review requirements are indicated in Table 1.4.

Table 1.4: Procurement Prior Review and Procurement Methods Thresholds (US$, millions)

Category	Prior Threshold Review	Procurement Methods Thresholds				
					Short List of National Consultants	
	Prior Review (US$, Millions)	Open International	Open National	RFQ	Consulting Services	Engineering and Construction Supervision
Works	≥ 10	**≥ 20**	**< 20**	≤ 0.5	n.a.	n.a.
Goods, IT, and non-consulting services	≥ 2	**≥ 1**	**< 1**	≤ 0.1	n.a.	n.a.
Consultants (firms)	≥ 1	n.a.	n.a.	n.a.	**≤ 0.3**	**≤ 0.5**
Selection of Individual Consultants	≥ 0.3	n.a.	n.a.	n.a.	n.a.	n.a.

33. The Borrower must include, in applicable procurement documents that include solar panels/components for the "core functions of a project" as defined in the World Bank ESF: (i) applicable provisions in the invitation for bids, instruction to bidders, and qualification requirements; (ii) Forced Labor Performance Declaration; (iii) Forced Labor Declaration; and (iv) strengthened contract clause on forced labor. These provisions and declaration forms must be included in procurement documents for both international as well as national competitive procurement and any direct selection/direct contracting within the above scope. As part of contract management plans, periodic progress reports including compliance with forced labor obligations will be produced. All applicable solar contracts will be prior reviewed by the World Bank. Training for E&S, procurement, and operational staff to raise awareness on these risks, the interface between E&S requirements and the procurement process, and mitigation approaches will be ensured. Continued engagement with industry, verification agencies, the International Labour Organization, and other multilateral development banks will be ensured.

Monitoring and evaluation

34. **The reporting and monitoring of project outputs, outcomes, and results will be based on the agreed Results Framework and monitoring arrangements.** Project reporting and M&E, including social accountability measures, will all be managed and coordinated by the PCU, using in many cases information collected by the various implementing and technical agencies (SONES, ONAS, OLAC, DGPRE, DS, DHORT/DBRLA, and so on). The Results Framework lays out the modalities and frequencies of collecting key data on results and outcomes, including project progress reports, agencies' operational dashboards, beneficiary surveys, and so on. A semiannual monitoring table and progress reports will be prepared by the PCU. These reports will assess achievements against the agreed work plans and the overall PDO. The PCU will be responsible for preparing quarterly reports and updating the work plans on an annual basis, considering the achievements of the project outcomes to date, the strategic focus of the project, and World Bank feedback. Special attention will be given to M&E from the beginning of the project.

35. **An in-depth evaluation of project results will be undertaken at the midterm review to make any course corrections needed.** The objective of the review will be to assess progress and, if necessary, make changes in the

project based on additional lessons and the realities on the ground. An Implementation Completion and Results Report will be undertaken within six months after project completion as the final comprehensive assessment of the project's performance and to review achievements, issues, and lessons. Lessons learned from the project should also be shared as appropriate with all participating agencies, beneficiary communities, and other stakeholder institutions. All studies and reports conducted in the framework of the project will be appropriately disseminated following the World Bank's disclosure policy.

36. **The definition and implementation of a communication strategy will be critical to enhance project results.** A communications specialist (within the PCU) will be recruited to manage the overall communications aspect for the project. The main objectives are to: (a) facilitate the flow of information between the various agencies involved in project implementation to create an environment of transparency and accountability (with regard to flow of funds, activities to undertake, outputs, and outcomes) and facilitate strategic decisions at all levels; and (b) ensure that the project's main objectives and progress being achieved are well communicated to the immediate beneficiaries, and to the general public at large considering suggestions, comments, and ideas received as feedback from project beneficiaries. The following aspects of the project would have a direct need for communications expertise: treated wastewater reuse; demand management; fecal sludge management; E&S aspects; transparency in the procurement process; community involvement, participation, and ownership; and possible political interference during project implementation. Any problems that could arise on any of these fronts should be clearly identified, and an appropriate communication plan should be developed promptly to address them. The PCU will develop and deploy, within six months of effectiveness, a comprehensive communications strategy designed to address all important issues identified that might affect project implementation, considering all stakeholders in the public and private sectors, beneficiary communities, civil society, and the media, and ensure consistency of messages to targeted audiences.

Role of partners

37. **The task team has been in close discussions with the development partners to maximize complementarity and development impacts.** Close coordination with *Partenaires Techniques et Financiers* (PTFs) willing to support the sector in Senegal will be critical. The full modernization of water supply and sanitation services in the capital city and the achievement of universal access is estimated to cost more than US$1,500 million, including for the construction of a new water treatment plants and interbasin water transfers. The World Bank will continue collaborating with key PTFs to ensure the complementarity of interventions, particularly in the review of sector reform activities or regional studies, such as the update of the Dakar-Thiès-Petite Côte Water Supply Master Plan, currently financed by AFD. The project complements the actions carried out by projects funded by AFD, the Japanese International Cooperation Agency, and Eximbank China, including those constructing desalination plants, reducing NRW, and developing on-site sanitation in Dakar. Collaboration with development partners along a common vision of sector development will be essential given the large financial needs.

Strategy and approach for implementation support

38. **The Implementation Support Plan (ISP) is based on the concept of having two full implementation support missions per year, which will include site visits.** In addition, the task team will advise the client, as needed, on an ongoing basis. Videoconference meetings will also be organized between the implementation agencies and the World Bank to address any urgent or pending issues. A midterm review of the project will be conducted after approximately 30 months of implementation to carry out an in-depth review of the project performance to assess progress, and if necessary, make adjustments to the project to ensure that the PDOs remain e on track. With the establishment of OLAC as one of the implementation agencies, the project will require extensive support in the

startup phase to ensure that key stakeholders are fully on board. This need is expected to reduce as the processes and management of project activities commence and capacities at the local level are strengthened. It is projected that about 12 semiannual implementation support missions will be required over the life of the project, in addition to the project launch mission. Specific elements of the ISP are described as follows:

- Monitoring adherence of safeguard instruments by including the safeguard specialists in semiannual missions. These specialists will also assure knowledge transfer to the project safeguard specialists.
- Development of a comprehensive communications strategy and implementation of responsive feedback mechanisms (spot checks, dedicated safeguards compliance support, and so on) for quality assurance and M&E.
- Fiduciary missions will focus on the PMU's performance in managing contracts, procurement, and financial matters, as well as on completing the agreed implementation plans.

39. **Risk minimization through design.** The strategy for implementation support is based on the project's design and its identified risk profile. During project preparation, considerable efforts have been made to identify key risks. Key project design decisions were made to reduce risks during project implementation. These include providing sufficient technical and operational assistance support to the implementation and technical agencie, and designing procurement strategies based on careful market assessments.

40. **Risks during implementation.** Notwithstanding these risk minimization and mitigation measures in project design, significant residual risks will remain during implementation, stemming from land acquisition activities, for example. The World Bank's implementation oversight activities will need to meet the World Bank's own fiduciary obligations. In addition, the World Bank's implementation support approach will focus on providing technical support to the PCU to support its efforts to: (a) successfully carry out the project activities; (b) meet the fiduciary, environmental, and social safeguards compliance requirements of Senegal and the World Bank; and (c) strengthen its institutional capacities.

Schedule of Implementation Support

Time	Focus	Skills Needed	Resource Estimate
First 12 months	Project launch and startup	Task team leader Water and sanitation engineer Water resources management specialist Irrigation specialist Procurement FM Environment and social Administrative support	Supervision budget
12–96 months	Project implementation	Task team leader Water and sanitation engineer Water resources management specialist Irrigation specialist Procurement FM Environment and social	Supervision budget

Time	Focus	Skills Needed	Resource Estimate
		Administrative support	

Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task team leader	8	2	Ongoing implementation support to the client, two yearly implementation support missions
Co-task team leader	16	2	Country-based, providing ongoing implementation support to the client, twice yearly implementation support missions plus regular check-ups and conversations to provide technical support
Water and sanitation engineer	6	2	Ongoing implementation support to the client, two yearly implementation support missions
Irrigation specialist	6	1	Ongoing implementation support to the client, one yearly implementation support mission
Water resources management specialist	6	1	Ongoing implementation support to the client, one yearly implementation support mission
PPP specialist	4	1	Ongoing implementation support to the client, one implementation support mission
Guarantee specialist	3	1	Ongoing implementation support to the client, one implementation support mission
Environmental safeguards specialist	4	2	Implementation support mission at least twice a year
Social safeguards specialist	4	2	Implementation support mission at least twice a year
FM specialist	2	2	Implementation support mission at least twice a year
Procurement specialist	3	1	Implementation support mission at least twice a year
Country officer	4	n.a.	Based in country office

ANNEX 2: Detailed Project Description

COUNTRY: Senegal
Senegal: Integrated Water Security and Sanitation Project

1. Project activities are organized around four components, each contributing to improved water security. Cost details are provided in Table 2.1 at the end of the present annex.

Component 1: Water resources management and protection (US$22.2 million equivalent)

2. **This component will promote water security and resilience to climate-exacerbated droughts and floods** in the four priority water security areas through the development of new water sources and the restoration of existing depleted or polluted sources. The circular economy principles supported by this component include diversifying water supply sources, optimizing the use of existing infrastructures, and planning and investing for resilience in the face of climate and non-climate uncertainties.

Subcomponent 1.1: Restoring strategic water sources of Lac de Guiers (US$11.2 million equivalent)

3. **This subcomponent, to be implemented by OLAC, supports the rehabilitation of the Lac de Guiers water sources and ecosystems** to improve the security of water supply in four priority water security areas relying on this water resource. It will finance the implementation of protection and safeguard measures for Lac de Guiers. Lac de Guiers is the main freshwater reserve in Senegal outside the Senegal and Gambia Rivers, and it currently supplies 40 percent of Dakar's water supply. The lake helps meet water demand for a broad range of activities, including agriculture, livestock, fishing, water supply, and ecological purposes (feeding the Ferlo and Ndiael ecosystems). Measures to protect the quality of water in Lac de Guiers will include the following:

i. the automation of the toll dam bridge with eight valves for the Richard Toll facility to improve the regulation of water abstraction on the Senegal River,
ii. the rehabilitation and raising of dikes by about one meter along the northern shore of the lake, adjacent to productive agricultural areas,
iii. a review and update of the 2005 Lac de Guiers pollution management plan,
iv. engineering design of the partial diking of Lac de Guiers and Taouey Canal rehabilitation.

4. Completion of Phase 4 investments (reprofiling and decluttering of the Taouey Canal to improve the system's hydraulics) will contribute to improved water quality for both local environmental services and water use, with direct benefits for the DMT. The subcomponent will also support the preparation of feasibility studies for the improvement of the Bango and Mbakhana water system upstream of Saint-Louis.

5. **The subcomponent will also review typha valorization options**, such as transformation into biochar to produce fertilizer and bio coal and into domestic biogas by mixing with cow dung. Feasibility studies will analyze options to involve the private sector in the development of these activities, and pilots to be tested in Phase 3 will be designed.

6. *Adaptation and mitigation benefits under Subcomponent 1.1*. The automation of the Richard Toll facility will allow for more accurate measurements in the abstraction of Senegal River water resources and regime adaptation in the face of climate-induced water variability. Modernizing the dikes will prevent recurrent flooding that damages highly productive agriculture areas while affecting the lake's water quality. When the rehabilitation of Taouey Canal is carried out, as planned in Phase 4, it will help improve the hydraulic capacity and water quality of Lac de Guiers, enhancing resilience to rising temperatures and droughts by improving the water resources availability and

reliability for the DMT water supply and irrigation activities in the Senegal River Valley and the Bas-Ferlo region. The review of the pollution management plan will include climate considerations such as the impacts of climate-exacerbated droughts and rising temperatures on water quality and the presence of invasive species in the lake. It will also review turbidity, sedimentation, and water quality impacts from more frequent and intense floods in the area, aiming to identify measures to manage and prevent these impacts in the future. Additionally, studies for the valorization of typha into biochar and biogas will focus on measures that generate revenue streams and offset emissions by developing local fuel and building materials from typha reuse while also removing them to protect the quality of surface water resources.

Subcomponent 1.2: Improving Diass and Littoral Nord groundwater recharge and management (US$3.7 million equivalent)

7. **This subcomponent, to be implemented by DGPRE, will support a pilot project for the recharge of the Diass and Littoral Nord water tables.** Specific activities will include: (a) the identification of aquifer recharge systems combining NBS and technologies adapted to the implementation of recharge works in the Greater Dakar area; and (b) the rehabilitation of the Panthior small dam (height from toe to crest of 3 m) and other enhanced aquifer recharge systems to collect water from a 9,000 ha watershed to enhance recharge and help improve the quality of a major SONES wellfield in nearby Sebikhotane (capacity of 20,000 m^3 per day) currently subject to saline intrusion. In addition to the preparation of feasibility and design studies, the subcomponent will finance the implementation and instrumentation of recharge facilities.

8. *Adaptation and mitigation benefits under Subcomponent 1.2*. The recharge activities will help reduce the drought-driven overexploitation of shallow groundwater in the region, which compounds sea-level rise to worsen saline intrusion, and improve the sustainability of groundwater exploitation by local dwellers and farmers in the face of future drought spells. Being able to maximize the sustainable use of local groundwater resources thus defers potential near-future demand for water from more energy-intensive sources. Aquifer recharge through these NBS (such as retention systems, soil restoration, construction of terraces, and bunds along contour lines) can enhance climate resilience by transforming runoff during intense precipitation to be utilized as a buffer during climate-exacerbated dry periods.

Subcomponent 1.3: Strengthening WRM governance and Developing New Water Sources in the Niayes area and in the Groundnut Basin (US$6.9 million equivalent)

9. **To promote water security at the national level, this subcomponent will support the strengthening of WRM governance.** It will support: (a) the strengthening of DGPRE's capacity, knowledge, resources, and management tools (including hydrological and hydrogeological data collection systems, integration of climate risk in WRM planning, water accounting, groundwater governance) so it can become the leading water resources authority; and (b) the institutionalization of a participatory IWRM mechanism (including for example in Lac de Guiers and in DMT) through the establishment and operation of SDAGE management committees, as well as the operationalization of DGPRE's decentralized consultation framework at the Planning and Management Units (*Unités de Gestion et Planification*, UGP) and sub-UGP levels in selected priority water security areas. The subcomponent will also fund feasibility studies for small-scale investments to be selected in those areas and implemented in Phase 4.

10. **This subcomponent will also support studies to improve water security with a focus on water resources development on the priority water security areas not covered by Phase 1 investments:** the Niayes area and the Groundnut basin. These feasibility studies will integrate climate considerations to enhance the preparedness of DGPRE and water service providers in the face of climate and natural hazards that could affect the availability or accessibility of current water sources in the future and will strengthen their decision-making in the face of such

uncertainties. Financial sustainability analyses will feed into the review of WRM reform options under Subcomponent 4.1. Finally, the subcomponent will support exploratory hydrogeological studies in Sebikhotane area.

Component 2: Improving sanitation in a circular economy (US$147.7 million equivalent)

11. This component aims to develop access to sanitation and water services and to promote treated wastewater reuse and water loss reduction to limit the demand of new water resources in a spirit of circular economy.

Subcomponent 2.1: Improving access to urban sanitation (US$140.1 million equivalent)

12. **This subcomponent will support improvement of sanitation services in Dakar** through the design, construction, and works supervision of two-thirds of Dakar's Eastern sewerage system[47] (with a target connection rate of 80 percent), in an area marked by rapid demographic growth and high population density in climate change-exacerbated flood-prone areas. This will include about 400 km of sewer lines, 29,000 connections, and about 25 pumping stations. The subcomponent will also finance the implementation of an activated sludge WWTP, with a total treatment capacity of up to 39,000 m^3 per day to cover the future needs of the connected areas, and of the additional sewerage system to be implemented in Phase 4. The WWTP will include sludge anaerobic digestors and desiccators to allow for valorization in agriculture. Biogas generated in this process will be used to power the WWTP's operating needs, leading to a further reduction in methane emissions. Household sewerage connections will replace on-site sanitation facilities (which are in large part unsafely managed), addressing a public health hazard during flooding events to which those areas are subject. Hygiene awareness and behavior change campaigns will be organized to support this subsector transition.

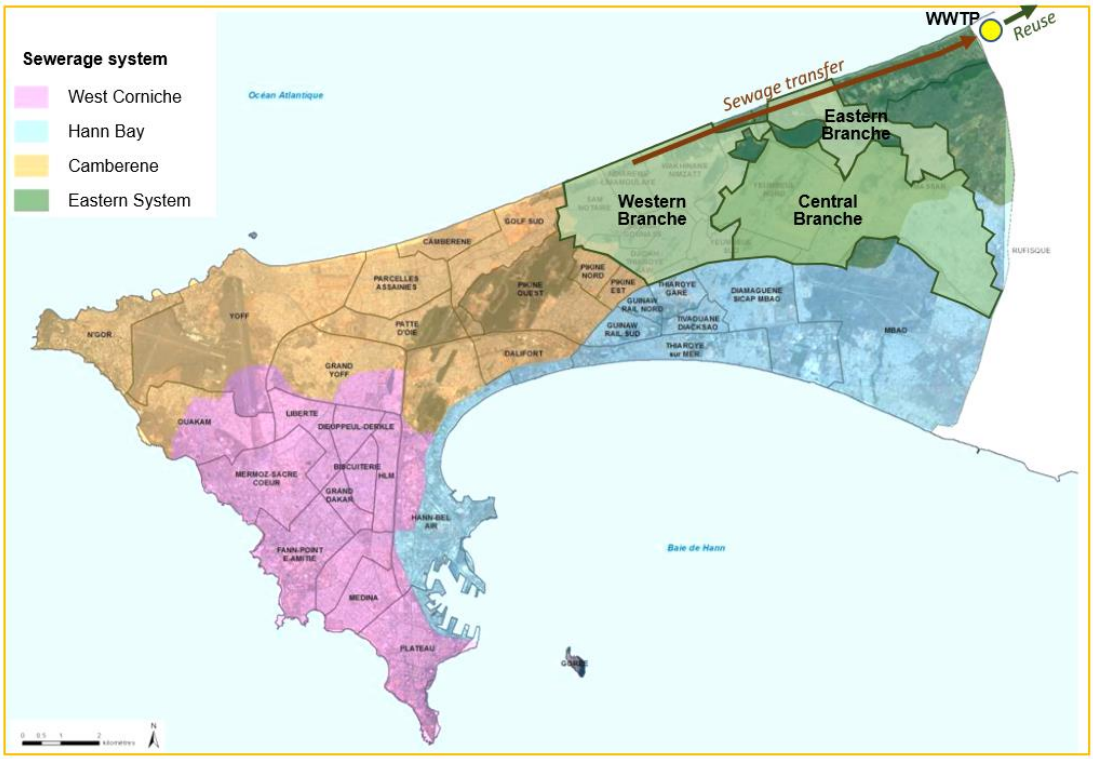
13. **The subcomponent will also include the construction of tertiary treatment (disinfection) facilities**, an 18-km treated wastewater conveyance system to the Niayes area for irrigation and enhanced aquifer recharge, and receiving storage and infiltration reservoirs. Hygiene awareness and behavior change campaigns will support the transition to improved sanitation.

14. **An early-stage and high-level market sounding analysis suggests the opportunity to mobilize private capital** to finance about 50 percent of the US$100 million WWTP (including associated facilities), the rest being funded by the project through a VGF. Under the proposed PPP arrangement, the WWTP will be implemented through a DFBOT contract with ONAS, with potential IFC debt financing. The subcomponent will finance the preparation of a feasibility study and bidding documents and the delivery of transaction advisory support, following the Scaling ReWater approach. The preparatory phase will also explore the appropriateness of an IDA guarantee (for example, a payment guarantee), which would be deployed under Phase 2, subject to due diligence and market interest at that time. The results of the early-stage and high-level market sounding carried out by IFC with international wastewater service providers, technology companies, and investors active in emerging markets confirm that the proposed project is of a sufficient size to attract interest. In addition, the relatively positive and long-dated track record of Senegal in water sector PPPs and the active involvement of the World Bank in the project contribute to

[47] The Dakar Liquid Sanitation Master Plan has identified four homogeneous sanitation systems for the development of sanitation. The Eastern system covers an estimated 56 percent of the population of the Dakar agglomeration. The Master Plan recommends developing sewerage systems in this area due to the high water table and vulnerability to flooding and protecting a shallow aquifer used for urban agriculture and local traditional uses. A primary drainage system was developed in this area under the World Bank-financed Stormwater Management and Climate Change Adaptation Project (*Projet de Gestion des Eaux Pluviales et d'adaptation au changement climatique*, PROGEP). There is evidence of some wastewater being discharged into this system, which is detrimental to the quality of coastal water and may undermine the perennity of stormwater infrastructure if unaddressed.

improve the appeal of this potential investment opportunity, under the condition that it is tendered under a "bankable" structure.

Figure 2.1: Location of the Eastern Sewerage System



Source: ONAS

15. *Adaptation and mitigation benefits related to the wastewater management investments.* Household sewerage connections will replace on-site sanitation (mostly unsafely managed), addressing a public health hazard during flooding events to which those areas are particularly vulnerable due to high water tables. Expanding the availability of piped sanitation services will not only contribute to water quality (by reducing the contamination of water bodies by septage), but also reduce the risk of floods (centralized systems suffer less from blockages and overflows during extreme weather events than on-site sanitation systems) and their impacts. The removal of septic tanks or anaerobic pits will help reduce GHG emissions. Substantial CH_4 emissions from secondary anaerobic treatment (27,613 tCO_2eq per year) will be eliminated by using digester gas for energy and heat generation (methane capture and combustion), while generating a large amount of energy (7,426 MWh per year, equivalent to about 4,871 tCO_2eq per year) in the process. Overall, net GHG emissions related to this component will be reduced by 37,701 tCO_2eq per year (for details, see Table 3.6).

Subcomponent 2.2: Strengthening Irrigation Systems (US$7.4 million equivalent)

16. **This component will finance the implementation of an irrigation pilot relying on treated wastewater reuse in Diender Valley** (Niayes) through preparatory studies, construction, works supervision, and associated communication and outreach to develop irrigation systems, including solar PV pumping from the reservoir receiving the treated wastewater. It will also: (a) assess wastewater reuse demand and acceptance in the area, thus reducing drought vulnerability; (b) conduct a communications campaign to engage stakeholders involved in treated wastewater reuse and raise awareness on associated benefits and safety measures; and (c) build capacity of market gardeners in organization and management, climate-resilient and water-saving agricultural practices, and irrigation techniques through gender-sensitive trainings. This subcomponent will also support the restructuring of irrigation networks, associated TA, and the setup of an affermage contract to manage the hydraulic installations and networks supplied by SONES's *Thiaroye* and *Beer Thialane* wellfields.

17. *Adaptation and mitigation benefits under Subcomponent 2.2.* Diversification of water sources will increase the resilience of the agricultural sector to the effects of drought spells and saline intrusion on water availability, especially during heat waves when water demand increases. These activities are estimated to replace the use of 29,640 m^3 per day in pumping from shallow wells, with a net reduction of GHG emissions by 500 tCO_2eq per year (for details, see Table 3.6). The repurposing of an idle wellfield in Eastern Dakar will help lower the shallow water table and reduce local vulnerability to urban flooding.

Figure 2.2: Location of the Wastewater Reuse System and Irrigation Activities

Source: World Bank team

Subcomponent 2.3: Improving access to rural sanitation (US$0.2 million equivalent).

18. **This subcomponent will finance preparatory activities for the expansion of on-site sanitation facilities planned under Phase 3**, aiming to improve sanitation services for more than 1 million people. This will include the preparation of engineering and safeguards studies, such as a mapping of sanitation needs around Lac de Guiers and the study of technologies suitable to the area's high water table.

Component 3: Improving water supply services (US$16.4 million equivalent)

Subcomponent 3.1: Improving urban water supply services (US$14.8 million equivalent)

19. **In preparation of NRW reduction activities planned in Phase 3**, the component will finance preparatory studies, works, and construction supervision for the sectorization of SONES's water supply network in the Dakar 2 service area (representing about 25 percent of DMT's water demand), including pilot NRW reduction activities and IT monitoring tools to facilitate NRW management. The sectorization will allow the establishment of clear NRW baseline, targets, and investment programs to be implemented in the subsequent phase. This intervention will complement NRW reduction efforts planned in the Dakar 1 service area under JICA financing. Demand management measures to reduce water wastage among large institutional and industrial water users will be identified and designed to promote water conservation by reducing unproductive use of water resources for implementation in subsequent phases. For example, this will include the pilot installation of smart water meters for selected large consumers, communication campaigns, and leakage reduction interventions among selected institutional users.

20. **The subcomponent will fund engineering studies and TA to SONES to foster PCM for the development of its water supply systems.** This will include include a feasibility study related to a PPP for an interbasin water transfer, for a total amount exceeding US$2 billion (with potential IFC financing for selected infrastructure) and transaction advisory services for a desalination plant in Dakar. Subject to confirmation of GoS priority and satisfactory due diligence, Phase 2 may provide a VGF for the construction of selected infrastructure of a bulk water production system for Dakar. Finally, the subcomponent will support the preparation of engineering designs and safeguards studies for infrastructure investment activities to be carried out in subsequent phases.

21. **The subcomponent will fund engineering studies, works, and supervision activities for the development and rehabilitation of secondary towns' water supply systems**. Site prioritization will be carried out during the first year of project implementation based on criteria to be described in the PIM, such as economic efficiency, complementarity with other investment programs, and readiness of bidding documents. Infrastructures to be developed or rehabilitated may include production systems, pumping stations, reservoirs, and transmission and distribution pipelines.

Subcomponent 3.2: Improving rural water supply services (US$1.6 million equivalent)

22. **This subcomponent will finance preparatory activities for the expansion and efficiency improvement of rural water supply services planned under Phase 4**, aiming to improve sanitation services for more than 500,000 people. This will include the preparation of feasibility and safeguards studies for the construction of multi-village water supply systems in the regions of Sédhiou, Tambacounda, and Kolda and the preparation of engineering and safeguards designs for NRW reduction in the Tambacounda service delegation perimeter, where water losses are the most acute.

Component 4: Sector reforms, strengthening citizen engagement, and project management (US$13.7 million)

23. This component focuses on fostering sector reforms, strengthening the participation and consultation of citizens in the realization of water security objectives, and supporting project management.

Subcomponent 4.1: Sector reforms (US$1.4 million equivalent)

24. **The subcomponent will support the preparation of a strategy to promote the application of circular economy principles in the sector.** This will include: (a) a review of sector decarbonization opportunities, such as

through energy efficiency optimization and renewable energy; (b) a study on opportunities for treated wastewater for reuse in the project area and for the scale-up of biogas generation and reutilization by ONAS; and (c) the identification of potential markets for treated sludge reuse. With TA support from the Global Center for Adaptation (GCA), solutions for the reuse of treated waste water for irrigation purposes activities will developed and tested by: (a) improving understanding of climate risks to urban areas and surrounding areas, identifying suitable options for the reuse of treated wastewater, and providing guidelines to inform intervention design; (b) identifying pathways and challenges to building resilience across administrative boundaries within formal and informal policies, institutions, and regulations to support the reuse of treated urban wastewater; and (c) capturing and documenting lessons learned and tools developed for scaling and replication in subsequent phases of the MPA. TA will also help leverage the MPA's climate mitigation potential for climate finance mobilization.

25. **For sector agencies already engaged in various forms of PPPs, a TA will strengthen their capacity to identify PPPs opportunities, structure contracts, and manage their transactions.** With SONES, a particular focus will be put on capacity for PCM. In the rural water sector, OFOR will be assisted with the formulation of second-generation water supply services delegation contracts based on an assessment of the first affermage contracts, set to close in 2025. TA will support DH in the review of concession, affermage, and performance-based contracts. These activities will also support ONAS through TA and studies to implement the first steps of the urban sanitation reform roadmap, aiming to find more efficient service delivery institutional arrangements and geared toward the delegation of services to the private sector to enhance sector efficiency (such as in the water supply subsectors). A technical-financial model of the sector will be set up to review revenue generation mechanisms (including tariff) and ensure the sector's financial viability. The actual reform entailing institutional change in sanitation service delivery arrangements, to be clarified under this subcomponent, will be implemented under the MPA Phase 3 PforR.

26. **The subcomponent will finance the review of WRM sector reform options**, building on previous work carried out through the Water Security Study and recognizing the lack of capacity and financial resources of DGPRE to fulfill its mandate. This will include: (a) the definition of a more coherent organizational framework, removing bottlenecks and overlaps between sector entities; (b) assessment of sector financing needs and options across relevant entities; and (c) improvements in the functionality of national consultative mechanisms for WRM. Support will be provided for the operationalization of key sector institutions such as SDAGE committees and the National Water Council and for the decentralization of DGPRE functions to support these consultative mechanisms. These activities will support the GoS toward the achievement of IMF-funded Resilience and Sustainability Facility's Resilience Measure 8 to define the roles and responsibilities and the procedures allowing each actor to assume their role and responsibilities for water. Based on the orientations defined under this subcomponent, institutional reforms to strengthen WRM governance and financial sustainability will be implemented under MPA Phase 3 PforR.

27. **Finally, it will finance TA for the definition of an entity in charge of agricultural water management in the Niayes area,** including in areas targeted for reuse—a prerequisite to the implementation of the future Lac de Guiers-Dakar water transfer which will supply the area. The actual setup of the entity will be promoted under the MPA Phase 3 PforR, supported by significant TA and training activities.

Subcomponent 4.2: Citizen engagement and project management (US$11.3 million equivalent)

28. **This subcomponent will support citizen involvement in SONES and ONAS** by: a) developing consultations and feedback mechanisms such as customer surveys, focus groups (including local associations), and GRMs; and (b) ensuring that consultation results are affecting service delivery and are publicly available on a project website. Joint capacity building, based on needs assessments, will promote cross-institutional and gender sensitivity. It will

also support the development of hygiene promotion campaigns, leveraging World Bank knowledge like the Handwashing Initiative, to reduce public health risks exacerbated by climate change, such as vector-borne diseases.

29. **This subcomponent will support activities (including staffing and other resources) needed to implement the project** efficiently, on time, and in accordance with the loan agreement. Activities to be financed include the operational costs of the PCU as well as any needed additional resources at the implementing agencies (operational costs, training, and so on), audits, preparation and implementation of safeguards instruments, M&E, implementation support such as field missions and data collection, and outreach and communications on the government's and implementing agencies' roles in the project.

Table 2.1: Estimated Costs of the Main Project Activities (US$ million) *

COMPONENT 1 – Water resources management and protection		
Subcomponent 1.1 – Restoring strategic water sources and protecting Lac de Guiers		
Lac de Guiers hydrology and quality	Richard Toll intake modernization	5.0
	Lac de Guiers partial diking	5.0
	Works supervision	0.50
Typha valorization	Feasibility studies and bidding documents	0.30
Pollution management	Update of pollution management plan	0.20
Bango/Mbakhana water sources	Reprofiling of Mbakhana water body and modernization of Bango reserve	0.250
Subcomponent 1.2 – Improving groundwater recharge and management		
Aquifer recharge	Panthior recharge engineering and safeguards studies	0.16
	Panthior and ancillary structures rehabilitation	1.4
	Identification and design of aquifer recharge options in DMT and Niayes area	0.50
	Construction of aquifer recharge facilities in the DMT and the Niayes area	1.50
Subcomponent 1.3 – Strengthening WRM governance and identifying new water sources		
Modernizing and strengthening water resources monitoring	Design and setup of a hydrological data collection platform in priority water security areas	1.50
	Preparatory activities for water quality monitoring system in priority water security areas	0.20
	Design and improvement of water resources monitoring system in priority water security areas	1.60
	Preparatory activities for strengthening the water resources network nationwide	0.15
	Capacity building to valorize data for decision-making	0.40
	Preparatory studies for a national water quality analysis laboratory	0.15
Water security studies	Water security studies in Groundnut and Niayes basins	0.60
Operationalization of IWRM	TA for the operationalization of decentralized IWRM in priority water security areas	1.30
Communication	Communication tools for the popularization of legal / regulatory texts for water users	0.15
Groundwater exploration	Exploratory hydrogeological studies on the Paleocene in the Sebikhotane area	0.82
COMPONENT 2 – Improving sanitation in a circular economy		
Subcomponent 2.1 – Improving access to urban sanitation		
PPP preparation	Feasibility study, bidding documents, and transaction advisory for PPP approach	1.80
Wastewater collection, treatment, and transfer	Sewerage network	81
	Wastewater treatment plant	50
Studies, supervision, and communication	Engineering studies	1.90
	Works supervision	4.30
	Information, education, and communication	1.60
Subcomponent 2.2 – Reusing treated wastewater for irrigation		
Treated wastewater reuse	Preparatory studies	0.16
	Pumping and distribution system	3.60
	TA (climate-resilient irrigation, acceptability, system management, etc.)	1.90
	Provision of startup intrants	1.00
Beer Thielane management system	Distribution system	0.11
	Setup of a delegated management system	0.20

	TA (climate-resilient irrigation, system management, etc.)	0.10
	Provision of startup intrants	0.23
Subcomponent 2.3 – Improving access to rural sanitation		
Rural sanitation	Mapping of sanitation needs in Lac de Guiers area, review of technological variants	0.13
COMPONENT 3 – Improving water supply services		
Subcomponent 3.1 – Improving urban water supply services		
NRW reduction	Sectorization in the DMT (studies, pilot, and supervision)	4.90
Electrochloration	Preparatory studies for the installation of electrocholoration systems in DMT	0.40
Demand management	Preparation of demand management action plan	0.32
DMT water system strengthening	Preparatory studies for the DMT Master Plan priority investment program	1.0
Desalination PPP preparation	Transaction advisory services	0.75
Interbasin transfer	Feasibility study for the interbasin water transfer	0.50
Secondary cities	To be identified	6.90
Subcomponent 3.2 – Improving rural water supply services		
NRW reduction	Preparatory studies for NRW reduction in Tambacounda	0.35
Multi-village systems	Preparatory studies for the implementation of multi-village systems	1.30
COMPONENT 4 – Sector reforms, citizen engagement, and project management		
Subcomponent 4.1 – Sector reforms		
Reforms and sector studies	Preparatory studies and TA for WRM reform	0.48
	Review of affermage, concession, and performance-based contracts, recommendations for next generation contracts	0.10
	PPP / PCM capacity building with SONES, ONAS, and OFOR	0.40
	Preparatory studies and TA for an irrigation management entity in the Niayes	0.24
	Preparatory studies and TA for urban sanitation sector reform	0.36
Circular economy	Preparation of a circular economy strategy and climate finance TA	0.40
Subcomponent 4.2 – Citizen engagement and project management		
Citizen engagement	Strengthened citizen engagement in water and sanitation utilities	0.25
Project management	Audits	0.74
	Implementation of ESMPs	0.66
	Stakeholders' capacity building	0.53
	Monitoring & evaluation / Communication	0.66
	Project management and coordination	5.90
	Beneficiary surveys	0.30
	Implementation support to participating agencies	2.20

** activities with cost estimates below US$0.1 million are not shown in this table*

ANNEX 3: Economic and Financial Analysis

COUNTRY: Senegal
Senegal: Water Security and Sanitation Project

1. Introduction

1. **The proposed project aims to help Senegal improve access to safely managed sanitation and water resources management capability in priority water security areas** through wastewater management in a project area located in northeast Metropolitan Dakar[48] referred to as the Eastern System. The project area is characterized by a high water table with shallow aquifers used for urban agriculture and other local traditional uses. The project proposes combining the principles of circular economy with water resilience strategies to put in place a more sustainable and reliable WRM system in the project area.[49]

2. **The project is expected to benefit 600,000 people who will have access to safely managed sanitation.** Households in the project area currently use septic tanks to handle their domestic wastewater, with partially treated effluent discharged into the open, leading to adverse health impacts and environmental degradation of ground water resources. A population of about 600,000 people will benefit from a newly installed sewerage network (into which they will discharge their sewage, phasing out their septic tanks) and a wastewater treatment plant (WWTP).

3. **The project will provide additional benefits such as treated water to be used for irrigated farming.** The WWTP will receive wastewater from households and will treat it to make it suitable for irrigated crops, thus reducing the abstraction of freshwater resources. The wastewater treatment technology is anaerobic activated sludge, which in the treatment process generates methane gas that will be captured and used to power an electricity generator to produce electricity for internal WWTP use. The WWTP will also include tertiary treatment to ensure the quality of treated water to be used for irrigated farming; irrigation water will be transported from the WWTP to a 600-ha irrigation pilot to be developed by the project, where farmers will be expected to produce crops. The WWTP will also produce fertilizer of a quality that could be used by local farmers and households.

2. Methodology

4. **An incremental cost-benefit analysis (CBA) methodology is used**. It is based on with project (WP) and without project (WOP) scenarios. The economic analysis seeks to assess the net economic benefits of the proposed project to Senegalese society. The financial analysis assesses ONAS's[50] financial viability of sewerage management in the project area and the conditions for a public-private partnership (PPP) contract to attain financial viability. Also, shadow prices of carbon are used to assess the impact of greenhouse gas (GHG) emissions on the project's economic viability. The economic and financial analysis covers US$222.05 million, which are those project costs allocated to infrastructure investments under Components 2.1 and 2.2, which have quantifiable benefits and are amenable to a CBA (86.4 percent of the total project cost).

[48] ONAS, 2013, Dakar Liquid Sanitation Master Plan (SMP).
[49] World Bank Water Global Practice, 2021, Water in Circular Economy and Resilience (WICER) – The Case of Dakar, Senegal. The World Bank, Washington, DC.
[50] ONAS is the project implementing agency charged with the development and management of the sanitation sector in Senegal.

5. **Key parametric and market-based assumptions used for the CBA**. The project area for the economic and financial analysis includes a zone of the Dakar Eastern System. The project will finance a sewerage network of about 400 km to collect sewage from about 600,000 people and a WWTP with a design capacity of 39,000 m^3/day. A conveyance system from the WWTP to the irrigation areas (in the Diender Valley) and the pilot to develop irrigated farming using treated water will also be financed by the project. The rate of exchange used is CFAF 600 per US$1, and the period of analysis is 30 years, including the project implementation phase and an average 25-year life of infrastructure assets. Costs and benefits are valued using constant prices of 2023; a 6 percent discount rate is used to estimate net present values and benefit cost ratios. No taxes and duties are included in the investment costs, so market prices are assumed to be the same as economic prices. No shadow pricing adjustments for foreign exchange rate distortions using the standard correction factor or adjustment for tax content in the local currency portion of the investment cost is made. These adjustments all tend to increase economic returns; their exclusion thus ensures a conservative result.

3. Economic analysis

(i) Project incremental benefits

6. Two groups of benefits are identified: (i) benefits derived from the reduction of unwanted impacts from the lack of access to safely managed sewage disposal and wastewater treatment infrastructure; and (ii) benefits derived from the implementation of circular economy principles and water resilient systems, thereby "creating" new goods, including water for irrigation, electricity, and fertilizer all produced by the WWTP. Benefits from the irrigation pilot are a spillover from the application of the circular economy principle in wastewater management; as such they will be included in the second group.

(ii) Benefits derived from the reduction of unwanted impacts of lack of access to safely managed sewage disposal

7. The project's deployment of a sewerage network will benefit a population of about 600,000 people by reducing their exposure to untreated wastewater, which has adverse health effects. At the same time, as households get connected to the sewerage network, shallow aquifers in the project intervention area will benefit from reduced household wastewater releases that carry pollutants that cause environmental degradation. Benefits accruing to the beneficiary population during the life of the project are estimated at US$18.85 million from improved health due to access to sewerage networks and US$99.11 million from reduced environmental degradation of shallow aquifers, both in present value terms.

Table 3.1: Benefits from the reduction of unwanted impacts of lack of access to safely managed sewage disposal

	US$, millions
Benefits from improved health due to access to sewerage networks	18.85
Benefits from reduced environmental degradation of shallow aquifers	99.11

8. Estimates of benefits from improved health assume that children under five[51] in households without access to wastewater disposal infrastructure (WOP scenario) are subject to abnormally high frequency of diarrhea episodes.[52] As diarrhea is a leading cause of death among children under five, it is also assumed that households with children under five experiencing diarrhea episodes must incur significant monetary costs to prevent death.

[51] Population in project area: Agence Nationale de la Statistique et de la Démographie, Sénégal. Population under five estimated using information in https://www.populationpyramid.net/senegal/2022/#google_vignette.

[52] Dakar MICS 2016 found that 21.9 percent of children under five experience diarrhea during the last two weeks prior to the survey. Source: Agence Nationale de la Statistique et de la Démographie du Sénégal, Novembre 2016, MICS Urbaine Dakar, 2015–2016.

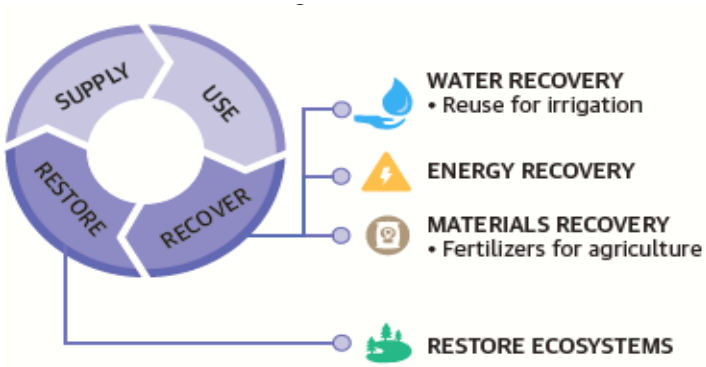
Frequency of diarrhea events is estimated using the most recent Multi Indicator Cluster Survey (MICS) for urban Dakar and literature regarding diarrhea prevalence.

9. Estimates of benefits from reduced environmental degradation of shallow aquifers in the project area assume that water of the shallow aquifers, when degraded (in the WOP scenario), will not be utilized as an input for urban agriculture and other local traditional uses. Monetary valuation of avoided environmental degradation considers pollutant loads (contained in wastewater) carried away by the installed sewerage infrastructure and is based on a methodology developed by a United Nations Environment Programme report[53] adapted to Dakar economic conditions.

(iii) Benefits derived from implementing circular economy and resilient water systems principles

10. The circular economy approach applied in the project through the WWTP aims to capture the full value of water (as a service, an input to processes, a source of energy, and a carrier of nutrients and other materials) through strategies like its reuse for irrigation, electricity generation, and fertilizer production. Water for irrigation will benefit farmers producing crops in an area of about 600 ha, which will be established through pilot activities financed by the project. Thanks to the use of the anaerobic activated sludge treatment process, electricity generation[54] will benefit the WWTP (that is, self-consumption) which will reduce its energy-input bill. Fertilizers produced by the WWTP dehydration of sludge will benefit farmers producing crops and household gardening (see Figure 3.1, which illustrates the principles of circular economy in water systems as applied to the Senegalese experience). Moreover, value added generated in the 600-ha pilot will accrue to the workers and commercial farmers involved.

Figure 3.1: Circular Economy in Water & Wastewater



Source: World Bank Water Global Practice, 2021, Water in Circular Economy and Resilience (WICER).

11. Benefits from water for irrigation produced by the WWTP used as an input for producing crops during the life of the project are estimated at US$38.94 million in present value terms (Table 3.2). Benefits from water for irrigation are estimated using the volumes of water for irrigation delivered to farming areas multiplied by the economic price of water for irrigation as a production input (for farmers).[55]

[53] United Nations Environment Programme, 2015, *Economic Valuation of Wastewater: The Cost of Action and the Cost of No Action*.
[54] To produce electricity the WWTP will install a generator (approx. capacity ~ 1 MW) to be powered by methane gas that is produced by the anaerobic degradation of organic matter in the wastewater.
[55] WICER document reports that private offtakes are willing to pay US$0.36/m^3 of water from WWTPs. At the same time, the cost of irrigation water produced by the WWTP is above US$0.36/m^3. Hence, the economic cost of water for irrigation is set in the analysis at US$0.36/m^3, which is US$0.26 above the willingness to pay by farmers. As the economic valuation excludes any taxes/subsidies, US$0.36/m^3 is used for the valuation of benefits from water for irrigation.

Table 3.2: Benefits from Implementing Circular Economy and Resilient Water Systems Principles

	US$, millions
Benefits from water for irrigation as an input of commercial farming	38.94
Benefits from electricity use captured by WWTP	21.29
Benefits from fertilizer use captured by farmers and gardeners	254.11
Benefits from irrigation pilot, value added captured by workers and farmers	27.46
Total benefits from reduction of lack of access to sewerage infrastructure	341.80

12. Benefits from electricity production accruing to the WWTP during the life of the project are estimated at US$21.29 million in present value terms. Benefits from energy used by the WWTP are estimated using the economic price of electricity[56] multiplied by the energy produced by the WWTP by year.[57]

13. Benefits from fertilizers produced by the WWTP and used by farmers as a production input are estimated at US$254.11 million in present value terms (Table 3.2). To make this estimation, it is assumed that the WWTP obtains 2.48 kg of fertilizer out of each m^3 of wastewater treated; it is also assumed that the economic price of fertilizer produced by the WWTP is US$0.90 per kg.[58]

14. Benefits from the 600-ha irrigation pilot are estimated as the value added accruing to (i) workers employed in irrigated crop production in the irrigation pilot and (ii) commercial farmers involved in the pilot. As inputs, two laborers per ha for crop production are assumed, as well as additional funding to be provided by farm owners (commercial farmers) to install irrigation equipment on their farms. Laborers are assumed to earn US$1,800/year,[59] and farm owners are assumed to make a 20 percent return on their investment; based on these assumptions, benefits from the irrigation pilot are estimated at US$27.46 million in present value terms (Table 3.2).

(iv) Project incremental costs

15. The project increments costs, outlined in Table 3.3, include:

- The investment cost to put in place the sewerage network, the WWTP, and the conveyance system to deliver irrigation water to farmers, along with the investment costs of the irrigation pilot; and
- The incremental operation and maintenance (O&M) cost of the sewerage network, the WWTP, and the conveyance system for irrigation water.

16. Investment and O&M costs during each year are expressed in constant 2023 prices and coincide with the costs in the feasibility study. Their respective present values are the sum of the discounted costs using a 6 percent discount rate. Incremental O&M costs go up gradually as beneficiaries get connected to the sewerage and conveyance networks beginning in year 5 of project implementation.

[56] Economic price of electricity is assumed at US$0.22/kWh, based on a report produced by IFC (April 2020, *A Country Private Sector Diagnostic Creating Markets in Senegal: Sustaining Growth in an Uncertain Environment*).
[57] Own production of electricity by the WWTP is estimated at ~9.24 GWh/year at 76 percent WWTP capacity utilization.
[58] Price per kg is taken from the WICER report: "stabilized sludge from the FSTP is sold as fertilizer at FCFA500/kg or FCFA450,000/ton (US$0.90/kg). The 2.58 kg fertilizer per 1 m3 of wastewater treated is estimated based on a WWTP producing 40,742 m3 of wastewater per day along with 101 tons of dehydrated sludge per day."
[59] Laborer wages estimated based on information in ILO, 2020, "Global Wage Report 2020-21, Wages and minimum wages in the time of COVID," Geneva.

Table 3.3: Incremental Investment and O&M Costs (US$, millions)

	Present	Year							
	Value	1	2	3	4	5	6	7	8 – 25 (average)
Infrastructure investment cost	**180.64**	**10.19**	**25.74**	**69.23**	**67.86**	**27.02**	**8.30**	**2.40**	
New sewage collection network (sewerage)	84.52	5.13	15.40	33.37	35.94	10.27	2.57	0.00	
Wastewater treatment plant (WWTP)	82.45	5.06	10.12	35.41	30.35	15.18	5.06	0.00	
Conveyance of water for irrigation	3.48	0.00	0.23	0.45	1.58	1.58	0.68	0.00	
Irrigation pilot including TA and on-farm equity	10.19	0.00	0.39	0.77	3.30	3.90	2.96	2.40	
Incremental O&M costs	**67.45**	**0.00**	**0.00**	**0.00**	**0.00**	**3.19**	**4.34**	**5.49**	**7.26**

(v) Summary of project incremental benefits/costs and economic viability assessment

17. **The proposed project is found to be economically viable.** Based on the summary of incremental benefits and costs presented in Table 3.4, the ENPV is estimated at US$211.66 million using a 6 percent discount rate. This ENPV means that the proposed project's benefits would exceed by US$211.66 million the benefits of other alternative projects were the investment resources channeled to other public investment projects in Senegal. The benefit cost ratio means that the present value of benefits exceeds by 85 percent the present value of the project investment and O&M costs.

Table 3.4: Estimated Economic Viability Indicators

Estimated present values, benefit/cost ratio, and EIRR	
Present value of incremental benefits (US$, millions)	459.75
Present value of incremental costs (US$, millions)	248.09
Net present value (US$, millions)	211.66
Benefit/cost ratio	1.85
EIRR (percent)	14.72

18. Also, Table 3.4 includes a 14.72 percent estimated EIRR, which shows that the project EIRR is well above the rate of return of alternative public investment projects in Senegal whose rate of return are represented by the 6 percent discount rate.

(vi) Sensitivity analysis

19. **Definition of a base case for the sensitivity analysis.** The economic viability indicators presented in Table 3.5 are assumed to represent the project's base case economic viability assessment. Sensitivity of economic viability is tested against the base case assuming cost overruns, time overruns, and lower market prices of fertilizer produced by the WWTP. The results are as follows:

- **Sensitivity to cost overruns.** A 10 percent investment cost overrun results in the ENPV going from US$211.66 million to US$194.02 million, which is an 8.33 percent fall in the ENPV; furthermore, a 20 percent investment cost overrun results in a 16.67 percent fall in the ENPV (Table 3.5).

- **Sensitivity to time overruns.** A one-year time overrun results in the ENPV falling from US$211.66 million to US$199.42 million which is equivalent to a 5.78 percent fall. A two-year time overrun results in the ENPV further falling to US$187.03 million or a loss equivalent to 11.63 percent fall.
- **Sensitivity to lower market prices of fertilizer produced by the WWTP.** A 10 percent fall in fertilizer price results in the ENPV falling from US$211.66 million to US$186.25 million (equivalent to 12.01 percent), and a 20 percent fall in prices results in a 24 percent fall in ENPV.

Table 3.5: Sensitivity to Costs and Time Overruns and Lower Fertilizer Market Prices

	Base	Cost overrun		Time overrun		Market fertilizer prices	
	Case	10%	20%	1 year	2 years	-10%	-20%
ENPV (US$, millions)	211.66	194.02	176.38	199.42	187.03	186.25	160.84
Percentage change of ENPV in relation to base case		-8.33	-16.67	-5.78	-11.63	-12.01	-24.01

20. The sensitivity analysis shows that the project's economic viability is more sensitive to cost overruns compared to time overruns. Taking as a reference a 10 percent cost overrun or a one-year time overrun, the project's ENPV falls 8.33 percent and 5.78 percent, respectively; taking a 20 percent cost overrun or a two-year time overrun, the project's ENPV falls 16.67 percent and 11.63 percent, respectively. Moreover, the analysis also shows that the project's economic viability is significantly more sensitive (compared with time and cost overruns) to the possibility of a lower market price of fertilizer produced by the WWTP; a 10 percent fall in market price results in a 12 percent fall in the project's ENPV, and a 20 percent fall in market price results in a 24 percent fall in the project's ENPV.

4. Economic assessment of the project GHG emission reductions

21. The detailed GHG accounting matrix is provided in Table 3.6, and the results of the economic assessment of GHG emissions by project activities are outlined in Table 3.7. The project contributes to GHG net emission reductions of 955,825 tons of carbon dioxide equivalent (tCO_2eq) during the project's economic lifetime of (an average of -31,561 tCO_2eq per year). Gross GHG emissions project activities during the project's life are estimated at 431,345 tCO_2eq. Key sources of emission reductions during the project's life include methane gas captured by the WWTP (under Component 2.1) which is then used to produce electricity for WWTP internal operations, thus contributing to further GHG emission reduction.

Table 3.6: GHG Emissions Resulting from Project Intervention and Avoided from the Without Project Scenario

Project interventions[60]	**GHG emission changes from the baseline counterfactual scenario**	**Total Net emissions: <u>-38,201</u> <u>tCO_2eq/yr</u>**
Subcomponent 2.1: Improving sanitation in Eastern Dakar		
Construction of a new sewer system for part of Eastern Dakar and construction of a WWTP at Tivaouane Peulh with a capacity of 39,000	Many households use septic tanks (50 percent) and shared latrines (50 percent). We will assume for the project baseline	**Net GHG: <u>-37,701</u> <u>tCO_2eq/yr</u>**

[60] We will assume the energy mix adopted by the World Bank for Senegal, yielding GHG emissions of 0.656 kg CO_2eq/kWh. Figures **<u>underlined</u>** are extracted from the *Greenhouse Gas Accounting Tool for Water Sector Lending Projects*. Figures in ***italic*** have been calculated outside the tool.

Project interventions[60]	GHG emission changes from the baseline counterfactual scenario	Total Net emissions: -38,201 tCO_2eq/yr
m^3/day, of which 76 percent = 29,640 m^3/d will be financed and used under the project, for a population of **600,000 people**.[61] Based on the WWTP feasibility study, the mass to be treated under the project is **18,000 kg BOD_5 per day (0.03 kg/day per capita** and 0.607 kg/m^3). The WWTP will be designed for secondary and tertiary treatment of 39,000 m^3/d with biogas generation (under the project 29,640 m^3/d will be treated), to be reused for irrigation in the Niayes zone. Basic secondary treatment with a default energy requirement of **0.37 kWh/m^3** was selected in the tool. ***Emissions of wastewater collection:*** Pumping of 29,640 m^3/d, with head = 25m, efficiency 80 percent: 0.0852 kWh/m^3 and 922 MWh/year (powered by the grid), yielding (tool) **605 $tCO_2eq/year$** ***Emissions from energy use*** for basic secondary treatment (tool): 4,006 MWh/year ≡ **2,628 $tCO_2eq/year$** ***Methane (CH_4) emissions*** from secondary anaerobic treatment (8,400 m^3/d digester gas): 37,319 tCO_2eq/year ***Avoided CO_2eq emissions*** by using digester gas for energy and heat generation (methane capture and combustion): -37,301 tCO_2eq/year ***Balance stationary emissions from combustion of digester gas*** (tool)***:*** **19 $tCO_2eq/year$** ***Energy recovery*** from capture and combustion of digester gas: 7,426 MWh/year ≡ **- 4,871 $tCO_2eq/year$** ***Process N_2O emissions from treatment*** (tool): **525 $tCO_2eq/year$** ***Fugitive N_2O emissions from effluent discharge*** (tool)*:* **3,422 $tCO_2eq/year$** ***Fugitive CH_4 from closed gravity sewers*** (tool)*:* **1,310 $tCO_2eq/year$** ***Fugitive CH_4 emissions from inlet works*** (tool)*:* **655 $tCO_2eq/year$** ***Emissions from 29,640 m^3/d tertiary treated water*** ("recycled water treatment" in the tool, without the use of membranes) for irrigation of vegetables: **3,004 $tCO_2eq/year$** **Sludge treatment:** 29,640 kg/day (density is 0.1+0.4+0.5 = 1 kg/m^3 for 3-stage treatment) – energy use for mechanical dewatering, liming, storage, and packaging for marketing (25 kWh/ton) = 270 MWh/yr, or ***177 $tCO_2eq/year$*** **Total GHG emissions: 7,474 $tCO_2eq/year$**	about 27,000 septic tanks and latrines (serving each about 22 people), 18,000 kg BOD_5/day including a surcharge for non-domestic latrines, the use of small emptying trucks (3 tons) traveling 30 km per roundtrip. Fecal material is estimated at 0.25 kg/person/day = 150,000 kg/day (at 1,250 kg/m^3 density with a volume of 120 m^3/day), requiring 50 trips/day. **GHG emissions**: ***Transport*** *(tool: emissions from trucking to empty septic systems)*: **311 $tCO_2eq/year$** ***Fugitive CH_4 emissions from septic systems*** (50 percent, tool): **27,613 $tCO_2eq/year$** (equivalent to 0.3 $kgCH_4/kgBOD_5$) ***Fugitive N_2O emissions from untreated wastewater***: **4,563 $tCO_2eq/year$** ***Fugitive CH_4 emissions from latrines*** (50 percent, tool): **11,045 $tCO_2eq/year$** (equivalent to 0.174 $kgCH_4/kgBOD_5$) ***FS treatment and dumping in open terrain*** of 150 m^3/day, on average @ 30 kg CO_2eq/m^3 (50 kg CO_2eq/m^3 for fecal sludge treatment and 10 kg CO_2eq/m^3 for dumping in open air): ***1,642 $tCO_2eq/year$*** **Total GHG emissions**: **45,174 $tCO_2eq/year$**	

[61] The total population of the area is estimated at 930,000 people, of whom 85 percent will ultimately be connected (790,000); under the project 76 percent of the latter (600,000 people) will be connected (80,000 households) through 23,325 connections.

Project interventions[60]	**GHG emission changes from the baseline counterfactual scenario**	**Total Net emissions: -38,201 tCO_2eq/yr**
Subcomponent 2.2: Reuse of treated wastewater in irrigation		
Treated wastewater transferred for irrigation use. The effluent of tertiary treatment (29,640 m^3/d = 343 l/s) will be pumped by 1.0 or 1.25 m[62] diameter pipe over 20 km, with 15–20m elevation difference, to ground storage reservoirs at 35 m above sea level. Effluent will be used for drip irrigation: efficiency 80 percent, gross head (incl. friction losses): 25m. Energy use: 0.085 kWh/m^3 *0.656 = 0.0558 kg CO_2eq/m^3. Solar energy will be used for pumping water to the irrigation systems. ***GHG emissions from water transfer for irrigation*** (tool): **605 $tCO_2eq/year$**	The treated wastewater will replace 29,640 m^3/d from shallow bore wells (H = 40m; efficiency 70 percent) @ 0.156kWh/m^3 ≡ 0.102 $kgCO_2eq/m^3$. ***GHG emissions pumping*** (tool, "Water Utilities" baseline)*:* **1,105 $tCO_2eq/year$** Total GHG emissions: **1,105 $tCO_2eq/year$**	**Net GHG: -500 tCO_2eq/yr**

Table 3.6: Project GHG Emissions Assessment

	Eastern Dakar sewerage system	Use of treated wastewater in the Niayes area	Total
Gross emissions, tCO2 eq	412,695	20,650	433,345
Net emissions, tCO2eq	-942,525	-12,500	-955,025
Net emissions average, tCO2eq/year	-31,418	-417	-31,834

22. When shadow prices of carbon (SPC) (lower and upper limits) are considered to assess the project's economic viability,[63] the ENPV rises from US$211.66 million to between US$239.70 million and US$267.81 million, which is the result of adding the emission reduction benefits from project activities (valued using SPC, lower and upper limits), all during the life of the project (see Table 3.7), to the net incremental benefits of the project. Thus, the project is not only economically viable, but it also contributes to the global public good, which is reflected in the higher range estimate of its ENPV. The project's contribution to the global public good is also reflected in the EIRR, which rises from 14.72 percent to between 15.62 percent and 16.49 percent when emission reductions are taken into account using the SPC.

Table 3.7: Economic Assessment of Emission Reduction Impacts Using SPC

		Estimates not including SPC	Shadow price of carbon (SPC)	
			Lower bound	Upper bound
Project ENPV (6 percent discount rate)	US$, millions	211.66	239.70	267.81
EIRR	Percent	14.72	15.62	16.49

[62] Estimated based on the Darcy-Weisbach equation pressure-loss equation.
[63] The economic analysis using shadow price of carbon is requested under the Operational Policy and Bank Procedure (OP/BP) 10.00. The updated 2024 Guidance Note on Shadow Price of Carbon in Economic Analysis has been used.

5. Financial analysis

23. The sewerage network deployed by the project will be operated and maintained by ONAS while the WWTP infrastructure and O&M will be deployed through a long-term design-finance-build-operate-transfer (DFBOT) referred here as a PPP contract. For projects that depend on the financial sustainability of an entity that operates on commercial terms or otherwise depends on cost recovery for sustainability, project financial analysis should establish that, under a set of plausible assumptions, the entity will eventually be able to self-finance its activities. The financial analysis for the project here thus assesses the conditions under which (i) ONAS could deliver on its mandate to operate and maintain the sewerage network deployed by the project and deliver expected volumes of sewage to the WWTP and (ii) the PPP contract could be financially viable, that is attract interest from experienced PPP contractors. The preparatory activities will review in detail ONAS's financial sustainability in the context of the PPP considered, including the need for tariff adjustments, VGF, and IDA guarantees.

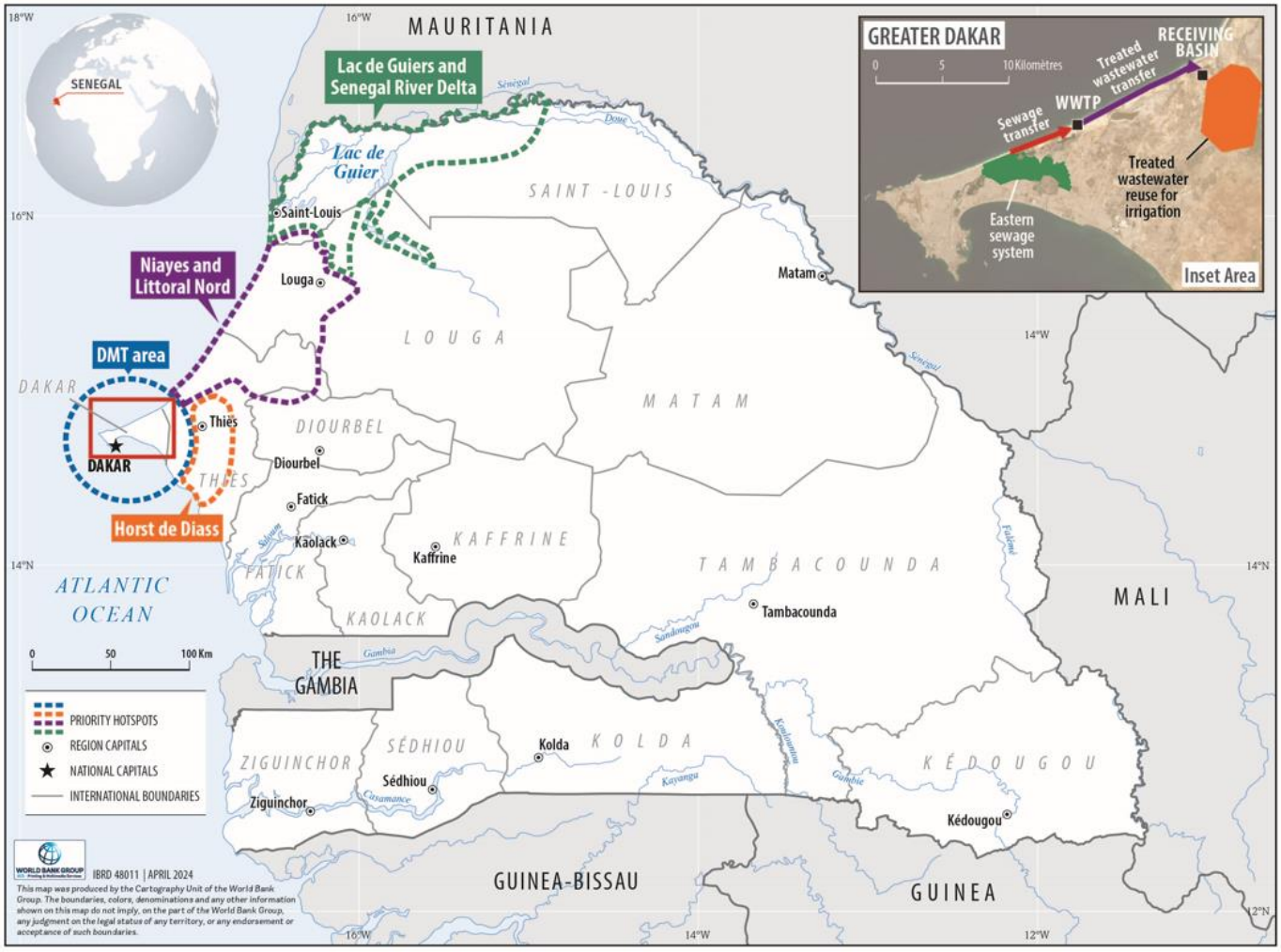
24. ***ONAS***. Based on the review of ONAS's financial statements for 2020, 2021, and 2022, the World Bank notes that ONAS has been experiencing financial challenges. ONAS's cost coverage ratio has deteriorated over the last three years, falling from 88 percent in 2020 to 72 percent in 2022. To cover its O&M expenses during this period, ONAS has received operating grants from the national government; but even after considering such operating grants, ONAS has not been able to cover its O&M expenses (see simplified income statement in Table 3.8). The PPP preparation TA will review revenue generation mechanisms based on a sector technical-financial model.

25. ***PPP contract***. A financial model was developed to forecast the preliminary cash flow of a commercial entity (the PPP contractor) to design, finance, build, and operate-transfer the WWTP and the irrigation conveyance system for 30 years (including construction time). Using this financial model, an 11 percent financial internal rate of return has been estimated, which is too low to attract the interest of a PPP contractor to fully finance the WWTP, estimated to cost US$105.67 million. Based on the cash flows projected by the financial model, PPP contractors could achieve financial viability if the project contributes at least 50 percent of the investment costs: US$52.83 million.

Table 3.8: ONAS's Simplified Income Statement

	F -CFA million			US$ million		
	2022	2021	2020	2022	2021	2020
Revenues						
Sale of products and other products	57.97	29.74	38.49	0.10	0.05	0.06
Sales of services and works performed	14,119.49	12,341.23	12,687.89	23.53	20.57	21.15
Sale of accessory products	62.46	107.31	120.31	0.10	0.18	0.20
Revenues from operating activities	**14,239.92**	**12,478.28**	**12,846.69**	**23.73**	**20.80**	**21.41**
Operating grants	2,738.98	216.04	350.26	4.56	0.36	0.58
Total revenues	**16,978.90**	**12,694.32**	**13,196.94**	**28.30**	**21.16**	**21.99**
Operating and maintenace expenses						
Purchases of raw materials and related supplies, net of inventory variation	86.43	-95.19	-30.81	0.14	-0.16	-0.05
Other purchases	-2,136.81	-2,252.67	-1,655.09	-3.56	-3.75	-2.76
Transportation	-35.50	-26.15	-23.92	-0.06	-0.04	-0.04
External services	-6,821.02	-4,794.60	-4,952.71	-11.37	-7.99	-8.25
Staff expenses	-5,620	-4,856	-4,272.89	-9.37	-8.09	-7.12
Other expenses	-5,167.33	-2,345.86	-3,658.96	-8.61	-3.91	-6.10
Total O&M expenses	**-19,694.37**	**-14,370.71**	**-14,594.38**	**-32.82**	**-23.95**	**-24.32**
EBITDA	**-2,715.47**	**-1,676.39**	**-1,397.44**	**-4.53**	**-2.79**	**-2.33**
Rate of exchange, F CFA/US$	600					
Source: ONAS Financial Statement Reports for years 2020, 2021 and 2022						
Reference: Estimated cost coverage ratio				-72%	-87%	-88%

ANNEX 4: Map


MAURITANIA
SENEGAL
Lac de Guiers and Senegal River Delta
Lac de Guier
Saint-Louis
SAINT-LOUIS
Niayes and Littoral Nord
Louga
LOUGA
Matam
MATAM
DMT area
DAKAR
Thiès
DAKAR
THIES
DIOURBEL
Diourbel
Fatick
Horst de Diass
Kaolack
KAFFRINE
Kaffrine
FATICK
KAOLACK
TAMBACOUNDA
Tambacounda
MALI
ATLANTIC OCEAN
THE GAMBIA
SÉDHIOU
Sédhiou
ZIGUINCHOR
Ziguinchor
KOLDA
Kolda
KÉDOUGOU
Kédougou
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GUINEA
0 50 100 Km
PRIORITY HOTSPOTS
REGION CAPITALS
NATIONAL CAPITALS
INTERNATIONAL BOUNDARIES
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GREATER DAKAR
0 5 10 Kilomètres
Treated wastewater transfer
RECEIVING BASIN
WWTP
Sewage transfer
Treated wastewater reuse for irrigation
Eastern sewage system
Inset Area