



I. STRATEGIC CONTEXT

A. Country Context

- 1. After a decade of rapid growth and social progress up to 2013, Brazil's economy first stumbled and then fell into deep recession.** The sound macro policies and a favorable external environment that characterized this period contributed to fast economic and social progress. Growth declined from an average of 4.5 percent per year in 2006–10 to 2.4 percent in 2011–14, followed by contractions of 3.5 percent in 2015 and 2016. While external factors triggered the slowdown, an expansionary policy response led to rapidly rising fiscal disequilibria and, with rising domestic political uncertainty, a loss of confidence and sharp drop in investment. The economic recovery has remained weak with 1 percent growth in 2017, 1.3 percent growth in 2018, and 2.5 percent growth projected in 2019.
- 2. The crisis threatens a decade of development progress.** Between 2006 and 2015, Brazil experienced an unprecedented reduction in poverty and inequality when 24.8 million Brazilians escaped poverty and the Gini coefficient of household incomes fell from 0.59 in 1999 to 0.51 in 2015. Most of this reduction was explained by the creation of formal sector jobs, with a sharp decline in the unemployment rate to a low of 6.8 percent in 2014. However, the economic crisis precipitated a rapid rise in unemployment with job losses of 0.6 million in 2015 and 2.0 million in 2016. As a result, poverty increased in 2015 and 2016. With on-going tepid economic growth, poverty is estimated to have leveled off at 20.6 percent.
- 3. Restoring fiscal sustainability is the most urgent economic challenge for Brazil.** To address unsustainable debt dynamics the government adopted a constitutional amendment to limit public expenditure growth that entails an accumulated adjustment of 5 percentage points of GDP for the period 2019-2026 and that would stabilize debt at around 89 percent of GDP by 2026, to start declining afterwards. Implementing this fiscal adjustment requires alleviating the rigidities affecting public spending and revenue earmarking mechanisms, which turn mandatory over 90 percent of the federal government's primary spending. It will also require a comprehensive reform of social security to halt the projected increase in the deficit. Other measures such as controlling the civil service wage bill and rationalizing programs to support the private sector may likewise be needed. Furthermore, this large fiscal disequilibrium also affects subnational governments, with limited capacity to cope with growing wage bill and pension payments unless reforms are adopted.
- 4. Brazil will also need to accelerate its productivity growth and infrastructure development.** The average per capita income has risen by just 0.7 percent per year since the mid-1990s, one tenth of the rate in China and only one half of the average in OECD countries. This is mainly explained by the lack of total factor productivity (TFP) growth between 1996 and 2015. The productivity problem in Brazil is affected by the absence of a conducive business environment, distortions created by market fragmentation, multiple business support programs, and a relatively closed market to external trade and competition. Brazil also posts one of the lowest investment levels in infrastructure (2.1 percent of GDP) when compared to its peers and the quality of this investment is low. Accelerating productivity growth remains a key priority for the country given that the demographic transition is over and there will be limited space for public sector led growth. Reforms could focus on boosting market competition, access to external markets, cheaper inputs and technologies, and simplification of the tax system. Higher levels of investment in infrastructure will also be needed to ensure adequate maintenance of existing infrastructure stock, removing bottlenecks and expanding access to social services. This calls for improving planning capacity at government level, strengthening regulatory environment and leveraging private resources to finance investments.
- 5. The State of Ceará faces significant economic challenges and vulnerability to inequality and climate change.** Ceará has a population of 9 million inhabitants, representing nearly 4.5 percent of the Brazilian population, but its GDP was only 2.1 percent of the country GDP in 2016. The global economic crisis has impacted the economy of the state,



which contracted in 2015 and 2016 and is very slowly recovering¹. In terms of inequality levels, the state ranks seventh in Brazil. The Metropolitan Region of Fortaleza (MRF), which contains the State capital and other 18 municipalities² is the sixth largest urban agglomeration in the country with 4 million inhabitants or almost half of Ceará's population and delivers 50 percent of Ceará's GDP³. Close to 17 percent of its population lives under the poverty line and 10 percent is considered extremely poor⁴. Despite significant reductions in poverty rates, between droughts (1998-2012), the vulnerability of the poor did not reduce significantly as households did not invest in risk management strategies.⁵ The State is also highly exposed to extreme weather events (such as droughts and floods) that pose additional constraints on social and economic development. This situation is expected to exacerbate with increasing impacts of climate change.

B. Sectoral and Institutional Context

6. **Brazil is overall abundant in water resources, with highly uneven spatial distributions, particularly in relation to population densities and industrial development.** About 73 percent of the country's freshwater is located in the Amazon basin where less than 5 percent of the people live. The semi-arid Northeast region with 28 percent of the Brazilian population has only 4 percent of the water resources, while the South and Southeast regions where 56 percent of the population live and are home to large urban metropolises and robust industrial development, confront continuous water scarcity due to mismanagement, over-exploitation, and pollution. Brazil has made progress in water resource management since the adoption of the National Water Law in 1997 and the creation of the National Water Agency (*Agência Nacional de Águas*, ANA) in 2000. The former set the foundations for multiple use, decentralized and participatory water governance in the country.

7. **Water has supported key drivers of economic growth and has been key to reduce poverty and promote shared prosperity through more equitable and widespread provision of water supply and sanitation (WSS) services to a growing population. However, increasing water stress poses a challenge to Brazil's sustainable growth.** Many important economic sectors in Brazil are highly dependent on water. In terms of water demands, 52 percent of withdrawals are for irrigated agriculture, 8 percent for livestock, 9 percent for industry and 24 percent for human consumption. In addition, about 65 percent of Brazil's electricity is generated from hydropower.⁶ Competing water demands, high concentration of economic activities and people in urban areas, increasing pollution and uneven availability of water pose great challenges to manage water resources, especially in the Northeast. A more integrated approach to water resources management is crucial for Brazil to meet its sustainable economic development goals.

8. **The lack of access to reliable water supply and wastewater services is strongly related with poverty and contributes to gender inequality.** Poor WSS services is directly related to an increase in waterborne and gastrointestinal diseases, which in turn leads to withdrawals from routine activities and negatively impacts on school achievements, labor performance and household incomes. There is robust evidence in Brazil showing that these withdrawals are more frequent among the poor and least educated people. In addition, Brazilian women are more vulnerable, especially in poor communities, contributing to widening gender gaps.⁷ In 2016, on average, women spent 3.5 days away from routine

¹ Growth experienced contraction of 3.85 and 5.33 percent in 2015 and 2016 respectively. The third quarter of 2018 showed signs of recovery, with an increase of 1.48 percent, compared to the same period in 2017.

² IBGE (*Instituto Brasileiro de Geografia e Estatística*) Brazilian Geography and Statistic Institute projection for 2017.

³ IPECE

⁴ Population with monthly house income per capita up to R\$ 70,00. IBGE, 2010.

⁵ Nelson, et al., 2016 (<https://iopscience.iop.org/article/10.1088/1748-9326/11/9/094011/meta>).

⁶ ANA, 2018 – Brazilian Water Resources Report

⁷ Nationwide and statewide data show that gender gaps remain large, with a gap in average earnings from jobs equal to 23. In 2016, 83% of the women and only 65% of men carried out domestic activities, whereas 28% of women and just 19% of men were responsible for health care activities in their households. While 48% of the women at productive age were out of the labor force, just 28% of men faced this situation.



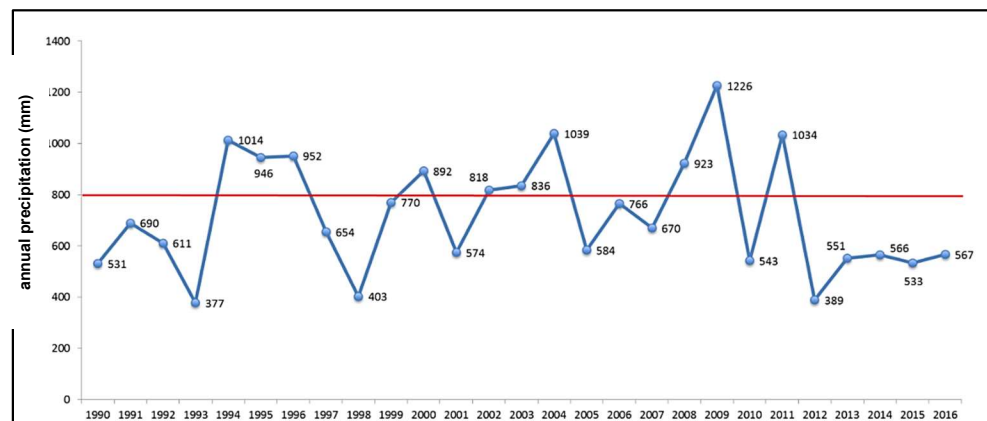
activities due to diarrhea and vomiting, whereas men lost, on average, only 3.15 days (10.5 percentage points' gap). Mortality rates as a result of gastrointestinal diseases were also higher among women compared to men: 2.5/100,000 women *vis-à-vis* 2.3/100,000 men (8.7 percentage points' gap).⁸

9. **Managing competing water demands efficiently is particularly relevant in the State of Ceará.** Roughly 93 percent of Ceará's territory is semi-arid (*caatinga*), with very high temperatures, low rainfall concentrated in space and time and serious water scarcity problems. Rivers are intermittent and most of the territory is underlaid by crystalline rock formation with shallow soil cover, which reduces the availability of groundwater and retention of natural water flows. Climate change is likely to exacerbate these problems with more prolonged periods of climate change-induced drought, undermining the State's economic and social development.

10. **Climate change impacts are making the Northeast Region susceptible to adverse weather conditions that are expected to increase Ceará's water scarcity problems and further contribute to socio-economic inequalities.** Changes in rainfall patterns, extreme weather events such as heat waves, more frequent and intense droughts and floods are expected to increase in the State. The semi-arid Northeast Region could see an average increase of 0.5 to 1 degree Celsius in temperature and a decrease in 20 percent of rainfall by 2040. The recent prolonged drought between 2012 and 2017 had serious impacts in the access to water and the State's economy overall. In 2017, the total registered rainfall was 698.2 mm, 12.8 percentage lower than the climatological average of 800.2 mm (1981-2010), as shown in figure 1⁹. This decrease had severe negative impacts on the availability of water for human consumption (contingency plan in the MRF led to a 20 percent reduction since 2016) and productive use (12 percent decrease in rice production and 51 percent decrease in corn). The impacts of the droughts were particularly felt by the poor and vulnerable groups. In this context, it is fundamental to develop actions to guarantee water supply in Ceará, thereby enabling climate change adaptation, building resilience to climate hazards and promoting prospects for sustainable development going forward.

Figure 1. Average Rainy Season Rainfall (mm) - Ceará: 1990 – 2016

Source: FUNCEME (2017).
Note: The red line represents the historical mean of rainfall



11. **The availability of water in reservoirs in Ceará has sharply decrease over the last seven years and the quality of water is deteriorating rapidly.** After the six consecutive drought years (2012-2017) and the 2018 rainy season¹⁰, the reservoir levels were severely reduced, and the volume of water stored in the 155 reservoirs monitored by the Water

Women was just 48% of the total working force, 43% of the people employed, and 28% of them had only part-time jobs (BRK Ambiental, 2018, *O Saneamento e a Vida da Mulher Brasileira*. Available at <http://www.tratabrasil.org.br/images/estudos/itb/pesquisa-mulher/relatorio.pdf>).

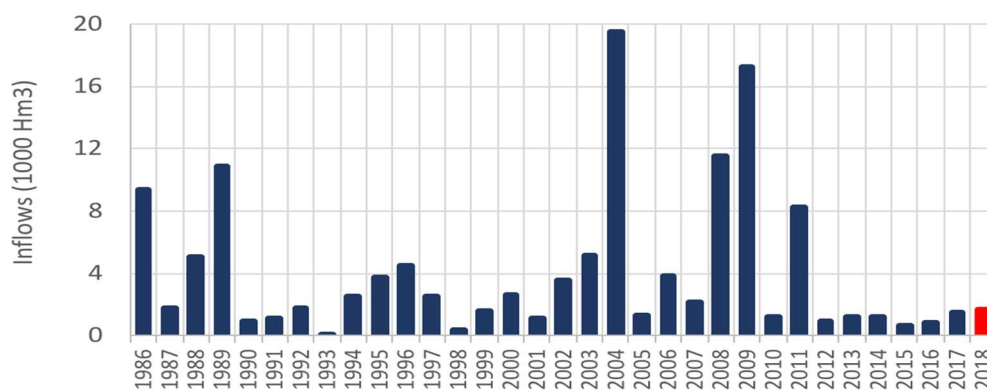
⁸ Instituto Trata Brasil: 2018, *Benefícios Econômicos e Sociais da Expansão do Saneamento no Brasil*. Available at <http://www.tratabrasil.org.br/estudos/estudos-itb/itb/beneficios-economicos-e-sociais-da-expansao-do-saneamento-brasileiro>. BRK Ambiental: 2018, *O Saneamento e a Vida da Mulher Brasileira*. Available at <http://www.tratabrasil.org.br/images/estudos/itb/pesquisa-mulher/relatorio.pdf>.

⁹ Ceará Meteorology and Water Resources Foundation (FUNCEME)

¹⁰ February to May 2018.

Resources Management Company (*Companhia de Gestão dos Recursos Hídricos – COGERH*) reached mere 11 percent of total capacity (estimated at 18.6 billion m³) by December 2018. Given the situation, COGERH implemented very stringent water allocation rules in 2017, with 75 percent of stored water allocated for human consumption, 16 percent for agriculture and 7 percent to industry. Figure 2 shows total water inflows to the reservoirs monitored by COGERH from 1986 to 2018. The lower water levels have deteriorated water quality in some of key reservoirs, jeopardizing the provision of safe and reliable water in certain regions of the State.

Figure 2. Inflows to the reservoirs monitored by COGERH



Source: FUNCEME (2018)

12. **Ceará also lacks appropriate access and efficient provision of water services.** In 2017¹¹, only 79.8 percent of Ceará's households had access to piped water, below the average rate in the Northeast Region of 80.3 percent¹² and the national average rate of 85.7 percent. The rate of urban household connections was 81 percent in 2016, compared to the Northeast rate of 89.3 percent, lagging behind Brazil's rate of 93 percent¹³. Water supply service in the State is characterized by intermittent water provision and high levels of water losses. The inefficient provision of water supply service contributes to growing pressure on already limited water resources. Studies indicate a close relationship between the lack of adequate water supply and important health indicators, such as infant mortality. Therefore, the absence of reliable water supply can be one of the main factors of proliferation of diseases.

13. **Ceará is one of the pioneer states in the implementation of a water resources management (WRM) model.** Even before the approval of the 1997 National Water Resources Policy Law, the State already had a State Water Resources Policy¹⁴ in place, which effectively established an Integrated Water Resources Management System (*Sistema Estadual de Gerenciamento de Recursos Hídricos – SIGERH*) and a set of water resources management instruments, including water resources plans.

14. **The State's institutional framework for water resources management has been established since 1987.** It started with the creation of the Secretariat of Water Resources (*Secretaria de Recursos Hídricos - SRH*), the Superintendence of Water Works (*Superintendência de Obras Hídricas - SOHIDRA*), and the Ceará Meteorology and Water Resources Foundation (*Fundação Cearense de Meteorologia e Recursos Hídricos - FUNCEME*), followed by the creation of COGERH in 1993, which is responsible for managing water resources and supplying bulk water. Water supply and sanitation services in the State mainly rely on the Ceará Water and Sanitation Utility (*Companhia de Água e Esgoto do*

¹¹ IBGE (*Instituto Brasileiro de Geografia e Estatística*) Brazilian Geography and Statistic Institute projection for 2017 (PNAD-C).

¹² Comprising services provided by the State WSS utility CAGECE in 152 municipalities and by municipal departments in another 32 municipalities.

¹³ SNIS (*Sistema Nacional de Informações sobre Saneamento*) National Sanitation Information System, 2016.

¹⁴ Law N. 11.996 of 1992, revised in 2010



Ceará – CAGECE), which treats and supplies water and sanitation services to 152 out of State's 184 municipalities.

15. **CAGECE is one of the largest WSS utilities in the country.** It supplies water to 5.7 million inhabitants (2.65 million inhabitants only in the city of Fortaleza). Nevertheless, service quality and efficiency remain a challenge. In 2018, water losses in Fortaleza represented 53.1 percent (out of which 21.5 percent are real water losses). Sanitation coverage reaches only 40.1 percent at the level of the state and 62 percent in the city of Fortaleza. The Bank is supporting CAGECE in increasing the efficiency of the sanitation system of Fortaleza through a lending operation¹⁵, which finances household connections in low-income areas and a comprehensive campaign to non-poor users to connect. Despite the challenges, CAGECE has been able to deal with the adverse water crisis scenario faced by the State over the past years. Besides providing incentives for responsible water use through a contingency tariff, with additional charges for water consumption above established targets, CAGECE has been working on a design, build and operate contract for a seawater desalination plant to increase water security to the municipalities within the MRF. Initially, the proposed new system will generate 1m³/s of desalinated water, increasing water supply by 12 percent.

16. **CAGECE is working in line with the maximizing finance for development (MFD) approach.** In addition to the proposed desalination plant, CAGECE is seeking partnering with the private sector to increase services coverage. The company has also engaged with the Brazilian National Economic and Social Development Bank (BNDES) in the assessment of other possible public-private-partnership (PPP) arrangements. However, as public sector investment capacity is reducing as a result of tighter fiscal situation, CAGECE will need to increasingly rely on its own cash generation capacity to finance needed investments. To this end, CAGECE also needs to increase its credit worthiness, through a series of measures comprising, among others, efficiency gains, cost reduction and increasing revenues from tariffs.

17. **The legal and institutional framework for rural water supply and sanitation has been recently defined.** The 2016 State WSS Policy¹⁶ establishes that the Secretary of Cities as responsible for coordinating WSS services in the State and for rural WSS (RWSS) calls for the close collaboration with the Secretariat of Agrarian Development (*Secretaria de Desenvolvimento Agrário – SDA*), currently responsible for RWSS infrastructure, and the SRH. The World Bank has been supporting the State in the implementation of RWSS activities for more than fifteen years through several Investment Project Financing (IPF) operations, including the second phase of São José III Project¹⁷.

18. **The World Bank has a long-lasting engagement with the State on water.** World Bank's support to the State dates to 1993, which helped implement the State's 1992 Water Law and increase water storage capacity. Subsequent operations helped consolidate the institutional framework and implement modern policies, planning and management tools. Water storage capacity and distribution infrastructure was further expanded to reduce vulnerability to droughts. More recently, the Bank has been providing technical assistance to the State of Ceará focusing on drought preparedness and water quality problems. Currently, the Bank is supporting preparedness plan for drought in the MRF and increased capacity of water-related institutions to sustain water sources for agriculture and build resilience in water resource management through the use of tools and monitoring systems¹⁸. This work builds upon previous activities facilitated by the Bank supporting the development of a Drought Monitor and Drought Preparedness Plans in the Northeast region¹⁹. In addition, the Bank presented to COGERH²⁰ methodologies and recommendations for improving water quality in the State's reservoirs. The proposed Project will further support FUNCEME and COGERH with the strengthening of the State's

¹⁵ Fortaleza Sustainable Urban Development Project (P153012)

¹⁶ Law No. 162 of June 2016

¹⁷ Ceará Rural Sustainable Development and Competitiveness Project (P167455)

¹⁸ "Piloting of an Agriculture Drought Monitoring and Prediction System in Brazil" (P166896)

¹⁹ See website: monitordesecas.ana.gov.br

²⁰ Improving Water Quality Management in the Reservoirs of the Northeast Region of Brazil – linked to the Federal Integrated Water Sector Project (P112073) implemented in 2016-2017



climate forecasting system and the improvement of water quality and quantity monitoring.

19. **Despite this support, the current water crisis and increased vulnerability to climate impacts call for a more proactive approach to water management to ensure water security and improve resilience in the State.** As result of the prolonged drought, in 2018, the State prepared a Strategic Action Plan (*Plano de Ações Estratégicas*), that establishes a set of water sector priorities, including expanding water infrastructure and improving water management and governance. The proposed Project will support the implementation of a number of priority investments under the Strategic Action Plan. In addition, it will support initiatives aimed at improving its public resources management and decision-making capacities as well as increasing its accountability. Project activities have been selected based on their relevance to the State's objectives and the Bank's value-added. The Project will further strengthen water management and governance, improve service delivery, increase accountability, and help develop tools for evidence-based planning and decision-making. In addition, the Project will reduce the vulnerability of the poor, increase the resilience of the State to climate related events and boost future sustainable growth and shared prosperity.

C. Relevance to Higher Level Objectives

20. **The proposed Project aligns well with the FY18-FY23 World Bank Group's Country Partnership Framework (CPF) for the Republic of Brazil (Report N° 113259-BR).** The CPF proposes a reorientation of new lending and advisory services and analytics toward supporting the government in addressing the main development constraints identified in the Systematic Country Diagnostic, including water security, with an emphasis on the third focus area of the Framework: inclusive and sustainable development. As stated in the CPF, "the third requirement for improved livelihoods and economic opportunities is the smarter management of Brazil's natural resources and the better mitigation of environmental pollution and the risk of natural disasters." Water management is defined as one of the principal issues in natural resource management standing out and affecting the bottom-forty (B40) directly and indirectly through its effects on growth and incomes. Also, the CPF states that "pricing policies need to be reviewed to improve incentives for conservation of water and other natural resources and encourage investments in improved quality and resilience of service provision". The Project will address these issues by improving governance of scarce water. It will strengthen resilience to climate shocks through interventions aiming at improving the quality of hydro-met services. It will likewise improve the operational efficiency of water services, increase access to water supply and enhance water security in the poorest area of the State. Finally, the proposed operation will provide the analytical foundations for tariff revisions aimed at improving prospects for the conservation and sustainable management of scarce water resources going forward.

21. **The Project is directly related to the third focus area of the FY18-23 CPF.** As stated in Objective 3.2 of the CPF (Provide more inclusive and sustainable urban services), "While Brazilian cities have become engines of economic growth, their competitiveness is below similar-sized cities in East Asia, Europe, and the U.S. Further, many cities face tremendous challenges in terms of reducing water and air pollution, improving the quality of the urban environment, reducing disaster risks, and addressing problems of water scarcity and lack of access to basic services". The CPF emphasizes the need for a more selective Bank focus on water and sanitation, urban transport, land use planning, risk management and resilience and energy efficiency. As mentioned in the CPF, the Bank will continue to invest in water and sanitation to foster resilience against the increased variability of water supply, while also focusing on pricing policies to ensure that water charges reflect provision costs; and the support from the Bank will be embedded in the broader context of water resource management and protection of scarce water resources, representing key areas of the proposed Project.

22. **The Project also contributes to the World Bank's Twin Goals and the World Bank Climate Change Action Plan.** Water scarcity and the unreliable provision of water supply have important negative impacts on the population's health, wellbeing and economic development, disproportionately affecting the poor due to the increased coping costs they need to incur to deal with rationing of water supply services and/or poor water quality. By enhancing water security in poor



areas of the State, the proposed Project will assist the State of Ceará in reducing poverty and boosting shared prosperity. By increasing the project beneficiaries' resilience to climate change, particularly droughts, the Project is fully aligned with and contributes to the World Bank Climate Change Action Plan and recently announced new set of climate commitments.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

23. The proposed Project's Development Objective (PDO) is to strengthen capacity for water resources management in the Borrower's territory, improve reliability of water services in selected municipalities, and improve operational efficiency of water services in the city of Fortaleza.

24. Achievement of the PDO will be measured based on specific activities and targets²¹. Strengthening capacity for water resources management will be measured by the increased knowledge on water use with the universalization of water macro metering and the regularization of water users; and the improved forecasting capacity with the provision of relevant information for decision-making on drought response, preparedness and mitigation. Reliability of water services will be measured as uninterrupted water supply following the National water quality standards²². Enhancing in efficiency of water services in the city of Fortaleza will be measured by water losses control and reduction in priority water supply sectors through sectorization and creation of District Metering Areas (DMCs).

PDO Level Indicators

- (a) Percentage of strategic water users regularized.
- (b) Continuity of water systems supplied with water from Banabuiú – Sertão Central Pipeline System²³ (Percentage).
- (c) People benefiting from more reliable water services (Number).
- (d) Women benefiting from more reliable water services (Number).
- (e) Reduction in Non-Revenue Water in the city of Fortaleza (liters/connections/day).

B. Project Components

25. The proposed Project is a US\$174.85 million IPF operation financed by a US\$139.88 million IBRD loan and US\$34.97 million in State counterpart funds. The Project will comprise three main components and a Contingent Emergency Response Component (CERC) to support the State of Ceará should emergencies associated with natural disasters negatively impact the State's water systems during implementation. Project activities comprise a set of interventions in three main areas: (i) water resources management; (ii) water service provision; and (iii) governance. Each component will include activities related to one of these areas and will be implemented by different institutions based on their competency.

26. **Component 1. Increasing Water Security (US\$149.93 million; US\$34.97 million counterpart funds).** This component aims at increasing water security through improved water resources management, expanded bulk water infrastructure and specific investments to ensure the safety of Project-related dams. It includes two sub-components:

²¹ Strengthening public sector management activities under component 3 are not reflected in the PDO as they represent a small portion of Project scope focusing on technical assistance activities that in part complement activities under components 1 and 2.

²² Ministry of Health PRC n. 05 of Sep. 28, 2017, Annex XX.

²³ Following National water quality standards.



- (a) **Sub-component 1.1: Integrated Water Resources Management (US\$10.82 million).** This sub-component will contribute to strengthen the State's water resources management and build its resilience to increased droughts by strengthening the technical capacity of key State agencies involved in water resources management. Specifically, the sub-component will support: (i) COGERH in increasing knowledge on bulk water usage, universalizing water supply metering and regularizing water users; and (ii) FUNCEME in the strengthening of the climate forecasting system and the improvement of water quality and quantity monitoring.

Information obtained from medium- and long-term forecasts/scenarios together with improved knowledge on water demand in the river basins will serve as inputs for the negotiated water allocation process followed by the State. The climate forecasts produced by FUNCEME are relevant in decision-making processes concerning drought response, preparedness and mitigation actions at both State and Regional levels. The activities complement ongoing State's efforts on water resources management responding to the constant need for improvement to deal with increasingly frequent and prolonged water scarcity periods, which are being exacerbated by climate change. Although Ceará has one of the most advanced water resources management systems in the country, continued support over time for improving water resources management is needed for consolidation of results.

The sub-component will also include capacity building activities to SRH, COGERH and FUNCEME. Integrated water resources management increases the available supply of clean water and contributes to its efficient use and distribution. It, therefore, directly addresses the problem of increasing, climate-induced water shortages.

- (b) **Sub-component 1.2: Water Infrastructure (US\$139.11 million).** This sub-component will support the construction of the Banabuiú – Sertão Central Pipeline System to supply treated water from the Banabuiú Dam reservoir²⁴ to selected municipalities, districts and rural areas in the Banabuiú and middle Jaguaribe river basins through the construction of an approximately 670km pipeline network and a treatment station near the source. It will also support dam-safety related institutional strengthening activities for SRH and COGERH, and specific measures related to the safety of the Gavião dam and Banabuiú dam, following the results of the Dam Safety Assessment. These measures will include the mobilization of a dam safety independent panel of experts, the preparation of a Dam Safety Periodic Review of Gavião, improvement of the Gavião dam safety and instrumentation plans, and installation of additional monitoring instruments for Gavião. In addition, for Banabuiú dam, it will include immediate actions recommended by the independent expert and provide technical support for DNOCS for safety and operational monitoring. Increasing the safety of dams also contributes to more reliable water supply services considering that a dam failure could significantly affect available water supplies as well as the environment.

The construction of the Banabuiú – Sertão Central Pipeline System will directly increase the supply of water available to the State, making the beneficiary population more resilient to the climate-exacerbated droughts and enhance adaptation to climate change in general. It will also enhance the State's water security by guaranteeing water supply in adequate quantity and quality to selected State areas.

The Pipeline System will be the first investment implemented as part of the State's *Malha D'água* project²⁵, which aims at increasing water supply reliability in quantity and quality and water storage management efficiency by placing water intakes inside the reservoirs, thereby, reducing the flows released from these reservoirs for river perenization and consequent losses to infiltration and other uses. The prioritization of the Banabuiú – Sertão Central Pipeline System was based on a set of hydrological criteria including water source availability, criticality of current water supply and availability of immediate alternative water sources – factors that are all severely affected by climate

²⁴ Banabuiú reservoir as well as the other reservoirs included as water sources under the *Malha D'água* project, is a secure water source, being a multiyear reservoir, which has been resilient to the recent six-year drought period.

²⁵ The complete *Malha D'água* project comprises the construction of 4,500 km of treated water pipeline network for a total estimated investment of US\$1.4 billion that would benefit 6.3 million people in the next 25 years.

change. The water delivered by the pipeline at the entrance of municipalities and districts will be stored in dedicated reservoirs and distributed by the existing systems.

27. **Component 2. Improving the Efficiency of Water Services (US\$ 15.95 million).** This component will seek to improve water supply service efficiency in the city of Fortaleza, and CAGECE's operational efficiency. The component includes two main sets of activities:

- (a) *Water Losses Control and Reduction.* This set of activities will support CAGECE in improving water supply efficiency through the implementation of water losses control and reduction activities in the city of Fortaleza. The proposed activities will contribute to CAGECE's Water Losses Reduction Program with focus on controlling pressure, sectorization and creation of District Metering Areas (DMAs) in priority sectors of Fortaleza. Implementation will follow a design and build approach in line with the MFD bringing the private sector through performance-based contracts.

The creation of DMAs will allow CAGECE to have detailed knowledge of losses related problems in the system, provide better equalization of pressures, and contribute to manage the losses in smaller areas, bringing better returns both in relation to actual and apparent losses. The activities will reduce water shortages and increase water availability to other users of the system, thereby increasing the water supply sector's resilience to climate change-induced droughts. It may also reduce the need for water withdrawals from existing sources, thereby contributing to flexibility in the face of climate shocks and further increasing the residents' resilience to climate change. In addition, NRW reductions and the adequacy of the pressures in the network will lead to reductions in net GHG emissions due to energy efficiency gains.

- (b) *Technical assistance support to CAGECE to improve governance capacity and operational efficiency.* This set of activities includes the preparation of: (i) CAGECE's organization restructuring plan focusing on improving corporate governance through a broader approach, using the turnaround framework for a performance improvement plan, from short to long term; (ii) economic and social studies to revise CAGECE'S tariff structure with the objective of providing CAGECE with a new tariff structure²⁶ by level of water consumption able to cover its operational and investment costs; and (iii) guidelines for improved infrastructure asset management processes.

Activities are in line with the MFD approach, especially with the preparation of a turnaround plan and development of a proposal for reforming tariffs and subsidies. The operational efficiency improvement will also benefit from the strengthening of the regulatory functions of Ceará State Delegated Public Services Regulatory Agency (*Agência Reguladora de Serviços Públicos Delegados do Estado do Ceará* – ARCE) proposed under component 3. Better corporate governance and improved, operational efficiency will enable adequate maintenance of water infrastructure, thereby contributing to the sector's resilience to climate change.

28. **Component 3. Strengthening Public Sector Management (US\$8.62 million).** This component will contribute to improving public sector governance, particularly in the water sector, through a set of activities aimed at embedding the use of evidence in planning and decision-making, improving service delivery and management of the State water resources, as well as increasing accountability. Better water governance—based on historical data, hydrological and economic models and forecasts of key climate variables—will indirectly contribute to a higher supply of water and a more efficient use and allocation, thereby further contributing to the water sector's resilience to droughts. Component activities have been divided into three groups based on their primary objective.

²⁶ The current tariff structure was designed in the 1970's and is based on Increasing Block Tariff (IBT) model with cross-subsidies between consumption level, category of users and municipalities, with a limited social tariff rule.



- (a) *Use of evidence for better planning and decision-making*, through data analysis capacity building activities and the establishment of a dedicated and on-demand research group to support the design and management of policies in the water and agribusiness sectors.
- (b) *Improving public sector investments and management*, through the optimization, strengthening and modernization of ARCE's management and regulatory activities; supporting Secretariat of Economic Development and Labor's (*Secretaria de Desenvolvimento Econômico e Trabalho* – SEDET) ability to assess the efficiency of water usage in the agricultural sector; the preparation of the State Water Supply and Sanitation Plan; and the implementation of a Public Investment Management System (PMIS) in SEPLAG to support decision making throughout the entire public investment cycle.²⁷
- (c) *Improving accountability in public investment*, through the development and implementation of a contract management system in the State General Controller (*Controladoria Geral do Estado* – CGE) to assess performance and compliance across the State; and a public works management system that will enhance the State Court of Accounts' (*Tribunal de Contas do Estado* – TCE) ability to monitor water infrastructure works.

29. **Component 4. Contingent Emergency Response Component (CERC).** This component will support the State of Ceará, following an Eligible Crisis or Emergency, to respond to emergency situations associated with natural disasters that affect water systems.

30. This disaster recovery contingency zero-fund component could be triggered following the declaration of a disaster or emergency. When triggered, funds may be reallocated to facilitate the rapid financing of goods and services under streamlined procurement and disbursement procedures. Eligible activities may include emergency rehabilitation works, supply of critical equipment, or any other critical inputs to ensure the continued operation of water infrastructure and provision of services. This component therefore directly enhances the residents' resilience to climate change.

31. **Project GHG emission reduction estimates.** The net GHG emissions are estimated at **-43,115 tCO₂-eq** over the life of the Project, while the gross emissions are estimated to be **108,228 tCO₂-eq**. On average, the Project will generate estimated net emissions of **-1,725 tCO₂-eq** annually. The water supply production increases under subcomponent 1.2 are estimated to experience net emissions of -25,817 tCO₂-eq due to the fact that the reduction in tanker fuel use will lead to emissions reductions compared to electricity use by a more reliable piped system. The NRW reduction activities under Component 2 will see total net emissions of -17,298 tCO₂-eq, resulting in energy efficiency savings.

C. Project Beneficiaries

32. **Overall beneficiaries.** It is estimated that roughly 120,000 people, half of which are women, living in the urban areas of the nine municipalities (including the districts supplied by the Banabuiú – Sertão Central Pipeline System located in the interior of Ceará) will benefit from a more reliable water supply due to the water infrastructure investments. The benefited population will also include the rural population living in small communities located alongside the pipeline. Poverty and social vulnerability are high among these potential beneficiaries. Approximately, 45.7 percent of the population lives under poverty in these municipalities.

33. Project beneficiaries also include existing CACEGE's users in the city of Fortaleza, who will benefit from the efficiency improvements to be pursued in the Fortaleza water supply system. Direct beneficiaries in the sectors where water losses control and reduction activities will be implemented are estimated at 550,000 people. At the same time, the improved efficiency will benefit the total population being served by the system, 2.6 million people, by increasing water

²⁷ The World Bank's PforR financed the development of the methodology behind the PMIS and successfully piloted it in the water sector (*Cinturão das Águas do Ceará*).



availability to the other users. The technical assistance activities focused on improving water resources management and strengthening the public sector will benefit the whole State population, around 9 million people.

34. **Prevailing social norms of social labor division patterns show that women are expected to benefit the most from more reliable water supply** because the adverse impacts of the lack of access to reliable water fall mostly on them. The assessment of social impacts and benefits incorporated a gender sensitive lens. Gender gaps remain large in Brazil. Nationwide data from 2016 show that women spend 18.1 hours per week in household and care-taking tasks, men spend 10.5 hours per week (meaning that women's workload with these tasks are 73 percent higher than men's). In addition, 83 percent of the women and only 65 percent of men carry out household tasks, whereas 28 percent of women and just 19 percent of men are responsible for care-taking in their households. While 48 percent of the women at productive age are out of the labor force, just 28 percent of men face this situation. Women represent 48 percent of the total work force and 43 percent of the employed people, while 28 percent have part-time jobs. The gender gap in average earnings from jobs reached 23 percent.²⁸

35. **Women continue to hold the responsibilities for fetching water to the households and for caring for the health of the family.** In consequence, the recurrence of waterborne and gastrointestinal diseases leads more frequently women than men to withdraw from their routine activities, compromising their school achievements, labor market opportunities and incomes. The construction of the Banabuiú – Sertão Central Pipeline System will increase the number of days of reliable access to water in the nine beneficiary municipalities, increasing continuity of water supply from 70 to 90 percent. The reliability of water services will reduce domestic workloads and the incidence of waterborne gastrointestinal diseases, contributing to improve the wellbeing of both men and women, but with a larger impact on women.

36. CAGECE will carry out supportive social actions at the local level promoting educational campaigns and communication strategies, which will target teachers, community health professionals and poor women and convey messages and information that promote improved health and hygiene practices and the rational water use. SRH social team will also develop -with the support of the social team of the works construction and supervision firms- awareness materials about waterborne diseases, gender norms and other topics as detailed in the Project's Gender Action Plan (Annex 4). CAGECE and SRH and the firms' social teams, teachers and, particularly, community health agents will act as multipliers, disseminating this knowledge during their household visits and community events.

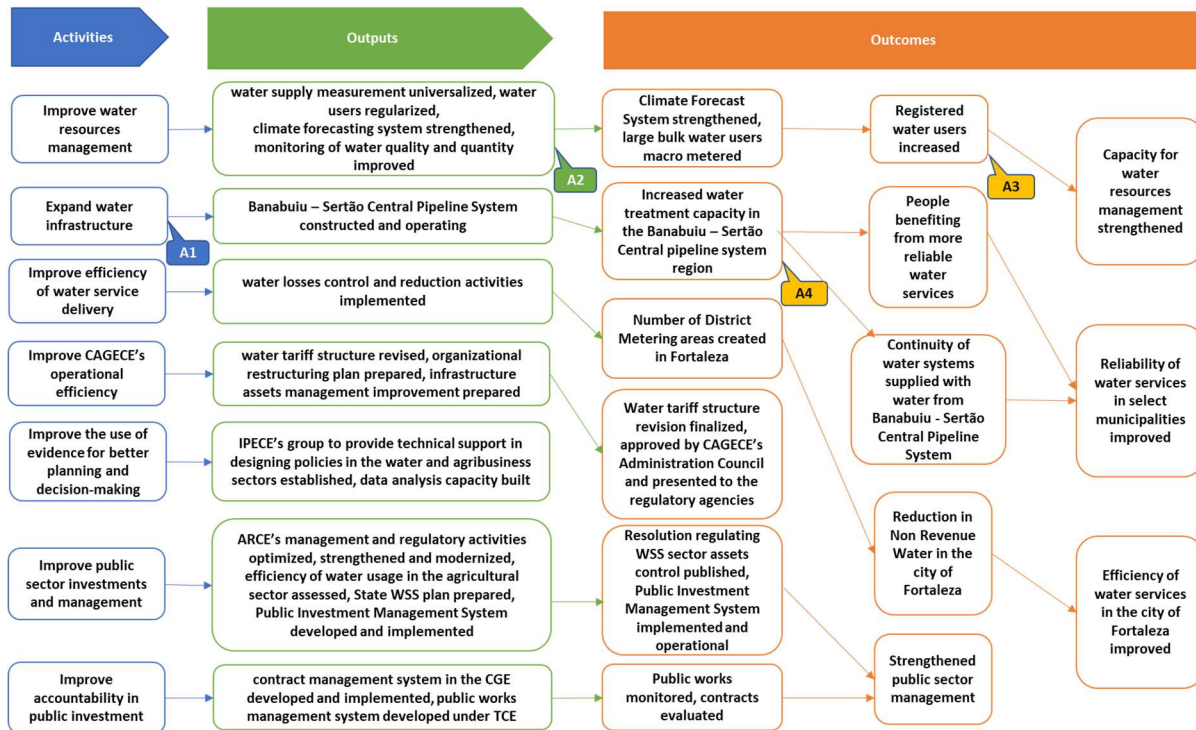
37. **Gender-related impacts and benefits will be monitored and evaluated.** The monitoring and evaluation (M&E) system will mostly rely on first-hand data collection at the local level on randomly sample-based surveys with beneficiaries of the Banabuiú – Sertão Central Pipeline System. The survey will measure, but not be limited to: (i) days of sickness or hospitalization due to water-borne and gastrointestinal diseases; (ii) time burden to secure access to water supply and to take care of sick family members due to water-borne disease; and (iii) impression of water quality and safety. Information will be collected on a sample basis, disaggregated by gender, and analyzed three times during implementation: (i) at the first year of implementation, (ii) at mid-term, and (iii) after the construction of the Banabuiú – Sertão Central Pipeline System. Two key indicators are included in the Project's results framework.

²⁸ BRK Ambiental, 2016 O Saneamento e a Vida da Mulher Brasileira. Available at <http://www.tratabrasil.org.br/images/estudos/itb/pesquisa-mulher/relatorio.pdf>



D. Results Chain

Figure 3. Project's Results Chain



38. Critical assumptions include:

- A1. Water is available at Banabuiu reservoir;
- A2. Institutional capacity for usage of new information;
- A3. New water users are registered; and
- A4. CAGECE's tariff is sufficient to full cover operation and maintenance (OPEX) costs.

E. Rationale for Bank Involvement and Role of Partners

39. **The value added of the World Bank goes beyond its ability to offer at-scale financing at conditions superior to commercial lenders.** The World Bank is also uniquely positioned to support water resources management and water supply infrastructure investments and reforms due to its strong local presence, specialized staff, and considerable experience implementing water projects in the Northeast region of Brazil. Within the framework of the Interantional Financial Institutions, the Bank's relationship in the water sector with the State of Ceará dates since early 1990's, as described in paragraph 18. From a multisectoral perspective, between 2003-2019, the World Bank supported the State on several key areas of social and human development, service delivery, leveraging the greatest possible benefit for government actions and enhancing public sector management capacity in a scenario of high debt services commitments.

40. Due to this successful and long-term partnership, the Government of the State of Ceará has expressed interest in carrying out a new credit operation based on the Investment Project Financing (IPF) instrument, with focus on water security and governance.



F. Lessons Learned and Reflected in the Project Design

41. **Project management staff and support.** Although having several institutions involved in Project implementation may add complexity, the positive experience of an earlier Program for Results (PforR) operation shows that a well-staffed Project Management Unit (PMU) with support from IPECE is key for a successful implementation. The Project will continue to count on the PMU and staff responsible for the PforR, which will have the responsibility of ensuring quality of procurement processes and overseeing the implementation of all activities. The PforR technical assistance component was successfully implemented by the same institutions involved in this Project.
42. **The satisfactory performance of PforR as a multisectoral Project resulted mainly from the performance of the Project intersectoral committee created by State decree.** Its success depended on IPECE's role in conducting monthly progress meetings, promoting significant synergy among project actions, and following up as problems arose. It also led to the systematic knowledge of technical and administrative procedures needed for good performance, providing a participatory and intersectoral collaboration platform. The current Project will continue to count on a similar structure.
43. **Climate change, particularly impacts of water scarcity and droughts, causes long-term harm that requires a paradigm shift from emergency response to proactive risk management.** Droughts can cause health impacts, hamper productivity, accelerate the destruction of forests, and compromise agricultural systems. Families feel the impacts of this uncertainty on their incomes, jobs, and long-term health and welfare. Based on worldwide analytical work and project experience, this Project will support the State of Ceará on increasing resilience, addressing these crucial development issues in a holistic way: (a) improving management of scarce water resources; (b) increasing efficiency of urban water services; and (c) providing new water infrastructure to provide people with reliable water sources.
44. **Ceará's water resources institutional model has become best practice and an example to other Brazilian states.** By separating planning and policy formulation from implementation of water resources instruments with financial sustainability, the State of Ceará has been able to achieve remarkable progress in managing its scarce water resources. The State has made significant efforts over the last decades to consolidate and strengthen its institutional set-up for water resources planning and operation and maintenance of bulk key water infrastructure. The Project will continue to support the State in improving the implementation of water resources management instruments and increasing information to support decision-making.
45. **The Government of Ceará has continuously expanded and reinforced its water system over the last decades,** mostly through World Bank-financed projects. This has involved not only expansion of infrastructure but also strengthening management and user participation, leading to more reliable access to water for all uses. This Project will support the State's new strategy for increasing resilience to water scarcity.
46. **The design and build type of contracts is essential to generate timely results.** The design and build ("turnkey") contract model used in the execution of most works has proved to be robust and effective in other World Bank funded water operations in Brazil and beyond. The same type of contract will be adopted under the Project for the construction of large infrastructure. Experiences in similar projects show that: (a) the allocation of a larger part of the responsibilities on the contracted firm along with a certain technical autonomy can be attractive to high quality firms with proven capacity to tolerate risks; and (b) this type of contract can also lead to faster execution of works as the contract model provides an incentive to the firm to resolve issues rapidly, and fewer contract amendments are necessary.
47. **Effective communications, consultations, and use of participatory approaches are integral to the success of water projects.** Such an approach allows for early identification of needs and priorities and potential implementation issues. It helps manage expectations, facilitates ownership and trust, and supports accountability mechanisms. These principles have been incorporated into the Project design and will be applied systematically using community



development activities²⁹, which will start before and continue during and after the construction of works in the Banabuiú – Sertão Central Pipeline System.

48. **Recent experiences with technical assistance activities under water projects have shown that extra efforts are needed to ensure adequate implementation and achievement of results.** It is crucial to have well prepared Terms of Reference ready for the procurement of activities once the Project initiates implementation.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

49. **Project implementation arrangement.** The Borrower will be the State of Ceará. Following the successful structure of the recently closed World Bank financed PforR, IPECE will be responsible for overall Project coordination through the establishment of a PMU and the creation of an Intersectoral Committee, including representatives of all beneficiary and executing agencies that will follow the Project's performance and strategic issues. The PMU will include a coordinator, procurement and financial management specialists, a safeguards specialist and a monitoring and evaluation specialist.

50. The implementation of proposed Project activities will be distributed among the institutions involved: (i) SRH, COGERH and FUNCEME will carry out activities under Component 1; (ii) CAGECE will carry out activities under Component 2; and (iii) IPECE, SEPLAG, ARCE, SCIDADES, CGE and TCE will carry out activities under Component 3. SEDET will be a Project beneficiary while providing technical support for the implementation of activities under Component 3 by IPECE as well as activities coordinated with FUNCEME. The PMU will be responsible for monitoring the overall Project execution, providing support to all implementing agencies on each of its responsibilities, reviewing each document for quality assurance, providing guidance in each procurement step and issuing internal no-objections to them. The PMU will also be responsible for legal matters and for monitoring and ensuring safeguards compliance; it will be the primary contact with the World Bank. Safeguards responsibilities related to Component 1 activities will remain under SRH considering its long experience in implementing World Bank investment operations with social, environmental and dam safety impacts.

B. Results Monitoring and Evaluation Arrangements

51. The M&E of Project activities will be undertaken by the PMU at IPECE, who will be responsible for coordinating and reporting on progress towards achieving PDO and results indicators with support from all executing agencies. The PMU will have a M&E staff that will report to the Project Coordinator. The PMU will further assist in providing Project information, facilitating regular joint monitoring and reporting, and providing feedback on lessons learned to ensure learning and continuous improvements in Project implementation. The PMU will prepare semi-annual reports, which will reflect Project progress using performance indicators defined in the Results Framework and the Project Operations Manual.

C. Sustainability

52. Sustainability of water investments supported by the Project relies on the financial and economic sustainability and technical capacity of beneficiary utility to efficiently operate and maintain built infrastructure and to bear at least the O&M costs. The investment cost will be covered by the State and it is not expected to be recovered from the tariff. Arrangements will be made during implementation for transferring the infrastructure to CAGECE. The Project will assist CAGECE in improving its financial and technical performance through technical assistance towards improving commercial efficiency, increasing operational efficiency, and being better prepared to plan and manage service delivery and operation of water infrastructure, especially with the use of the Utility Turnaround Framework.

²⁹ As described in the social safeguards' session of the PAD.



53. The major social focus of the Project is on providing water supply services to populations in the interior of Ceará. The Project will also address sustainability through the following activities: (i) education and communication programs to induce knowledge, attitude, and behavioral changes related to a range of drinking water issues and with regards to tariffs; (ii) citizen engagement mechanisms to enhance accountability; and (iii) application of Brazilian technical design standards, or international standards where Brazilian standards do not exist in the Brazilian normativity framework.

54. The water resources management institutions in Ceará are well-staffed and qualified for implementing activities foreseen under the Project and achieving the expected results. SRH, COGERH and FUNCEME will receive additional support from the Project with capacity building activities focusing on water resources management, climate and infrastructure, including dam safety. The technical specifications and terms of reference for improving water quality and quantity monitoring as well as for strengthening the climate forecast system are being prepared by FUNCEME, which has been a partner with the World Bank in several technical assistance activities over the past ten years.

55. The public good nature of climate change adaptation interventions related to more reliable supply of water, coupled with the large capital outlays required for their construction, justifies public financing of these investments. Nevertheless, the impact of these investments to the government budget could be mitigated by progressively increasing cost recovery within the water sector. This Project will contribute to this aim by revising and supporting the application of new tariff structure, setting the stage for the most direct beneficiaries of infrastructure investments to start paying for these services.

56. On the public sector strengthening side, the Project will strengthen institutional capacity for public resources management and decision-making. The proposed activities build on the previous initiatives supported by the Bank.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis (if applicable)

(i) Technical Analysis

57. Based on the State's vulnerability to droughts, which will be exacerbated by climate change, the Project activities have been prioritized to focus on actions to support expansion of water infrastructure and strengthening water resources and public-sector management. They are based on a comprehensive strategic planning exercise led by SRH, covering water resources planning, climate forecasting, infrastructure, and water governance.

58. The proposed investments to increase the reliability of water supply to municipalities in the Banabuiú and middle Jaguaribe river basins were defined based on a detailed concept study of the *Malha D'água* project carried out by SRH, which proposed a series of treated water supply pipeline systems, using reliable water sources for ensuring human supply to urban centers in the whole State of Ceará. The proposed Banabuiú – Sertão Central Pipeline System was prioritized based on the following criteria: (i) the level of severity of water shortages in the municipality driven by droughts; (ii) the level or urgency driven by the lack of temporary alternative for water supply in the municipality; (iii) the availability or existence of water source; and (iv) the tendency of the problem getting worse. A preliminary environmental license has been issued with the requirements for the preparation of an Environmental Viability Analysis (EVA). The detailed designs including study of alternatives, the environmental and social analysis, the EVA and the works will be procured in the first year of Project implementation under a design and build contract. This will be under the responsibility of SRH. During implementation, the detailed institutional arrangements for the operation of Banabuiú – Sertão Central Pipeline System by CAGECE and the legal arrangements between CAGECE and the municipal water operators, when applicable, will be defined and implemented prior to starting the operation of the pipeline. The water tariff charged by CAGECE to the municipal water operators will be regulated by ARCE.



59. The decision to invest in water losses reduction was driven by the need to improve efficiency of water services provision to the city of Fortaleza, which relies on inter-basin transfers. The approach to sectorization and pressure control follows international best practice promoted by the International Water Association. Implementation of water losses reduction will be done by the private sector through performance-based contracts.

60. All the Terms of Reference for the implementation of technical assistance activities are being prepared and the selection processes for implementation of activities will be initiated right after effectiveness. The proposed technical assistance to improve CAGECE management and performance is based on both international best practices and successful experiences in Brazil.

(ii) Economic Analysis

61. The World Bank has been a long-term partner of Brazil in water supply and sanitation and water resources management sectors. By addressing water scarcity in the poor Northeastern region and improving efficiency of services, the Bank involvement is justified given its vast experience in addressing these water issues that ultimately bolsters equitable access to water supply.

62. The financial and economic analyses focus on Project's subcomponents with specific investments, which benefits could be quantified. The economic analysis assesses all Project's investments excluding activities aimed at building capacity or improving knowledge and technical expertise.

63. The flows of costs and benefits for the Project's lifetime estimated at 25 years were considered. Costs and benefits were expressed in constant prices as of 2018 at an exchange rate of 3.72 Reais per US dollar. The discount rate recommended by the World Bank guidelines is 6 percent, but the analysis uses a discount rate of 10 percent.

64. The net present value (NPV) of net benefits reaches US\$59 million with a benefit to cost ratio of 1.42. The Internal Economic Rate of Return (IERR) for the Project reaches 14.5 percent. The IERR per subcomponent is as follows: subcomponent 1.2 (water infrastructure—storage and availability) 14.2 percent and component 2 (loss control/efficiency improvements) 17.2 percent.

65. The financial analysis of CAGECE shows that in the year 2017, the company obtained net revenues from services rendered reaching R\$1.16 billion (US\$311.8 million) and in the year 2016, net revenues amounted of R\$1.06 billion (US\$284.9 million). Gross revenues, or revenues before taxes in 2017 were estimated at R\$941.89 million (US\$253.2 million) for water supply services and R\$335.75 million (US\$90.2 million) for sanitation services. In 2016, gross revenues were R\$869.88 million (US\$233.8 million) for water supply services and R\$298.07 million (US\$80.3 million) for sanitation services. For the 2017-2018 period, CAGECE's Net Operating Revenues (NOR) from water supply and sanitation services totaled R\$981.5 million (US\$263.8 million), up 17.8 percent compared to the same period of 2016-2017. CAGECE is showing a positive NOR trend.

66. CAGECE is tackling losses based on reviewing accounts receivable and other receivables and contractual assets for an amount equal to the expected credit loss, to ultimately improve its financial position based on increasing operating margins vis-a-vis debt and liabilities. Current financial liabilities expose CAGECE to risks and higher financial costs from variations in input prices and interest rate fluctuations. Furthermore, CAGECE's financial positions are based on the expectation of future generation of taxable income and recognizes tax credits and tax losses. Also, the negative balances from social contributions and tariffs that follow statutory periods have a cap of 30 percent of annual taxable profits to prevent the company to rely on subsidies or transfers to cover for lost revenue due to these provisions.

67. The municipality of Fortaleza through Municipal Law No. 8,716 granted onerous and exclusive rights to CAGECE for the delivery of water supply services and water management for 30 years. In addition to the investments that CAGECE undertakes for Fortaleza, the State transferred to the Municipal Government, 22 percent of its shares with the right to



vote on water and sanitation issues. CAGECE assumed the commitment to pay the City concession, the equivalent of 1.5 percent of the monthly direct water and sewage revenues generated in Fortaleza.

B. Fiduciary

(i) Financial Management

68. **Financial Management Assessment (FMA).** The FMA was carried out for the proposed Project in accordance with *Bank Policy: Investment Project Financing and Bank Directive: Investment Project Financing* and the *Financial Management Manual for World Bank-Financed Investment Operations (effective March 1, 2010 and revised February 10, 2017)*. The conclusions of the FMA are that: (i) the financial management (FM) arrangements for the proposed Project are considered adequate; (ii) the funds flow, disbursements, monitoring, auditing and supervision arrangements have been designed in a way to respond to the Project's implementation arrangements; and (iii) the residual FM risk associated with the Project is rated as Moderate. There are no FM-related conditions of effectiveness.

69. **Institutional arrangements.** The PMU within IPECE will undertake the primary fiduciary responsibilities for the Project, including: (i) preparing and obtaining approval of Project FM arrangements; (ii) coordinating and supervising Project implementation by all project executors; (iii) preparing and submitting Project interim unaudited financial reports (IFRs) for disbursement and monitoring to the Bank; (iv) preparing and providing all financial documentation and Project reports requested by external auditors and Bank staff; and (v) preparing, updating and ensuring that POM is observed. Detailed staff duties and tasks have been included in the POM.

70. **FM risk and mitigation measures.** Based on the proposed Project's design and the FMA conducted during preparation, the residual FM risk associated with the Project is rated as Moderate. Based on previous projects lessons learned, to mitigate implementation delays and documenting the use of funds, the PMU has been properly staffed to provide timely support and advice to the Project, including use of the asset management system, systematically assuring that the control of all funds transferred is properly and timely monitored.

(ii) Procurement

71. **Procurement assessment.** Since the same PMU as in the two previous Bank operations with the State, and mostly the same executing agencies are involved in this Project, a formal capacity assessment was not required. The PMU – responsible for quality control of all procurement activities – and the bidding committees' teams, has kept most of the staff from the last projects, who have large experience and a proven good performance track record.

72. **Procurement arrangements.** The Procurement workflow will also be kept the same. First of all, the implementing agencies will: (i) develop terms of reference and technical specifications; (ii) prepare bidding documents; (iii) evaluate bids and proposals; and (iv) negotiate contracts. During preparation, training was delivered to all implementing agencies personnel on preparing consulting services terms of reference, cost estimates, selection methods and proposals' evaluation procedures. Second, the PMU will support all implementing agencies, reviewing documents for quality assurance, providing guidance on procurement and issuing internal no-objections. It will also be responsible for the STEP – Systematic Tracking of Exchanges in Procurement system, requesting all no-objections to the Bank. Bidding documents will be routed to the State Bidding Central by the respective implementing agency with the support of the PMU.

73. The State Bidding Central receives the bidding documents, which will follow one of two options: (i) all Selections of Consultants and Request for Quotations (RFQ) go to Special Bidding Committee 04 – CEL 04 (*Comissão Especial de Licitações*), a team of four procurement professionals with extensive experience on World Bank's procurement rules that takes care of the entire external procurement phase; or (ii) all national and international procurement of goods, non-consulting services and works above the RFQ threshold will be directed to the Tendering Central Committee – CCC (*Comissão Central de Concorrência*), a team of six procurement professionals proficient on National and Banks



procurement rules.

74. **Procurement Risk.** Overall, the procurement risk associated with the Project has been assessed as Low. Because the PforR was implemented following World Bank's former Procurement Guidelines, training on the new Procurement Regulations has been delivered to the entire PMU staff and to some of CEL 04 and CCC members. The procurement action plan is to deliver training to the remainder of its members, therefore keeping risk as Low.

75. **Procurement Plan.** The PMU has prepared a Procurement Plan in STEP for the first 18 months of Project implementation, which provides the basis for the procurement processes. This plan was agreed upon between the Borrower and the Bank Team before negotiations. The Procurement Plan will be updated in agreement with the Bank on a biannual basis or as required to reflect the actual Project implementation needs and improvements in institutional capacity.

C. Safeguards

(i) Environmental Safeguards

76. **Project Environment Assessment.** Based on the assessment of potential impacts and institutional capacity, the proposed project is Category B as there are not expected significant adverse environmental impacts that are irreversible or unprecedented.

77. **Potential Environmental Impacts.** The proposed interventions may have net positive impacts on the local ecosystems, reducing raw wastewater spillovers and contributing for the resilience to droughts in the Ceará State. Among the activities under the Project, direct environmental impacts are expected mostly from the works related with (i) the expansion of the water infrastructure and (ii) the implementation of water losses control and reduction activities.

78. The works for the expansion of the water infrastructure will take place in the Banabuiú and middle Jaguaribe river basins and will supply treated water to the urban areas of nine municipalities, 37 districts and selected rural areas. Interventions will be expected in rural and urban areas.

79. Despite the diversity of activities to be supported by the proposed Project, the foreseen potential adverse environmental and social impacts are expected to be site specific and, in most cases, mitigation measures can be designed to prevent, minimize, mitigate or compensate adverse impacts and improve environmental and social performance.

80. It is expected that mitigation measures will be required for the following direct potential environmental and social impacts that are common on these project types: (i) civil works/construction activities can bring about noise, dust, and wastes; and (ii) local communities can be affected by the use of local roads for improving water services provision, affecting traffic patterns and local infrastructure, increasing levels of noise and dust and other nuisances and, consequently, posing risks to safety in local communities.

81. **Safeguard Policies.** As part of the preparation process and in accordance with the World Bank project financing procedures, a screening of the type of activities proposed, their location, scale and magnitude and their potential direct and indirect socioenvironmental impacts was conducted. An institutional capacity assessment of the implementing agency for management of social and environmental risks was also carried-out. The following environmental safeguards are triggered: OP/BP 4.01 on Environmental Assessment; OP/BP 4.04 on Natural Habitats; OP/BP 4.36 on Forests OP/BP; 4.11 on Physical Cultural Resources; and OP/BP 4.37 on Safety Dams.

82. **Environmental Assessment OP/BP 4.01.** The proposed Project locations are not yet fully defined. Site-specific investments are still in a preliminary design stage. Feasibility studies will be completed during the first year of implementation. In this context, an Environmental and Social Management Framework (ESMF) was prepared, publicly disseminated and consulted. The ESMF was disclosed in country on November 8, 2018 and in the Bank website on March



22, 2019. The ESMF was also prepared based on the World Bank Group Environmental Health and Safety Guidelines (EHS Guidelines). The ESMF includes a section on the CERC, listing the types of activities likely to be financed and evaluates the potential environmental and social risks and mitigation measures associated with them.

83. **OP/BP 4.04 on Natural Habitats.** Some activities under the proposed Project may have interference on water use, ecosystems and natural habitats as riparian forests and natural vegetation. Nevertheless, no significant conversion or degradation on natural habitats is expected. Springs and river margin areas are classified as Permanent Preservation Areas, and legally protected by the Brazilian Legislation (Federal Law 4771/65).

84. **OP/BP 4.36 on Forests.** As indicated above, some activities under the Project may have interference on natural habitats. Nevertheless, it is not expected that Project implementation will have negative impacts on forest resources. The ESMF considers the requirements of OB/BP4.36 whenever restoration activities are being planned. They should be planned and executed in such a way to minimize or prevent negative impacts on forests and natural habitats.

85. **OP/BP 4.11 on Physical Cultural Resources.** There is no indication, so far, that the proposed Project works may interfere with known cultural resources. However, the nature and scope of civil works may result in interference with historical and/or paleontological sites. The ESMF includes procedures for screening any known cultural property in the Project area and incorporates 'chance find' procedures if culturally significant resources are discovered during Project implementation. The 'chance find' procedures are defined in accordance with requirements under OP 4.11 and the National Historic and Artistic Heritage Institute (*Instituto de Patrimônio Histórico e Artístico Nacional*).

86. **Safety of Dams OP/BP 4.37.** The Project will rely on two existing dams. The Banabuiú – Sertão Central Pipeline System (Sub-component 1.2) will depend on the performance of the Banabuiú Dam and the Fortaleza water supply system, where water loss interventions will be carried out (Component 2), depends on the Gavião Dam Reservoir. The Banabuiú dam (57.7 meters height and 1,600 million m³) and Gavião dam (14.6 meters height and 33 million m³) are classified as 'large dams' in accordance with OP 4.37. The Banabuiú Dam is operated by the National Department of Drought Works (DNOCS) under the Federal Government and the Gavião Dam is operated by COGERH under the State Government.

87. The Borrower retained an independent dam expert to: (a) inspect and evaluate the safety status of the existing dams, their appurtenances and performance history; (b) review and evaluate the owners' operation and maintenance procedures; and (c) provide written reports of findings and recommendations for any remedial work or safety related measures necessary to upgrade the existing dams to an acceptable standard of safety. The client also assessed the potential risk of dam cascade failure in the upstream of Banabuiú Dam and confirmed that there would be no significant impacts on the dam due to the upstream dams' size and distance.

88. The Independent Dam Safety Assessment Report concluded that none of the two large dams related to the Project exhibit major anomalies, which could lead to imminent failures but recommended some additional investigations and analyses for detailed safety inspection and preparation/upgrading of non-structural measures, including improvements in the O&M plans and development of Emergency Preparedness Plans. The Report confirmed that the Banabuiú dam was subject to a comprehensive assessment by DNOCS in 2015/2016, following the requirements of the National Dam Safety Policy, which led to the preparation of a comprehensive rehabilitation work design to be implemented by DNOCS. The framework EPP and the preliminary O&M plans for both dams have been defined at Appraisal. A summary of the Report is included in the ESMF.

89. A communication strategy related to the dam safety activities being implemented by the Project will be formulated and implemented. An Independent Dam Safety Panel will be engaged to follow-up all activities related to dam safety. The Project will fund institutional strengthening activities for SRH and COGERH, as well as specific measures related to the dams, including: preparation of a Dam Safety Periodic Review of Gavião; improvement of the Gavião dam



safety and instrumentation plans, and installation of additional monitoring instruments. The rehabilitation measures proposed by the Gavião Dam safety periodic review will be implemented by the Borrower. For Banabuiú, it was agreed that the regulating agency, the Secretariat of Water Resources – SRH of Ceará (Borrower), will prepare the dam safety instruments for both dams (i.e. instrumentation plan, O&M plan and EPP), as well request DNOCS the execution of the rehabilitation works proposed for Banabuiú³⁰ in a timely and qualitative manner. The State Government agreed to implement the Banabuiú rehabilitation works if DNOCS does not conclude them by the fifth year of Project implementation. Additionally, the Borrower agreed to conduct immediate actions recommended by the independent expert and provide technical support for DNOCS for safety and operational monitoring, as required.

(ii) Social Safeguards

90. **Social assessment.** For the purposes of the proposed Project, a full assessment of the environmental and social impacts and benefits of Project activities has been carried out. The ESMF gives special consideration to impacts and benefits for vulnerable social groups. The overall impacts of the Project are expected to be positive, because its activities will provide reliable water supply services to the population of nine municipalities in the Banabuiú and middle Jaguaribe river basins, that have been facing high levels of water scarcity for the last seven years. The Project will also improve the reliability of the water services in the city of Fortaleza. The assessment of social impacts and benefits incorporates a gender-sensitive lens and proposes, to the extent needed, specific actions to close identified gender gaps as well as indicators to monitor actions designed to address or narrow these gaps.

91. **Social Safeguards.** OP 4.10 Indigenous People was not triggered because there are no Indigenous Peoples within the area of intervention of the Project. OP 4.12 Involuntary Resettlement was triggered because: (i) the construction works of the Banabuiú – Sertão Central Pipeline System may require the acquisition of a small number of site-specific plots of land; and (ii) technical assistance activities may have downstream effects related with involuntary resettlement. As site specific designs are not completed yet, potential adverse impacts related to involuntary resettlement were addressed through the preparation of a Resettlement Policy Framework (RPF). The RPF was disclosed in country on November 8, 2018 and in the Bank website on January 30, 2019.

92. **Consultations.** Key stakeholders, beneficiaries, and affected people were consulted by the Borrower during preparation. In addition to an online consultation, two meetings were held and convened 246 representatives of local people and authorities, members of the Banabuiú and middle Jaguaribe River basins committees, NGOs and water service providers, among others. These meetings took place in the towns of Senador Pompeu and Solonopole, in November 13 and 14, 2018, respectively. During the meetings, the findings of the social and environmental assessment were presented including the identification of impacts and benefits derived from Project activities as well as the proposed measures to avoid, minimize, and/or mitigate adverse impacts.

93. **Citizen engagement.** The Project will promote education and communication programs to induce knowledge, attitude, and behavioral changes related to a range of drinking water, sanitation, and hygiene issues. Citizen engagement will be measured through beneficiary feedback surveys and efficiency of the Project's grievance redress mechanism (GRM). To assess the outcomes of citizen engagement activities in the Banabuiú and middle Jaguaribe river basins, the Project will carry out beneficiary assessment surveys aimed at measuring changes in their level of satisfaction with the services provided by the constructed water supply system. These surveys will measure, but not be limited to: (i) the level of satisfaction with the provision of water services (disaggregated by gender); (ii) the proportion of households adopting new hygiene and sanitation behaviors; and (iii) the proportion of households adopting practices of rational use of water. Information will be collected on a sample basis and analyzed three times during implementation: (i) at the first year of

³⁰ In accordance with the National Dam Safety Law and the Ceará State Normative 2747/SRH/CE/2017, which regulates dam safety at the State level.



implementation; (ii) at mid-term; and (iii) after the conclusion of the Banabuiú – Sertão Central Pipeline System. The Project's results framework includes a beneficiary satisfaction indicator, measuring the perception of the quality of water services in consequence of the construction of the Banabuiú – Sertão Central Pipeline System. This indicator will be disaggregated by gender.

94. **Labor Influx, Working Conditions and Prevention of Gender-Based Violence.** Risks linked to labor influx are expected to be limited. When civil works are carried out, it is expected that most of the workforce will be locally hired. Nonetheless, the Project will incorporate measures to mitigate potential negative impacts of labor influx and, specifically, those related with gender-based violence. First, it will be required that the Environmental and Social Management Plans (ESMPs) include labor influx management/camp management measures. Second, it will be required that the contractor's bidding documents (and subsequently in the Borrower-contractor's contracts) include: (i) mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women; (ii) informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted; (iii) introducing a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g., termination), and (iv) contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence. The Borrower will also ensure that (i) complaints about gender-based violence are taken seriously by local law enforcement and (ii) any incident or accident involving persons contracted by the Project, directly or indirectly (through contracted companies), must be registered and informed to the Bank. Workers' complaints will be reported to the GRM of the Project and should be monitored until their resolution.

(iii) Grievance Redress Mechanisms (GRM)

95. Communities and individuals who believe that they are adversely affected by a World Bank supported Project may also submit complaints to the World Bank's Grievance Redress Service. The Service ensures that complaints received are promptly reviewed to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel, which determines whether harm occurred, or could occur, as a result of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service, please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

96. The Project's GRM will rely on the network of sectorial ombudsman offices and the General Ombudsman Office, including a web-based portal *Ceará Transparente* (<https://cearatransparente.ce.gov.br/>). The portal allows access to the state network of sectorial ombudsman offices, the General Ombudsman Office of the State of Ceará as well as access to information and social oversight of the implementation of the Multi-Year State Plan. In addition to this official website, requests of information and grievances can be filed through the phone-hot line (number 155), e-mail (ouvidoria.geral@cge.ce.gov.br), Instagram, Twitter and Facebook's networks (<https://www.instagram.com/cgeceara/>; <https://twitter.com/cgeceara>; and <https://www.facebook.com/cgeceara>) as well as the network of 65 sectorial ombudsman offices. From January to December 2018, 49,776 requests were received by the *Ceará Transparente* portal; out of which 64.1 percent were complaints. The average time to answer these requests equaled 12.2 days and 91.6 percent of them were replied within the standard time period.

97. The Project will also establish a GRM to regulate the relationship between beneficiaries and Project officers. Efficiency of the GRM will be periodically evaluated in terms of: (i) number of complaints registered (a proxy of the level of public recognition and trust on the GRM), (ii) number of grievances redressed on the appropriate time frame and (iii)



portion of grievances that could not be solved at the Project's GRM level. The efficiency of the GRM will be measured by the proportion of grievances redressed on the established time frame over the number of grievances received.

V. KEY RISKS

98. The overall Project risk is rated as **Substantial**.

99. *Political and Governance risk is rated Moderate*. Despite some changes in the administrative structure of the State Government after the recent elections, the transition has been relatively smooth. Although the changes at the Federal level were more significant, the criteria for project approval remains the same. Therefore, no impacts are expected in the further approval process of the loan agreement. The World Bank continues to keep a close dialogue with both the Federal and State governments to ensure a smooth and rapid approval process.

100. *Macroeconomic risk is rated Substantial*. Since the Federal Government is the guarantor of the operation, a change in fiscal space for new debt at both Federal or State levels would have impacts on the signing of the loan agreement. In addition, a deterioration in the State's fiscal situation would also negatively impact Project implementation. Considering that the State of Ceará has kept a relative comfortable fiscal situation vis-a-vis the Federal Government requirements in the past year, it is not expected any change over the next months until signing. Nevertheless, it is important that the State Government keeps close attention to its fiscal situation to avoid delays during implementation. The World Bank team is monitoring the fiscal situation, including constant dialogue with Treasury.

101. *Sector Strategies & Policies risk is rated Substantial*. Current CAGECE tariffs do not fully cover capital costs and COGERH bulk water charges to agricultural users have yet to be fully implemented. Project activities include support to the review of the CAGECE tariff structure and improvements in the regulation and charging of COGERH water users, with a focus on the agriculture sector.

102. *Technical Design risk is rated Substantial*. Alternative studies, environmental and social analysis and engineering design of the large works will be developed under a design and build contract after loan effectiveness. Although the studies' results will only be known during the first year of implementation, based on the detailed conceptual designs and complementary studies, it is expected that a viable alternative will be confirmed for implementation by the Project.

103. *Institutional Capacity for Implementation and Sustainability risk is rated Substantial*. The involvement of several institutions in implementation is considered a risk. Although institutional capacity of implementing agencies and the institution in charge of Project Coordination is good, they will be further strengthened building on their previous experience in Bank-financed multisectoral operations.

104. *Environmental and Social risk is rated Substantial*. While the risk rating for social aspects is considered Moderate, environmental risk is rated Substantial considering that the Project comprises construction works, and a contingent emergency response component. In addition, the Project will support specific dam safety activities on existing dams related to Project's activities, including the rehabilitation works of Banabuiú dam. The Client has a long and positive experience with the safeguard policies of the World Bank, having developed operations in a satisfactory way since the 1990s. A full assessment of the institutional capacity of State agencies to manage social and environmental risks was prepared and a strategy for institutional capacity building in this area is included in the ESMF.

105. *Climate change risk is rated Substantial*. Based on the recent protracted drought that has impacted the Northeastern states throughout six consecutive years, there is a substantial risk of increased water scarcity. The Project is equipped with a Contingent Emergency Response Component in order to ensure rapid response, including the availability of emergency response funding in the event of such an occurrence.

106. Fiduciary and Stakeholders risks are considered Moderate.



VI. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: Brazil

Ceará Water Security and Governance

Project Development Objectives(s)

The proposed Project's Development Objective (PDO) is to strengthen capacity for water resources management in the Borrower's territory, improve reliability of water services in selected municipalities, and improve operational efficiency of water services in the city of Fortaleza.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	End Target
Strengthen capacity for water resources management			
Percentage of strategic water users regularized (Percentage)		0.00	80.00
Improve reliability of water services in select municipalities			
Continuity of water systems supplied with water from Banabuiu - Sertao Central pipeline system (Percentage)		70.00	90.00
People benefiting from more reliable water services (Number)		0.00	118,490.00
Women benefiting from more reliable water services (Number)		0.00	61,615.00
Improve operational efficiency of water services in the city of Fortaleza			
Reduction in Non Revenue Water in the city of Fortaleza (litters/connection.day) (Number)		469.00	317.00



Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
Increasing Water Security							
Climate Forecast System strengthened (Text)		Climate Forecast System based on two global climate models on biweekly basis.	Climate forecast system information available to the public.				Climate Forecast System generated information being used to calculate water inflow in strategic reservoirs.
Percentage of registered large users that have macro metering (Percentage)		7.00					75.00
Increased water treatment capacity in the Banabuiu Sertao Central pipeline system region (Text)		0.00					1,900 m3/h
Reduction of the time lost from routine activities because of waterborne and gastrointestinal diseases (Text)		For women – 3.48 days/year For men - 3.15 days/year					Gap reduction by 20%
Reduction of time spent with household workloads (including fetching water to the household) (Text)		For women - 18.1 hours/week For men - 10.5 hour/week					Gap reduction by 10%
Beneficiaries’ Level of satisfaction with the provision of water services (Percentage)		0.00					70.00
Complaints and inquiries received through the Grievance Redress Mechanism that are registered and addressed (Percentage)		0.00					90.00



Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
Improve safety conditions of Banabuiú and Gavião dams (Text)		No activity implemented.	Dam Safety Panel of Experts hired.	Gavião Dam Safety Periodic Review and complementary studies for Banabuiú dam contracted. Database to store the instrumentation data of the dams operated by COGERH, including automated alerts, developed.	Gavião and Banabuiú Dam Safety Plans contracted (instrumentation plan, O&M plan, EPP). Gavião Dam Safety Periodic Review and Banabuiú complementary studies completed.	Gavião and Banabuiú Dam Safety Plans (instrumentation plan, O&M plan, EPP) completed. Banabuiú rehabilitation works contracted.	Banabuiú rehabilitation works completed.
Improving the Efficiency of Water Services							
Number of District Metering Areas created in Fortaleza (Number)		0.00	9.00	18.00			44.00
Water tariff structure revision proposal finalized, approved by the Administration Council and presented to the regulatory agencies. (Text)		Tarif structure not revised.	Water tariff structure revision study contracted.	Water tariff structure revision proposal completed.	Water tariff structure revision study approved by CAGECE's Board of Directors.		Proposed tariff structure revision presented and approved by regulatory agencies.
Strengthening Public Sector Management							
Public Investment Management System implemented and operational (Text)		No system	System 100% implemented and made available to all users.	10% of Secretariat of Agrarian Development (SDA) new projects analyzed via the System.			20% of new water resources related projects analyzed via the System.
Percentage of public works monitored (Text)		0.00	Works monitoring system developed and operational, with drone and situation room interconnected.	70% of Project works monitored. 50% of the States large works (above R\$50 million) monitored.			100% of the Project's works monitored. 80% of the State large works (above R\$50 million) monitored.
Resolution regulating the patrimonial control of the		0.00					1.00



Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
water and sanitation sector assets published (Number)							
Contract evaluation average index developed (Text)		No index.	Calculation methodology defined including evaluation criteria to be established by the institutions that will use the system together with the hired firm.				Methodology applied for contracts registered in the new system.
Dedicated group created at the IPECE to provide technical support in designing policies in the water and agribusiness sectors through on-demand research. (Text)		No group	Group created within IPECE's Directorate of Economic Studies.	Productive chains study with focus on water intensive production completed.			Inter and intra sectoral water demand study using input output model completed.

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Percentage of strategic water users regularized		Monthly.	Project progress reports.	Number of strategic users regularized (with water licenses) divided by the number of strategic users.	COGERH



Continuity of water systems supplied with water from Banabuiu - Sertao Central pipeline system	Continuity of water services means uninterrupted supply (except for maintenance) following the National water quality standards (Ministry of Health PRC n. 05 of Sep. 28, 2017, Annex XX).	Monthly	Project Progress Report	The index will be calculated in relation to number of hours paralyzed by the total number of hours in the month. Pressure will be measured in the piezometric stations in several points across the pipeline system.	CAGECE
People benefiting from more reliable water services	People benefiting from more reliable water services measured on a basis of uninterrupted water supply (except for maintenance) following the National water quality standards (Ministry of Health PRC n. 05 of Sep. 28, 2017, Annex XX).	Year 7	Project progress reports	Baseline estimated urban beneficiary population based on the data of IBGE 2010 census, projections and population estimates. Estimated beneficiary population at the end of the Project was calculated based on annual population growth geometric mean rate in the municipalities and the 2010 census demographic structure related to population distribution by gender and geographic region.	IPECE



Women benefiting from more reliable water services	People benefiting from more reliable water services measured on a basis of uninterrupted water supply (except for maintenance) following the National water quality standards (Ministry of Health PRC n. 05 of Sep. 28, 2017, Annex XX).	Year 7	Project progress reports	Baseline estimated urban beneficiary population based on the data of IBGE 2010 census, projections and population estimates. Estimated beneficiary population at the end of the Project was calculated based on annual population growth geometric mean rate in the municipalities and the 2010 census demographic structure related to population distribution by gender and geographic region.	IPECE
Reduction in Non Revenue Water in the city of Fortaleza (litters/connection.day)	Reduction in Non Revenue Water based on the creation of DMAs in hydraulic sectors in the city of Fortaleza.	Monthly	Project Progress Reports	Calculation will be done using the formula: $IPL = (Loss) / (No. Links * day)$	CAGECE Business Unit in Fortaleza



Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Climate Forecast System strengthened	System strengthened measured in terms of improving the climate component, public availability of information and use of information for decision making and water resources sector public policies.	Single measurement after completion of phases 1 and 3: Phase 1 (2021) and Phase 3 (2022).	Project Progress Report	FUNCEME. Currently, FUNCEME runs one global climate model on a monthly basis. The measurement of this indicator will take place in three stages: 1.Run the ECHAM every two weeks; 2. Set up and put into operation the forecast generated from the CAN model; 3. Generate the forecast for the set of ECHAM and CAN models.	FUNCEME
Percentage of registered large users that have macro metering		Monthly	Project progress reports	Number of macro meters installed for major users (SAAE, CAGECE, large industries, large irrigators) / total registered large water users.	COGERH
Increased water treatment capacity in the Banabuiu Sertao Central pipeline system	Capacity refers to CAGECE's water treatment stations in	Single measurement	Project progress	Target achievement will be verified after the	SRH / CAGECE



region	the municipalities of Senador Pompeu (110 m3/h), Piquet Carneiro (110 m3/h), Mombaça (220 m3/h), and Jaguaratama (110 m3/h).	ent upon operation of the Banabuiú - Sertão Central Pipeline System.	reports. Target calculated based on the detailed conceptual study for the water treatment station outflow and the estimated population. It may be adjusted after implementation start.	construction and operation of the water treatment station.	
Reduction of the time lost from routine activities because of waterborne and gastrointestinal diseases	Average number of days per year lost from routine activities due to waterborne and gastrointestinal diseases and the gap reduction between men and women.	Years 1, 4 and 6	Beneficiaries surveys (Regional Household Sample Survey - PRAD). Baseline values refer to the National average, which will be	Data collection at the local level on randomly sample-based surveys with beneficiaries of the Banabuiú – Sertão Central pipeline system.	IPECE, SRH, CAGECE



			updated after year 1 survey.		
Reduction of time spent with household workloads (including fetching water to the household)	Average number of hours per week dedicated to household workloads, including fetching water to the household, and the gap reduction between men and women.	Years 1, 4 and 6	Beneficiary surveys (Regional Household Sample Survey - PRAD). Baseline values refer to the National average, which will be updated after year 1 survey.	Data collection at the local level on randomly sample-based surveys with beneficiaries of the Banabuiu – Sertão Central pipeline system.	IPECE, SRH, CAGECE
Beneficiaries' Level of satisfaction with the provision of water services	Level of satisfaction of beneficiaries of the Banabuiu WSS with the provision of water services (disaggregated by gender). Three survey rounds will be carried out (baseline, mid-term and final).	Year 1, 4 and 6	Beneficiary surveys (Regional Household Sample Survey - PRAD).	Data collection at the local level on randomly sample-based surveys with beneficiaries of the Banabuiu – Sertão Central pipeline system.	IPECE, SRH, CAGECE
Complaints and inquiries received through the Grievance Redress Mechanism that are registered and addressed	Percentage of claims and inquiries received and addressed through the GRM	Continuous	GRM accessible to beneficiaries	The GRM will register all Project-related claims received and	General Ombudsman Office / PMU / SRH.



	(disaggregated by gender, age and priority groups).		and project affected people through different outlets, both physical and electronic.	corresponding responses provided by General Ombudsman Office / PMU / SRH.	
Improve safety conditions of Banabuiú and Gavião dams	Implementation of dam safety activities.	Annual	Project Progress Reports.	Targets established follow the recommended actions for improving the safety conditions of Banabuiú and Gavião dams. Banabuiú dam rehabilitation works are to be immediately executed by the dam owner, DNOCS. However, the State of Ceará will carry out the works directly in case DNOCS do not carry them out by five years after implementation.	SRH and COGERH.
Number of District Metering Areas created in Fortaleza	Number of District Metering Areas (DMA's) created in hydraulic sectors in the city of Fortaleza.	Bi-annual	Project progress reports	Number of DMAs installed in Fortaleza.	CAGECE (Gcope)



Water tariff structure revision proposal finalized, approved by the Administration Council and presented to the regulatory agencies.		Yearly	Project progress report	Study delivered by the consulting firm and approved by CAGECE technical team. Study presented by the consulting and approved by the Board of Directors of CAGECE. Study presented and approved by the Regulatory Agencies.	CAGECE (Gecor)
Public Investment Management System implemented and operational		Yearly	Project progress report	Target 1 refers to the developed platform delivered to SEPLAG. Target 2 refers to the cadaster and analysis by the system of new SDA projects and water resources (SRH, COGERH, FUNCEME) projects.	SEPLAG
Percentage of public works monitored	Monitoring of Project works, and State large works, contracts above R\$ 50,000.00, and presentation of high risk associated with the bidding, contracting and/or execution.	Yearly	Project progress reports and reports from the system.	Collection through system generated reports.	TCE



Resolution regulating the patrimonial control of the water and sanitation sector assets published		Yearly.	Project progress reports	Publication of ARCE Resolution in the Official Gazette, based on the consultant's proposal.	ARCE
Contract evaluation average index developed	Level of adequacy of the contracts completed based on pre-established criteria based on qualitative and compliance aspects.	Yearly.	Project progress reports Contractual Instruments Control System.	Data will be collected through system reports.	CGE
Dedicated group created at the IPECE to provide technical support in designing policies in the water and agribusiness sectors through on-demand research.	Water economy group within IPECE to carry out water resources and agribusiness sectors studies to support public policies decision making and strengthening the State's economic growth.	Yearly.	Project progress reports.	Group created and studies completed.	IPECE

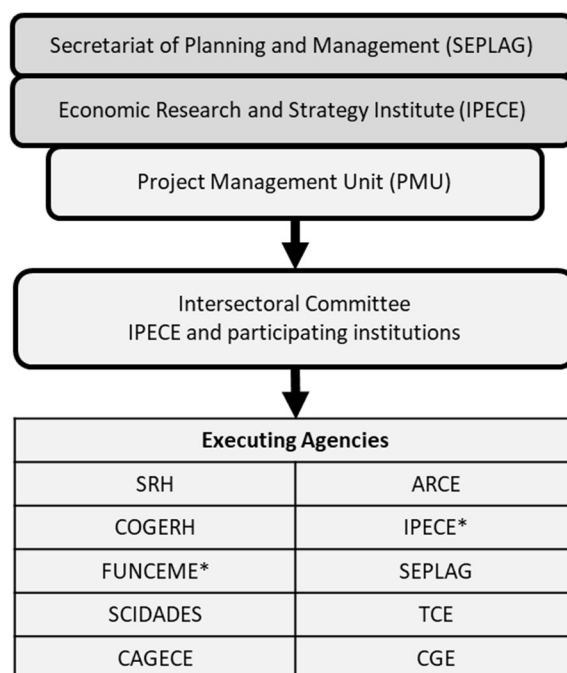
ANNEX 1: Implementation Arrangements and Support Plan

COUNTRY: Brazil
Ceará Water Security and Governance

Project Implementation Arrangements

1. The Borrower will be the State of Ceará. IPECE, under the administrative authority of SEPLAG, will be responsible for Project coordination through the establishment of a Project Management Unit (PMU) and the creation of an Intersectoral Committee, including representatives of all beneficiary and executing agencies that will follow the Project's performance and strategic issues. The PMU will include a coordinator, procurement and financial management specialists, a safeguards specialist and a M&E specialist.
2. The implementation of Project activities will be distributed among the institutions involved: (i) SRH, COGERH and FUNCEME will carry out activities under Component 1; (ii) CAGECE will carry out activities under Component 2; and (iii) IPECE, SEPLAG, ARCE, SCIDADES, CGE and TCE will carry out activities under Component 3. SEDET will be a Project beneficiary while providing technical support for the implementation of activities under Component 3 by IPECE as well as activities coordinated with FUNCEME.
3. Figure A1.1 below shows the institutions that, under the PMU coordination, will carry out Project activities: a total of 11 institutions, out of which one (SEDET) will only provide technical support. Table A1.1 below sets out the detailed implementation arrangement under the Project.

Figure A1.1. Project Implementation Arrangement



* FUNCEME and IPECE will be in charge of implementing activities for SEDET with their technical support.

Table A1.1. Implementation Arrangement

Implementation aspects/project component	Intersectoral Coordination	Technical Management	Monitoring	Social/ Environmental Safeguards	Procurement	Contracts Management	Financial Management
Overall Project	PMU		PMU	PMU	PMU	PMU	PMU
Component 1	SRH, COGERH, FUNCEME	SRH, COGERH, FUNCEME, SEDET	SRH, COGERH, FUNCEME, SEDET → PMU	SRH	SRH, COGERH, FUNCEME	SRH, COGERH, FUNCEME	PMU
Component 2	CAGECE	CAGECE	CAGECE → PMU	CAGECE	CAGECE	CAGECE	PMU
Component 3	SCIDADES, SEDET, ARCE, IPECE, SEPLAG, TCE, CGE	SCIDADES, ARCE, SEDET, IPECE, SEPLAG, TCE, CGE	SCIDADES, SEDET, ARCE, IPECE, SEPLAG, TCE, CGE → PMU		SCIDADES, ARCE, IPECE, SEPLAG, TCE, CGE	SCIDADES, ARCE, IPECE, SEPLAG, TCE, CGE	PMU

4. The PMU will be responsible for monitoring the overall Project execution, providing support to all implementing agencies on each of its responsibilities. It will be composed of a technical team to support the implementing agencies with financial, management, monitoring, control, operational and logistic tasks. The PMU staff will include consultants to be hired as needed specifically to carry out procurement activities, following World Bank Guidelines.

5. The specific attributions of the PMU will include: (i) general coordination of the Project; (ii) acting as focal point with the World Bank and its technical missions; (iii) preparation and submission of contractual reports (including Procurement and Financial Plans, Progress Reports, Midterm Review and Final Report); and (iv) monitoring and supervision of activities related to the socio-environmental aspects to ensure the compliance of the Bank safeguards. The PMU will be also responsible for obtaining internal no-objection of the procurement processes, whether they are prior or post review. Although the implementing agencies are responsible to prepare the bidding documents, it is the PMU's responsibility to guarantee the adequate and minimum quality for acceptance by the Bank.

6. The PMU will also be responsible for legal matters and for monitoring and ensuring overall safeguards compliance. Safeguards responsibilities related to Component 1 activities will remain under SRH considering its long experience in implementing World Bank investment operations with social, environmental and dam safety impacts; and CAGECE will have safeguards responsibilities for Component 2.

7. Every six months, the PMU will make the Project Progress Report available on the IPECE website with the objective of reporting on the actions of the Project to the State, the World Bank, the Federal Government (SAIN) and to the society. In addition, all project performance information will be made available on the IPECE website, on the Project page, as well as on the site of the beneficiary institutions as a means of increasing the transparency and access to the Project information.

8. IPECE, under the administrative authority of SEPLAG is the institution responsible to the establishment of PMU. Both IPECE and SEPLAG also have defined responsibilities in the execution of Component 3. The Project will support the institutional capacity of IPECE including with provision of technical support to the PMU. SEPLAG will provide support to IPECE and oversee actions in the implementation of Component 3.

9. The Intersectoral Committee shall be composed of two or more technicians designated by the highest authority of each institution involved in the implementation of the Project. The Committee will meet periodically to ensure the constant M&E of the activities. The PMU will present the results based on the information obtained from each institution and the meeting will be the opportunity for multisectoral interaction in the debates and adoption of action plans to solve

any presented question. The presentations and minutes of each meeting will be made available on the IPECE website.

10. Procurement of works, goods, consulting and services will be carried out in accordance with the World Bank Procurement Regulation. Each of the implementing agencies will be responsible for its own projects and their due implementations, following the government's state flow for each phase of the contracting. While the internal phase is the responsibility of the executors, the external phase is the responsibility of the State Procurement Commission, through the State Attorney General's Office (PGE), which implements all competitive bidding processes. Payments to contractors and service providers will be made by the Secretariat of Finance (SEFAZ) under instructions from SEPLAG through IPECE, based on the PMU instructions.

11. All projects will have a technical staff assigned by the sectoral executor, who will oversee all steps of the process, from the elaboration of the Term of Reference to the accountability of the service, work or good purchased. The technical staff will also support the audit processes of the World Bank and the Ceará Court of Account.

12. The key actions that will be executed by each of the implementing agencies are listed below.

Table A1.2. Implementing Agencies' Main Responsibilities

SRH	<ul style="list-style-type: none"> ▪ Execution of the following activities under Component 1: (i) procurement process of studies, projects and civil works of Banabuiú – Sertão Central Pipeline System; (ii) procurement process of the socio-environmental supervision and the supervision of the works of Banabuiú – Sertão Central Pipeline System; ▪ Management of the contracts for the implementation of Banabuiú – Sertão Central Pipeline System studies, designs and works and for the supervision of the works; ▪ General socio-environmental supervision of the Implementation of the Banabuiú – Sertão Central Pipeline System; ▪ With the support from SOHIDRA, technical monitoring of the works of the Banabuiú – Sertão Central Pipeline System; ▪ Implementation of dam safety activities; ▪ Preparation and submission of reports related to the progress of works to the PMU; ▪ Compliance with the Project Operational Manual and Procurement Plan.
COGERH	<ul style="list-style-type: none"> ▪ Execution of the following activities under Component 1: (i) universalization of Bulk Water Macro metering; (ii) regularization of water users; ▪ Management of the contracts related to the above activities; ▪ Implementation of dam safety activities; ▪ Preparation and submission to the PMU of the reports related to the progress of contracts; ▪ Compliance with the Project Operational Manual and Procurement Plan.
FUNCEME	<ul style="list-style-type: none"> ▪ Execution of the following activities under Component 1: (i) improvement of qualitative and quantitative monitoring; (ii) strengthening the Climate Forecast System; and (iii) cadaster of irrigators for definition of water demand, water use efficiency training course, acquisition and installation of meteorological stations (with technical support from SEDET); ▪ Management of the contracts related to the above activities; ▪ Preparation and submission to the PMU of the reports related to the progress of contracts; ▪ Compliance with the Project Operational Manual and Procurement Plan.



SEDET	<ul style="list-style-type: none">▪ Technical support to FUNCEME in the preparation of the bidding package and in the management of contracts related to the cadaster of irrigators for definition of water demand, water use efficiency training course, acquisition and installation of meteorological stations (Component 1);▪ Technical support to IPECE in the preparation of the bidding package and in the management of contracts related to the efficiency of Water User in the Agricultural Sector for five basins in the State of Ceará (Component 3);▪ Technical support to FUNCEME and IPECE in the preparation of the reports related to the above contracts for sending to PMU;▪ Compliance with the Project Operational Manual and Procurement Plan.
CAGECE	<ul style="list-style-type: none">▪ Technical support and supervision of activities related to the studies, designs and works of the Banabuiú – Sertão Central Pipeline System;▪ Supervision of the works related to the Banabuiú – Sertão Central Pipeline System;▪ Execution of the following activities under Component 2: (i) sectorization and creation of DMAs in the city of Fortaleza, (ii) implementation and supervision of social and environmental activities related to the creation of DMAs, (iii) CAGECE's organization restructuring plan focusing on improving corporate governance through a broader approach, using the turnaround framework for a performance improvement plan, from short to long term; (iv) economic and social studies to revise CAGECE'S tariff structure with the objective of providing CAGECE with a new tariff structure by level of water consumption able to cover its operational and investment costs; and (v) guidelines for improved infrastructure asset management processes.▪ Management of the contracts related to the activities above;▪ Preparation and submission to the PMU of the reports related to the progress of the contracts;▪ Operation of the Banabuiú – Sertão Central Pipeline System;▪ Compliance with the Project Operational Manual and Procurement Plan.
SEPLAG	<ul style="list-style-type: none">▪ Execution of the following activity under Component 3: development of a Public Investment Management System (PMIS), which would help make better informed decisions throughout the entire public investment cycle (proposal, design, implementation and evaluation), as well as improve the management and monitoring of investments.▪ Management of the contracts related to the activities above;▪ Preparation and submission to the PMU of the reports related to the progress of the contracts;▪ Compliance with the Project Operational Manual and Procurement Plan.
IPECE	<ul style="list-style-type: none">▪ Execution of the following activities under Component 3: (i) establishment of a dedicated group that would provide technical support in designing policies in the water and agribusiness sectors through on-demand research; (ii) capacity building activities, including for data analysis, particularly in those institutions that directly work in or with the water sector; and (iii) assess the efficiency of water usage in the agricultural sector in five basins of Ceará, helping prioritize agricultural activities (with technical support from SEDET);▪ Support the Project Management Unit;▪ Management of the contracts related to the activities above;▪ Preparation and submission to the PMU of the reports related to the progress of the contracts;

	<ul style="list-style-type: none"> Compliance with the Project Operational Manual and Procurement Plan.
SCIDADES	<ul style="list-style-type: none"> Execution of the following activity under Component 3: preparation of the State WSS Plan; Management of the contracts related to the activities above; Preparation and submission to the PMU of the reports related to the progress of the contracts; Compliance with the Project Operational Manual and Procurement Plan.
ARCE	<ul style="list-style-type: none"> Execution of the following activities under Component 3: (i) methodology of regulatory control of the assets of Sanitation infrastructure and distribution of piped gas; (ii) optimization, strengthening, modernization, monitoring and regulatory control; (iii) improvement of the Regulatory Agency of Delegated Public Services of the State of Ceará; (iv) improvement of the Control, Inspection and Information Certification Processes; Management of the contracts related to the activities above; Preparation and submission to the PMU of the reports related to the progress of the contracts; Compliance with the Project Operational Manual and Procurement Plan.
TCE	<ul style="list-style-type: none"> Execution of the following action under Component 3: institutional strengthening of the Court of Accounts of the State of Ceará; Management of the contracts related to the activities above; Preparation and submission to the PMU of the reports related to the progress of the contracts Compliance with the Project Operational Manual and Procurement Plan.
CGE	<ul style="list-style-type: none"> Execution of the following action under Component 3: development of the Contract Control System; Management of the contracts related to the activities above; Preparation and submission to the PMU of the reports related to the progress of the contracts; Welcoming Bank experts and Project auditors, providing all necessary Information and documents; Compliance with the Project Operational Manual and Procurement Plan.

Financial Management

Institutional Arrangements and Staffing:

13. **Implementing Agency:** A PMU will be established under IPECE, linked to SEPLAG (Secretary of Planning). The PMU will oversee the management, coordination, monitoring and evaluation of all Project activities, and will undertake the primary fiduciary responsibilities for the Project. These responsibilities include: (i) preparing and obtaining approval of Project FM arrangements; (ii) coordinating and supervising Project implementation by all project executors; (iii) preparing and submitting Project interim unaudited financial reports (IFRs) for disbursement and monitoring to the Bank; (iv) preparing and providing all financial documentation and Project reports requested by external auditors and Bank staff; and (v) preparing, updating and ensuring that Project Operational Manual (POM) is observed. Detailed staff duties and tasks will be included and be detailed in the POM.

14. **Other executing agencies:** Other project executing agencies will be responsible for providing technical inputs, but no funds will be transferred to these agencies, except in the case of COGERH and CAGECE, as explained below.

15. **COGERH:** The Water Resources Management Company - COGERH-is a public company and is connected to the Secretariat of Water Resources of Ceará (SRH). Activities to be implemented by COGERH include component 1.1: a) universalization of macro mediation and b) the regulation of water.

16. **CAGECE:** The Ceará Water and Sanitation Company (*Companhia de Água e Esgoto do Ceará*) is a public company and is connected to the State Secretariat of Cities. CAGECE will execute component 2's three main activities: a) economic and social study to review its tariff, b) support improving water supply efficiency and c) improve its governance and operational efficiency.

17. **Staffing:** Most IPECE, COGERH and CAGECE staff members are public servants, under the respective statutory law, hired through public hiring process. As the project PMU, IPECE has sufficient capacity to fulfill its FM responsibilities; is adequately exposed to the Bank's FM procedures having adequately implemented previous Bank funded operations - *Strength. Serv. Delivery Ceará PforR (P127463)*. However, based on previous project lessons learned, to mitigate implementation delays, at least one dedicated qualified FM staff needs to be identified as part of the PMU, no later than one month after project signing³¹. In addition, except for IPECE, the other implementing agencies do not have prior experience with the Bank's procedures. Mitigation measures include training to be provided to CAGECE and COGERH, covering the Bank's fiduciary procedures.

Planning and Budgeting:

18. The budget cycle includes planning and implementation of all government activities, which are to be reflected in the PPA, LDO and LOA³². The State's budget process is clearly defined, follows Law 4.320/64 and is in line with IPSAS standards. The procedures in place to be used to plan Project activities and prepare related budgets and to collect information from the other project executors in charge of the different components, is functioning satisfactorily.

19. CAGECE and COGERH are public companies governed by the Federal Law 6.404/76, of December 15, 1976 which together with specific State laws and rules, sets out their purpose to hold, manage and explore assets, in respect of the water supply and sanitation system related service provision in the State of Ceará.

20. The State of Ceará owns at least 51% of both companies' social capitals. To fulfill their mandate, the State annual budget law (LOA) includes a capital increase for the respective companies, which are transferred annually to each entity, through their line Secretariats.

Accounting:

21. The State has satisfactory accounting arrangements, controlled through the State Administrative System - S2GPR. The State of Ceará follows: (i) the Brazilian Accounting Standards Applicable to the Public Sector (*Normas Brasileiras de Contabilidade Aplicadas ao Setor Público-NBCASP*); (ii) Law 4.320/64, that establishes certain high-level accounting principles (*Normas Brasileiras de Contabilidade-NBC*); and (iii) the Accounting Manual Applicable to the Public Sector (*Manual de Contabilidade Aplicada ao Setor Público-MCASP*) issued under Law 10.180 of February 6, 2001 and Decree 3.589 of September 6, 2000. Both the NBCASP and MCASP were revised via Portaria STN 467 of August 6, 2009 and updated in 2013 to incorporate the text of the International Public-Sector Accounting Standards (IPSAS), with adaptations for the Brazilian reality. There is a work plan (National Treasury Secretariat (STN) Ordinance Implementation Plan n ° 548/2015) in progress, that will culminate in the convergence of 35 IPSAS currently in force by 2023; with the STN subsequently verifying the data of the respective entities of the Federation, by the year 2024. The State is following the National Treasury's (STN) NBCASP implementation schedule. Transactions under the Project will be accounted for on a cash basis, for disbursements, reporting and auditing purposes.

22. COGERH and CAGECE are subject to the rules, policies, and procedures issued by the National Federal Accounting Council (*Conselho Federal de Contabilidade*) that are aligned with international accounting standards and International

³¹ This is not a condition of effectiveness

³² PPA—Plano Pluri-Anual, LDO—Lei de Diretrizes Orçamentárias, LOA—Lei Orçamentária Anual which includes the Government's goals and programs that are approved by Congress every five years, 18 months, and 12 months, respectively.

Financial Reporting Standards. For project purposes, each company will maintain the accounting records of the transactions executed under their respective control, using their own corporate information system (TOTVS PROTEUS- which is used by both companies). Information from TOTVS PROTEUS will be migrated daily (through the Web Service Online) to the State Administrative system S2GPR. An equivalent to a ledger account and a fund number will be created to separately account and record all loan transactions. All project contracts (including those that will be accounted as counterpart funds) will be associated to the project, thereby enabling the tracking of all sources and uses of funds, which will be reconciled with the monthly budget execution report sent to IPECE. The Bank evaluated the robustness of the respective systems and concluded that they can provide financial information for the purposes of supporting the Bank-financed Project. However, CAGECE and COGERH corporate systems will need to be customized to enable the export of the respective financial information to S2GPR. This step is required to be completed one month after project signing³³.

Internal Control / Internal Audit:

23. Although IPECE will hold the primary fiduciary responsibilities for the project and PMU staffing is appropriate to assure segregation of functions and reconciliations of accounts, COGERH and CAGECE will also need to ensure a proper FM and control environment.

24. For the State project executing agencies, all project budgeting and accounting transactions will be processed through S2GPR. The first payment step commitment (*empenho*) is approved by the PMU; acquisition, verification and certification (*liquidação*) and final payment (*pagamento*) is made by SEFAZ (Secretary of Finance). The approval and authorization controls are adequate to approve budget transfers/allocation and will be described in the Project Operational Manual. – POM. Accounting records are maintained electronically. For Project purposes, they will be reconciled with budget and procurement reports monthly.

25. For COGERH and CAGECE, all their project budgeting and accounting transactions will be processed through TOTVS PROTEUS. All payments will follow acquisition, verification of invoices (*provisão*), and payment (*pagamento*) routine and any other specific procedure stated by the regulators. All transaction processing (recording annual budgets, budget commitments, and payables; authorizing payments; and internal control reviews) will be carried out by the respective companies, who will execute payments and control the respective segregated project operational bank accounts. These functions will be carried out by the Accounting and Finance Departments of each company. Internal controls procedures will be detailed in the POM and will follow each companies' established routine.

26. The *Controladoria Geral do Estado do Ceará* – CGE-CE is the unit responsible to support the State's direct and indirect agencies, on legal procedural compliance for contracting public expenditures and complying with the public information access law. Therefore, for Project purposes, the CGE-CE will be responsible for the internal audit compliance related functions and certain aspects of internal control.

27. Both COGERH and CAGECE also have internal audit units, that are properly staffed and that follow a risk management approach. The project will be included in each units' annual audit plan throughout the project's life. The respective audit units will undertake the relevant project internal control activities, through reviewing bidding processes and financial execution of contracts.

28. There is also an adequate system for protecting the Project's assets from fraud, waste and abuse. Assets purchased will be listed in an inventory record, using the State asset system (*Sistema Integrado de Gestão de Bens Móveis e Sistema Integrado de Bens Imóveis* (SGBM-CE e SGBI-CE) and at COGERH and CAGECE respective corporate systems. Each asset is given an individual master record and number. A physical inventory control is performed at the end of each fiscal year for these assets and reconciled with the respective control accounts annually.

³³ It is not a condition of effectiveness.



29. The Project's internal control system are documented in the POM that comprises descriptions, flow charts, policies, templates and forms, user-friendly tools, tips and techniques to ensure that the approval and authorization controls continue to be adequate and are properly documented and followed with adequate safeguarding of the Project's assets (including the following topics in the FM and Disbursements section: flow of funds, chart of accounts, Project organizational structure and responsibilities, oversight lines, authority limits, internal and external audit arrangements, accounting practices, disbursement procedures and the financial reporting arrangements). The POM should be prepared by the PMU and be approved by the Bank and be maintained/updated throughout the Projects' life.

30. To strengthen S2GPR, the Loan will finance the update of the new State Administrative System *SACC (Sistema Administrativo de Contratos e Convênios)* to allow for an integrated system view of the State's budget execution. The project and its respective executing institutions will be used to pilot the system. The system is expected to be ready at the end of the project. The system implementation will be led by the CGE and the value assigned to this activity is US\$1.2 million. The TOR must be submitted to the Bank one month after project signing³⁴.

31. The implementing agencies shall also observe the Bank's Guidelines on Preventing and Combating Corruption in Projects financed by IBRD and IDA credits and Grants, dated Oct 15, 2006 and Revised in January 2011, that set the general principles, requirements and sanctions applicable to persons and entities which receive, are responsible for the deposit or transfer of, or take or influence decisions regarding the use of the loan proceeds. IPECE, COGERH and CAGECE staff must observe the highest standard of ethics, take all appropriate measures to prevent and refrain from engaging in, and reporting allegations of fraud and corruption in connection with the use of the loan proceeds, maintaining appropriate fiduciary and administrative arrangements, cooperating with Bank investigations, taking timely and appropriate action to address the problem, and following other applicable government and corporate related rules and guidelines.

Financial Reporting and Monitoring:

32. S2GPR can adequately control, account for, report on, and manage the proposed loan's financing. The system can provide FM data to prepare respective reports in local currency (BRL) and USD (for purposes of documenting the DA), which are to be prepared for Bank purposes on a cash-basis (although the State follows accrual accounting). A specific cost center will be created in the system, to record all loan transactions and will be aligned with the structure of the loan to record transactions by category and component/subcomponent. COGERH and CAGECE respective implementation will be electronically migrated to S2GPR (IFR module). The PMU will ensure the timely production of semester IFRs to be submitted to the World Bank, within 60 days after the end of each semester. S2GPR must be customized by project signing³⁵ to automatically produce the reports needed for Project monitoring and reporting.

33. Accordingly, the format and content of the IFRs (in both BRL and USD) will cover the following items:

- a. IFR 1A - Sources and Uses of Funds by Component and Subcomponent³⁶, cumulative (project-to-date, year-to-date, and for the period) versus actual expenditures, including a variance analysis
- b. IFR 1B - DA bank reconciliation (as appropriate).
- c. IFR 1C - Disbursement Forecast

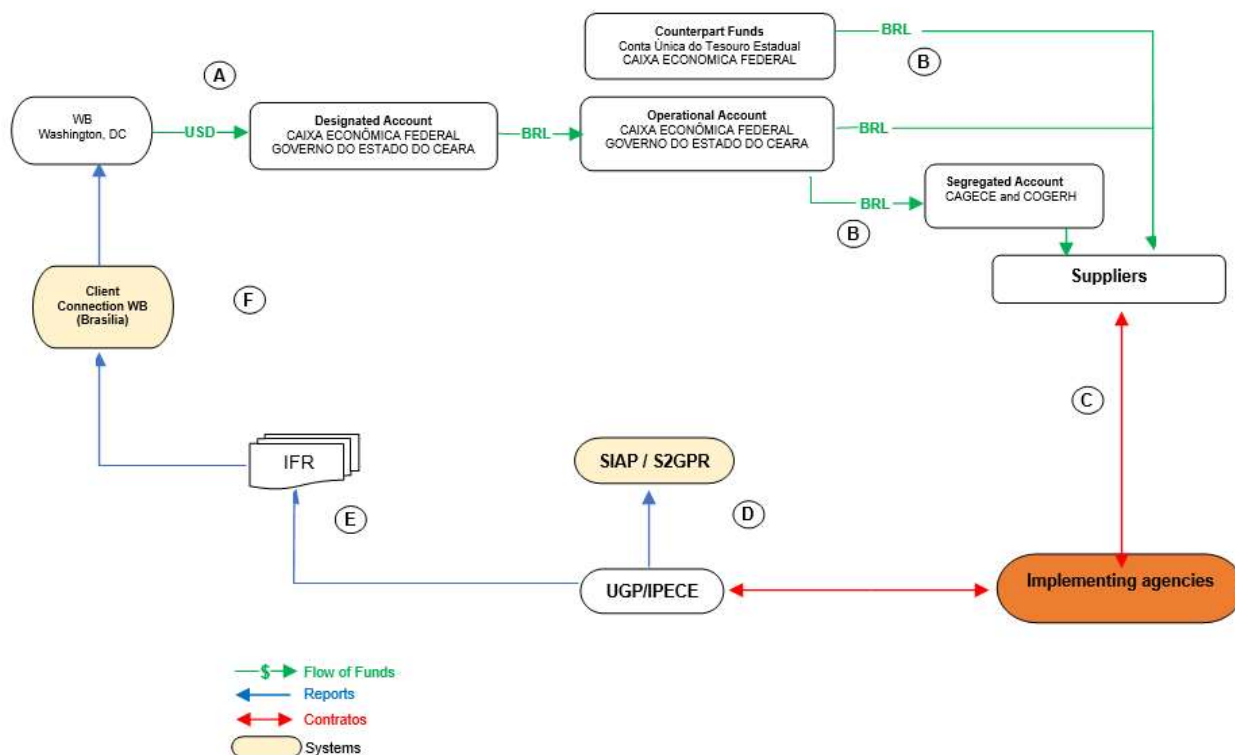
³⁵ It is not a condition of effectiveness.

³⁶ As there is only one disbursement Category.

³⁶ Except in the case of funds advanced to and expenditure incurred by COGERH and CAGECE, where the payments will be made by each company, using their own corporate system (TOTVS PROTEUS).

Funds Flow and Disbursement Arrangements

Figure A1.2. Funds Flow and Disbursement Arrangements



34. The disbursement of Project funds will be processed in accordance with Bank procedures as stipulated in the Legal Agreement and in the Disbursement and Financial Information Letter (DFIL). Funds will be disbursed in respect of eligible expenditures incurred or to be incurred under the Project and will be disbursed in accordance of agreed financing percentages.

35. The proposed funds flow and disbursement arrangements were considered satisfactory and will be streamlined within the project to facilitate execution, avoid unnecessary incremental operational arrangements, and rely as much as possible on Public FM (PFM) country systems.

36. The following disbursement methods will be available: Advance, Reimbursement, and Direct Payment. The Advance method will be the primary disbursement method. For Advances, disbursements will be documented based on the interim financial reports (IFRs), submitted to the Bank within 45 days from the end of each semester, following the prescribed agreed format. The DA ceiling will be variable based on the forecast needed for a six months period, recalculated every three months. Reimbursements will also be documented by the IFRs. Direct Payments will be documented by Records (copy of the invoices).

37. The Secretariat of Finance (*Secretaria da Fazenda*, SEFAZ) will open a segregated DA in US dollar in *Caixa Econômica Federal* (CEF) – New York, in the name of the State of Ceará, to receive loan funds, process disbursements in US dollars and then transfer funds into a local currency (Brazilian Reals, or BRLs) operational account (also maintained in CEF in Fortaleza), to process local currency payments. The frequency for reporting eligible expenditures paid from the DA will be semesterly.

38. IPECE will be responsible for instructing the State Treasury to make all payments for works, goods and services³⁷ through S2GPR, once payment obligations have been incurred and properly documented. S2GPR requires that funds be committed by source, enabling the tracking of loan disbursements to project expenditures. Such arrangements are considered appropriate and have the necessary segregation and level of approvals and can speed up implementation.

39. In case of CAGECE (works) and COGERH (goods), funds will be advanced from the DA to the separate segregated operational accounts opened by COGERH and CAGECE in BRL, to cover their project expenses for a three-month period. Both companies will submit a monthly reconciliation implementation report to the PMU. Every quarter a new advance will be provided to COGERH and CAGECE, based on the reconciliation report and the forecast report.

40. Retroactive financing will be allowed for components 1, 2 and 3 of this Project up to an aggregate amount not to exceed USD27,976,000 to be made for payments up to 12 months before the signing date of the loan agreement for eligible expenditures as set out in the Legal Agreement.

41. The loan will also have a four-month grace period after the closing date, during which the World Bank will accept withdrawal applications relating to project transactions incurred before the closing date. The Loan will have a Minimum Application Size of US\$ 250,000 equivalent for Reimbursements and Direct Payments. All disbursement details will be reflected in the DFIL. The table below specifies the categories of eligible expenditures that may be financed out of the proceeds of the Loan.

Table A1.3. Disbursement Categories

Category	Amount of the Loan Allocated (USD)	Percentage of Expenditures to be Financed (Inclusive of Taxes)
(1)(a) Goods, Works, Consultants' Services, Non-Consulting Services, Operating Costs, and Training and Workshops for Components 1, 2 and 3	139,530,300	100%
(1)(b) Goods, Works, Consultants' Services, Non-Consulting Services, Operating Costs, and Training and Workshops for Component 4.	0	100%
Front end fee	349,700	
Total Amount	139,880,000	100%

42. Counterpart funds will be managed separately from the DA and will be properly accounted for in S2GPR, monitored, and reported by IPECE in the IFRs.

43. **Contingent Emergency Response Component (CERC).** The objective of this zero-fund component (financed under category 2) is to support the State of Ceará in eventual emergencies associated with natural disasters that affect water systems. This disaster recovery contingency component could be triggered following the declaration of a disaster or emergency. When triggered, funds may be reallocated from other components and activities to facilitate the rapid financing of goods and services under streamlined procurement and disbursement procedures. Eligible activities may include emergency rehabilitation works, supply of critical equipment, or any other critical inputs to ensure the continued operation of water infrastructure and provision of services. This component therefore directly enhances the residents'



resilience to droughts and floods. During project preparation, the definition of the key aspects of the CERC will be detailed in the POM.

44. The same flow of funds, accounting, financial reporting, disbursement methods and corresponding supporting documentation requirements, will apply to disbursements under the CERC, that will be described in the initial DFIL, as the CERC will also be implemented by the same implementing agencies³⁸.

External Auditing:

45. For project purposes, the project's annual financial statements will be audited by the TCE-CE (*Tribunal de Contas do Estado do Ceará*) and the CGE-CE, for the activities/contracts implemented by the TCE-CE, according to TOR acceptable to the World Bank (prepared by the PMU and approved by the Bank by three months after project signing³⁹) and in accordance with International Standards on Auditing (ISAs) (issued by The International Auditing and Assurance Standards Board (IAASB) of the International Federation of Accountants (IFAC)) (or national auditing standards if, as determined by the Bank, these do not significantly depart from international standards).

46. The audited financial statements will be prepared in accordance with accounting standards acceptable to the Bank (i.e. IPSAS or national accounting standards where, as determined by the Bank, they do not significantly depart from international standards).

47. The TCE-CE and CGE-CE are technically capable and independent to audit the project based on previous Bank's assessments and high-level quality audit reports prepared for other Bank financed operations over the last eight years and delivered in a timely manner based. The TCE is the current financial statement auditor for all state level projects being financed by the World Bank and other international organizations.

48. The auditors will also have to prepare a Management Letter, where any internal control weaknesses will be identified, which will contribute to the strengthening of the control environment. All supporting records will be maintained at the project executors and the PMU for at least (a) two years after the Closing Date; or (b) one year after the World Bank has received the Audited Financial Statements covering the period during which the last withdrawal from the Loan Account was made, whichever is later.

49. The audit reports (and any accompanying Management Letters) should be submitted to the Bank nine⁴⁰ months after the end of the fiscal year. The Bank will review the audit reports and will periodically determine whether the audit recommendations are satisfactorily implemented. The Bank also requires that the Borrower/Recipient disclose the audited financial statements in a manner acceptable to the Bank and following the Bank's formal receipt of these statements from the Borrower/Recipient, the Bank will also make them available to the public in accordance with *The World Bank Policy on Access to Information*.

50. The Loan includes institutional capacity activities, in the amount of USD 500,000 to support the TCE-CE in monitoring and building its' auditing infrastructure. The amount of USD 500,000 is expected to finance three contracts to develop the TCE-CE's IT system and buy equipment. The TOR for these activities needs to be prepared by project signing⁴¹. The CGE-CE will be responsible for auditing the activities/contracts implemented by the TCE-CE and the TOR for the CGE-CE's external audit role, must also be submitted and be approved three months after project signing⁴². The

³⁸ If another entity, other than the ones stated under the project will be responsible for the CERC, a new FMA will need to be performed of that entity.

³⁹ It is not a condition of effectiveness.

⁴⁰ Request was submitted by the Borrower and TCE and the exception was approved by GGOLF PM, based on the volume of audit reports to be delivered six months after the end of the fiscal year.

⁴¹ It is not a condition of effectiveness.

⁴² It is not a condition of effectiveness.

audit report from the CGE-CE will also be due nine months after the end of the fiscal year.

Procurement

51. Procurement for the proposed Project will be carried out in accordance with the World Bank Procurement Regulations for IPF Borrowers dated July 2016 and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general terms below. For each contract to be financed by the Loan, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and timeframe will be agreed between the Borrower and the Bank in the Procurement Plan.

52. The World Bank's Standard Procurement Documents will govern the procurement of World Bank-financed Open International Competitive Procurement. For procurement involving National Open Competitive Procurement, the Recipient will use Standard Procurement Documents acceptable to the World Bank that will be included in the Operational Manuals.

53. **Procurement of works.** Procurement of works are expected under the project, including one large Water Treatment and Distribution Plant estimated at US\$132 million and smaller water loss control interventions. The large works will be contracted through a turnkey international open competition and a Request for Bids. Smaller works are likely to be awarded through open national competition and Request for Bids.

54. **Procurement of goods.** Goods procured under the Project will include, among others: IT and electronic equipment, water meters, software licenses, weather stations, drones, etc. Depending on the estimated amounts, they will be carried out through Open National Requests for Quotations – RFQ or Requests for Bids – RFB. It may be carried out in accordance with the method known as “*Pregão Eletrônico*”, as set forth in the Brazilian Law No. 10.520, dated July 17, 2002, provided (i) documents are acceptable to the Bank, (ii) documents include anti-corruption clauses, and (iii) the process is carried out under an e-procurement system previously approved by the Bank.

55. **Procurement of non-consulting services.** Non-consulting services under the Project will include, among others: civil works’ projects, installation services, translation, logistics support, etc. Depending on the estimated amounts, they will be carried out through Open National Requests for Quotations – RFQ or Requests for Bids – RFB. It may be carried out in accordance with the method known as “*Pregão Eletrônico*”, as set forth in the Brazilian Law No. 10.520, dated July 17, 2002, provided (i) documents are acceptable to the Bank, (ii) documents include anti-corruption clauses, and (iii) the process is carried out under an e-procurement system previously approved by the Bank.

56. **Selection of consultants.** Consulting services under the Project will include works supervision, engineering designs, studies, IT systems’ development, etc. The following methods will be used for selecting consulting firms depending on the nature, estimated amounts and complexity of assignments, attractiveness to foreign firms and need for international expertise: Quality and Cost Based Selection (QCBS), Least Cost Selection (LCS), Selection under a Fixed Budget (SFB), Selection Based on Consultant’s Qualification (QBS), Single-Source Selection (SSS) both for consulting firms and individual consultants, and Selection of Individual Consultants (IC). The threshold for international advertisement will be in the procurement plan.

57. **Operating costs.** During Project preparation, it was agreed that operating costs are the ones associated with the coordination and implementation of the Project, including: (a) operation and maintenance of vehicles, repairs, fuel and spare parts; (b) equipment and computer maintenance; (c) shipment costs (whenever these costs are not included in the costs of goods); (d) office supplies; (e) utilities; (f) travel and per diem costs for technical staff carrying out supervisory and quality control activities; (g) communication costs, including advertisement for procurement proposals; and (h) all costs associated with audits. Procurable expenses under operating costs to be financed by the project will be procured following the World Bank Procurement Regulations for IPF Borrowers dated July 2016 or using implementing agencies’

administrative procedures found acceptable to the Bank and will be listed in the procurement plan.

58. **Others.** The need for special arrangements for scholarships, grants, etc. was not identified during Project preparation. The procurement procedures and standard bidding documents to be used for each procurement method, as well as model contracts, are presented in the Project's Operational Manuals.

Strategy and Approach for Implementation Support

59. The implementation of the proposed Project will be supported by the World Bank's task team. The type and level of support will be guided by the scope of the Project, the activities in each component, relative risks involved, and the institutional capacity in place. Implementation support by the World Bank will consist of semiannual full supervision missions, short technical missions, meetings, and audio conferences between the World Bank and the Project representatives, including senior management and the PMU team, as appropriate. Field visits to construction sites will be conducted during supervision missions. Additional support will also be provided by the World Bank's procurement, FM, and safeguards specialists based in the Brasilia office, on Project contracts and overall compliance with safeguard and fiduciary requirements. National and international technical experts from the World Bank team will also provide advice to the institutions involved and to the PMU, as required, regarding draft ToRs, design and feasibility studies, technical assistance needs, knowledge exchange activities and, especially, promote/share innovative approaches. This Implementation Support Plan is indicative and may be revised during the Project implementation based on emerging Project challenges.

Implementation Support Plan

60. Semiannual supervision missions and short follow-up technical missions will focus on the following areas:

- (a) **Strategic support.** Supervision missions will meet with the State's representatives to: (i) review progress on the Project's activities; (ii) discuss strategic alignment of the Project's different activities, especially at the planning level between the relevant stakeholders; and (iii) evaluate progress on cross-cutting issues such as M&E, training, communication, knowledge exchange, innovation, dissemination of the Project results and experiences, and coordination between relevant stakeholders.
- (b) **Technical support.** Supervision will concentrate on ensuring the technical quality of bidding documents, ToRs, evaluation reports, construction plans, products delivered by consultants and validation of the performance-based activities/targets. During construction and commissioning, technical supervision will be provided to ensure that technical contractual obligations are met. Regular site visits will be carried out during Project implementation and involve technical specialists as needed. Moreover, technical assistance including capacity building and institutional strengthening will be provided to enhance performance of the Project-supported activities.
- (c) **Fiduciary support.** Periodic supervision of procurement and FM support will be carried out by the World Bank semiannually or annually to: (i) perform desk reviews of the Project IFRs and audit reports, following up on any issues raised by auditors, as appropriate; (ii) assess the performance of control systems and arrangements; (iii) update the FM rating in the FM Implementation Support and Status Report as needed; (iv) provide training and guidance on carrying out procurement processes in compliance with the Procurement and Anti-Corruption Guidelines and the POM; (v) review procurement documents and provide timely feedback to the PMU; (vi) carry out the post review of procurement actions; and (vii) help monitor the Project's progress against the Procurement Plan.
- (d) **Safeguards support.** The coordination that began during preparation would continue throughout Project implementation, especially to ensure that relevant safeguards concerns are included in the works financed under Components 1 and 2 and in specific studies/plans under Component 3 through due diligence from applications of

the ESMF, RPF and effective mitigation measures. Supervision from the World Bank safeguard specialists will take place at least twice a year.

Table A1.4. Implementation Support Resource Estimates

Time	Focus	Skills Needed	Resource Estimates (Staff Weeks)
First 12 months	Project rollout, management, and implementation support coordination	Task team leaders	6 per task team lead per year
	Refine subcomponent activities and ensure quality of detailed designs	Task team leaders/technical specialists	2 per task team lead per year
	Social and environmental safeguards, including risk mitigation measures, and safety of dams	Social, environmental, and dam safety specialists	4 per year
	Technical and procurement review of ToRs and bidding document	Task team leaders, technical specialists, procurement	6 per year
	Fiduciary arrangements and FM systems	Financial management	3 per year
	Support the preparation of procurement documents for the turnkey contract.	Task team leaders/technical and procurement specialists	3 per year
	Operational support	Operations Officer	6 per year
12 to 84 months	Procurement review and feedback of bidding documents and consultant contracts	Procurement specialist	6 per year
	Technical review of ToRs, technical reports, and bidding documents	Task team leaders, technical specialists	6 per year
	Non-lending technical assistance, capacity, and institutional strengthening efforts	Task team leaders, technical specialists	4 per year
	FM supervision	FM specialist	3 per year
	Social safeguards—supervision	Social specialist	4 per year
	Environmental safeguards—supervision	Environmental specialist	4 per year
	Dam safety - supervision	Dam safety specialist	4 per year
	Project management, M&E, and project supervision coordination	Task team leads, technical specialists	8 per year
	Operational support, M&E, lessons learned, progress and final reporting	Technical specialists and operations officer	6 per year

Table A1.5. Skill Mix Requirements

Skill Needs for Supervision	Comment
Task team leaders	Country based
Water supply and sanitation specialists	Headquarters and country based
Water losses control experts	Headquarters and country based
FM specialist	Country based
Procurement specialist	Country based
Social specialist	Country based
Environmental specialist	Country based
Dam safety specialists	Country based
M&E specialists	Headquarters based
Operations analyst	Country based
Lawyers	Country based
Disbursement officers	Country based



ANNEX 2: Detailed Project Description

COUNTRY: Brazil

Ceará Water Security and Governance

1. The proposed Project is a US\$174.85 million IPF operation financed by a US\$139.88 million IBRD loan and US\$34.97 million in State counterpart funds. The Project will comprise three main components and a Contingent Emergency Response Component (CERC) to support the State of Ceará should emergencies associated with natural disasters negatively impact the State's water systems during implementation. Project activities comprise a set of interventions in three main areas: (i) water resources management, (ii) water service provision, and (iii) governance. Each component will include activities related to one of these areas and will be implemented by a different institution based on their competency.
2. **Component 1. Increasing Water Security (US\$149.93 million; US\$34.97 million counterpart funds).** This component aims at contributing to increase water security through improved water resources management, expanded water infrastructure and specific investments to ensure the safety of Project-related dams. Project activities under this Component have been divided into two sub-components.
3. **Sub-component 1.1: Integrated Water Resources Management (US\$10.82 million).** This sub-component will contribute to strengthen the State's water resources management and build its resilience to increased droughts by strengthening the technical capacity of key State agencies involved in water resources management. Specifically, the sub-component will support (i) COGERH in increasing knowledge on bulk water usage, universalizing water supply metering and regularizing water users; and (ii) FUNCEME in the strengthening of the climate forecasting system and the improvement of water quality and quantity monitoring.
4. The State Water Resources Management Policy updated by State Law 14.844/2010, presents as one of its main management instruments, the concession of bulk water use rights. The concession of water rights aims at controlling the use and ensuring the right to access to bulk water, subject to the priorities established in the Water Resources State Plan and in the River Basin Plans. The same legislation addresses another important management tool, which is the water charging as an inductor for water resources management, using its economic value as a productive input. According to the law, water charge aims to encourage the rational water use, obtain financial resources for program financing, cover water resources management systems and associated interventions contemplated in the Water Resources State Plan and in the River Basin Plans. The activities proposed under sub-component 1.1. aim at, in a complementary manner, strengthen state's water resources management, looking not only to the supply side but also to the demand. Information obtained from medium- and long-term forecasts/scenarios together with improved knowledge on water demand in the river basins will serve as inputs for the negotiated water allocation process followed by the State. The climate forecasts produced by FUNCEME are relevant in decision-making processes concerning drought response, preparedness and mitigation actions at both State and Regional levels. The activities complement ongoing State's efforts on water resources management responding to the constant need for improvement to deal with increasingly frequent and prolonged water scarcity periods, which are being exacerbated by climate change. Although Ceará has one of the most advanced water resources management systems in the country, continued support over time for improving water resources management is needed for consolidation of results.
5. The sub-component will also include capacity building actions to SRH, COGERH and FUNCEME. Integrated water resources management increases the available supply of clean water and contributes to its efficient use and distribution. It, therefore, directly addresses the problem of increasing, climate-induced water shortages. Improved WRM –based on

hydrological models and forecasts of key climate variables—will indirectly contribute to a higher supply of water and a more efficient use and allocation of water.

Improving water use knowledge

6. The activities proposed by COGERH focus on the improvement of bulk water use knowledge through the macro metering and regularization of large water users. Universalizing macro metering aims at increasing more precise knowledge on the major systems demands through the implementation of flow meters for large users (i.e. urban supply, industries, irrigated perimeters), fostering the right assessment of volumes produced and volumes delivered. The regularization of users, together with the macro metering initiative, will provide knowledge on real water use demand, essential for water resources planning and implementation of management instruments. The implementation of these activities will lead to better knowledge of water demand in the state river basins water systems, including the representative aspect of the categories of water resources users, based on type of use, interference, size and/or consumption. It will provide inputs for the River Basin Committees, through the negotiated allocation process, to take decisions more coherent with the water reality, allowing for more adequate water distribution and more efficient water restriction policies; as well as elements for improved implementation of water resources management tools such as rights concession, charging and enforcement.

7. At water scarcity conditions, the updated registering may guide policies for water use restriction and make the monitoring and enforcement of system users more effective. From the state water resources system sustainability aspect, the activities will provide strategic information for the expansion of water use charges, with the possibility of defining the charging parameters based on the percentage of updated users, customized to the water condition, type of use, etc. Finally, the improved knowledge will lead to a more inclusive approach on conflict resolution for water use; sustainable water supply and demand management as it implies in demand identification and definition of tools that promote its conservation and the efficient use; and users' consumption efficient control, mainly of the largest water consumers, through macro metering, with benefits for the management tools and the allocation process.

Strengthening the Climate Forecast System

8. The strong climate variability in the Northeast region and, mainly, in the state of Ceará, imposes an extra challenge to water resources management and, as a result, it is crucial that weather and climate information generated by the forecast and monitoring systems are used in the water resources management sector planning and operations. The years of 2008 and 2009, for example, were extremely rainy. Particularly, 2009 rainy season imposed a difficult decision between blindly following the existing flood control plan for Castanhão⁴³ reservoir or using the monitoring and inflow forecast system, based on the weather and climate forecast systems, to obtain incremental water supply at the end of the rainy season, in the reservoir operation. At the time, the second alternative was implemented, although not counting with the appropriate tools yet. At the other extreme of climate variability are the recurrent droughts. Provision of information about the following rainy season allows for early dialogue between water managers and users as well as for early decisions in the case of water crisis.

9. FUNCEME is responsible for providing climate forecasts for the State of Ceará. The climate forecasts produced by FUNCEME are relevant in decision-making processes concerning drought response, preparedness and mitigation actions at both State and Regional level. For instance, generated seasonal forecasts directly feed and complement the Northeast Drought Monitor on evolving indications of drought severity and duration across the semiarid region. The Drought Monitor is deployed as a key tool to support impact assessments and on-going dialogues between the nine states in the Northeast and the Federal Government about addressing drought risks and conditions in the region, thereby creating a platform for consensus building and institutional integration. Through an on-going technical assistance facilitated by the

⁴³ Castanhão dam is the largest reservoir in the State and the main water source to the state and the metropolitan region of Fortaleza.

WB, FUNCEME is also looking to strengthen drought monitoring capacity at State level by incorporating an agricultural drought and prediction system with an increased spatial resolution of 1 Km. This tool will also bring additional drought indicators (i.e. Lear Area Index -LAI- and soil moisture) to further support agricultural and irrigation planning activities as well as risk/impact evaluations associated with drought conditions. Improved accuracy in generated climate forecasts will cascade into operating DSS with reduced uncertainties and enhanced reliability.

10. For more than ten years, FUNCEME has released probabilistic precipitation forecasts using global and regional models from January until June thus covering each year's rainy season (February to April). While the current seasonal forecasting system implemented at FUNCEME is based on the ECHAM4.6 General Circulation Model (GCM)⁴⁴, forecasts results are combined using the super-ensemble technique with the North American Multi-Model Ensemble (NMME) to increase the spatial resolution and temporal fidelity of the predictions for Ceara. The post processing of forecasts uses the quarterly total accumulated precipitation in order compute the probabilistic forecasts (below normal, near normal and above normal) and generate secondary products such as: (i) drought and flood indicators, (ii) Standardized Precipitation Index (SPI) Maps, and (iii) streamflow forecast for the Ceara State reservoirs. All these products are then either directly used or integrated into operating Decision Support Systems (DSS) to inform water resources planning and drought risk management. Activities under sub-component 1.1 will strengthen FUNCEME's climate forecasting framework by integrating an additional GCM. An evaluation of the plausibility and capacity of different forecasting models in the Semiarid Northeastern Brazil was recently conducted considering different types of drought events⁴⁵ during the period of 1981-2014 (Delgado et al., 2018). Results showed that a multi-model ensemble⁴⁶ can forecast drought events of timescales relevant to water managers in northeastern Brazil with skill⁴⁷. Individual combinations of GCM forecasts considering different downscaling approaches surpassed the multi-model ensemble skill only occasionally, for specific combinations of regions, months and tested meteorological and hydrological drought indicators. The additional GCM (the ECMWF seasonal forecast model) also showed often best forecast skills when compared to the ECHAM4.6. The assessment evidenced that with a multi-model ensemble probabilistic drought forecasting skills can be consistently enhanced for northeast region in Brazil.

11. As raining forecast is not the same as reservoirs inflow forecast, FUNCEME has been standing out for promoting climate information focused on the water resources sector, in particular, inflows forecast based on climate forecasts and its use for water allocation. In addition, FUNCEME has been defining medium-term scenarios (12 to 18 months) for the operation of the State's strategic reservoirs systems based on climate information. The proposed activities under the Project will guarantee the continuation of the efforts to provide timely information on climate, for water allocation decision making by water resources sector. They will strengthen the climate forecast system, not only by including an extra model, but also by increasing frequency of climate forecast, from monthly to bi-monthly basis. This effort for improving the processing and storage infrastructure capacity should be continued considering the evolution of numerical models in time and spatial resolution, which requires more IT resources. The scope of activities also includes the

⁴⁴ ECHAM4.6 developed at the Max Planck Institute for Meteorology in Germany; more information in: *Roeckner et al., 1992*

⁴⁵ Drought events considered: a rainfall anomaly during the rainy season, standardized precipitation indices below a given threshold and anomalies in regional reservoir storage.

⁴⁶ The multi-model ensemble was as obtained by binding all models and applied downscaling techniques into one product (including the ECHAM and the ECMWF seasonal forecasts with the downscaling techniques XDS and EQM and a weather pattern classification approach).

⁴⁷ The skill of the forecasting systems was evaluated with regard to root mean square error (RMSE), the Brier skill score (BSS) and the relative operating characteristic skill score (ROCSS). The ensemble mean from the multi-model ensemble, for example, had in most cases a lower root mean square error (RMSE) than the climatology. The RMSE of the ensemble mean however was comparable to the climatology and in some cases greater. See results in Delgado et al., 2018: <https://www.hydrol-earth-syst-sci.net/22/5041/2018/#Ch1.F8>

preparation of operational products, aiming at the effective use of weather and climate information, by the water resources sector, in frequency and with the details required for the sector planning and operations.

12. **Sub-component 1.2: Water Infrastructure (US\$139.11 million).** This sub-component will support the construction of the Banabuiú – Sertão Central Pipeline System to supply treated water from the Banabuiú Dam reservoir⁴⁸ to selected municipalities, districts and rural areas in the Banabuiú and middle Jaguaribe river basins through the construction of an approximately 670km pipeline network and a treatment station near the source. It will also support dam-safety related institutional strengthening activities for SRH and COGERH, and specific measures related to the safety of the Gavião and Banabuiú dams (both linked to Project interventions), following the results of the Dam Safety Assessment. These measures will include the mobilization of a dam safety independent panel of experts, the preparation of a Dam Safety Periodic Review of Gavião, improvement of the Gavião dam safety and instrumentation plans, and installation of additional monitoring instruments for Gavião. In addition, for Banabuiú dam, it will include immediate actions recommended by the independent expert and provide technical support for DNOCS for safety and operational monitoring. Increasing the safety of dams also contributes to more reliable water supply services considering that a dam failure could significantly affect available water supplies as well as the environment.

13. The construction of the Banabuiú – Sertão Central Pipeline System will directly increase the supply of water available to the State, making the beneficiary population more resilient to the climate-exacerbated droughts and enhance adaptation to climate change in general. It will also enhance the State's water security by guaranteeing water supply in adequate quantity and quality to selected State areas.

14. The Pipeline System will be the first investment implemented as part of the State's *Malha D'água* project, which aims at increasing water supply reliability in quantity and quality and water storage management efficiency by placing water intakes inside the reservoirs, thereby, reducing the flows released from these reservoirs for river perenization and consequent losses to infiltration and other uses. The prioritization of the Banabuiú – Sertão Central Pipeline System was based on a set of hydrological criteria including water source availability, criticality of current water supply and availability of immediate alternative water sources – factors that are all severely affected by climate change. The water delivered by the pipeline at the entrance of municipalities and districts will be stored in dedicated reservoirs and distributed by the existing systems.

The Malha D'Água project

15. The drought period, from 2012 to 2016, revealed serious impacts resulting from water scarcity, which led the main reservoirs of the State to depletion, and exposed the vulnerability of some existing systems abstracting water from rivers perenized by the reservoirs. Such abstractions require the release of water flows by reservoirs highly above the demands of the urban centers to be served, considering the losses in transit and the consumption of the other uses throughout the perennial, such as irrigation. This type of operation, in times of prolonged droughts, must be very restricted and even suspended, which compromises the operation of these existing pipelines and generates serious conflicts of use, reducing the supply for other uses once the priority is human supply.

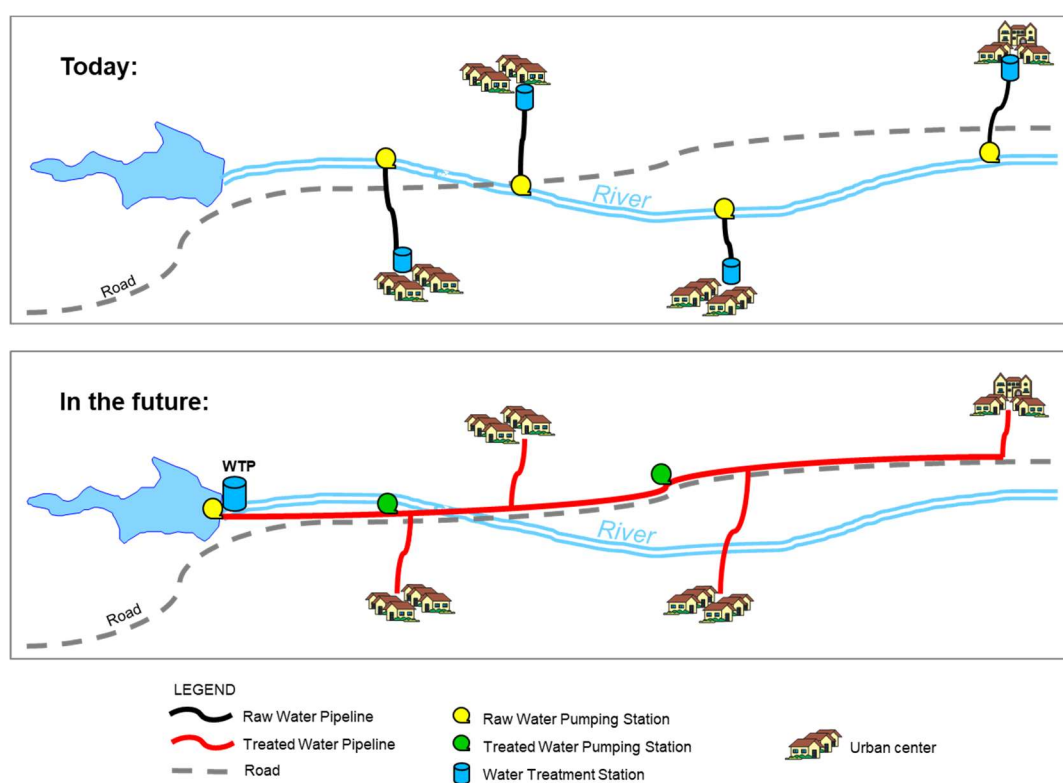
16. The State Government has, then, prioritized the use of resources to minimize the effects of droughts and has developed several actions to increase the State water security. Among these actions is the *Malha D'água* project: the construction of a network of water mains that allow the transfer of water from the sources of lower collapse risks (medium and large reservoirs and water transfer canals), subject to minimal or no losses in pipes, treated near the source and pressurized to the distribution reservoirs in the urban centers.

⁴⁸ Banabuiú reservoir as well as the other reservoirs included as water sources under the *Malha D'Água* project, is a secure water source, being a multiyear reservoir, which has been resilient to the recent six-year drought period.

17. Figure A2.1. below presents, in a general way, the current situation of abstraction and distribution of raw water for the water supply systems of the municipalities of the State. The *Malha D'água* project intends to change the current logic by significantly reducing the risk of shortages due to a prolonged drought. It is important to highlight that the *Malha D'água* project is a medium and long-term action strategy (25 years) that goes well beyond the actions proposed in this Project. The proposed Project will contribute to the *Malha D'água* with the implementation of the *Banabuiú-Sertão Central* pipeline system.

18. The goal of the *Malha D'água* is to increase the water security of the State, guaranteeing qualitative and quantitative conditions of water supply to urban centers and complementarily to rural communities located alongside the pipeline systems to be implemented. It comprises the construction of 4500 km of treated water pipeline network for a total estimated investment of US\$1.4 billion that will benefit 6.3 million people in the next 25 years.

Figure A2.1. Current and proposed situation for water supply abstractions



19. The proposed Banabuiú – Sertão Central Pipeline System was prioritized based on the following criteria (i) the level of severity of water shortages in the municipality driven by droughts; (ii) level or urgency driven by the lack of temporary alternative for water supply in the municipality; (iii) the availability or existence of water source; and (iv) the tendency of the problem getting worse.

The Banabuiú – Sertão Central Pipeline System

20. The Banabuiú – Sertão Central pipeline system, with water abstraction in the Banabuiú Reservoir, will provide treated water service for the urban population of the municipalities of Solonópoles, Banabuiú, Milhã, Deputado Irapuan Pinheiro, Jaguaratama, Senador Pompeu, Piquet Carneiro, Mombaça and Pedra Branca. It includes a pipeline system of approximately 670km for supplying water to the urban areas of the nine municipalities and additional extensions to 37 existing districts as listed in Table A2.1.

21. Although the focus of the project is the urban population, and therefore does not contemplate the construction of pipeline systems for the rural population, the project will consider in its dimensioning the entire population of the municipality, to allow, in the future, the integration with other supply systems, serving as a water source. As for the rural population located along the pipeline system, water supply points will be defined during the execution of the Project.

Table A2.1. – Municipalities (urban centers and districts) to be supplied by Banabuiú - Sertão Central Pipeline System

Municipalities	Urban Centers and Districts	Municipalities	Urban Centers and Districts
Banabuiú	Main urban center	Pedra Branca	Main urban center
	District of Laranjeiras		District of Capitão Mor
Dep. Irapuan Pinheiro	Main urban center		District of Mineirolândia
	District of Aurora		District of Santa Cruz do Banabuiú
	District of Baixo		District of Tróia
	District of Betânia		District of Barra Nova/Bom Jesus (Tauá)
	District of Maratoã	Piquet Carneiro	Main urban center
	District of Velame		District of Catolé da Pista
Jaguaretama	Main urban center		District of Ibicuã
Milhã	Main urban center		District of Mulungu
	District of Barra	Senador Pompeu	Main urban center
	District of Carnaubinha		District of Bonfim
	District of Ipueira		District of Codia
	District of Monte Grave		District of Engenheiro José Lopes
	District of Baixa Verde		District of São Joaquim do Salgado
Mombaça	Main urban center	Solonópole	Main urban center
	District of Boa Vista		Assunção
	District of Açudinho dos Costas		Cangati
	District of Cangati		Pasta
	District of Carnaúbas		Prefeita Suely Pinheiro
	District of Catolé		São José de Solonópole
	District of Cipó		
	District of Manoel Correia		
	District of São Gonçalo do Umari		
	District of São Vicente		

Banabuiú and Gavião Dams Safety Actions

22. The Project has specific provisions for improving the safety of two existing dams, Banabuiú and Gavião. The Project will rely on two existing dams. The Banabuiú – Sertão Central Pipeline System (Sub-component 1.2) will depend on the performance of the Banabuiú Dam and the Fortaleza water supply system, where water loss interventions will be carried out (Component 2), depends on the Gavião Dam Reservoir.

23. The Banabuiú dam (57.7 meters height and 1,600 million m³) and Gavião dam (14.6 meters height and 33 million m³) are classified as 'large dams' in accordance with OP 4.37. The Banabuiú Dam is operated by the National Department of Drought Works (DNOCS) under the Federal Government and the Gavião Dam is operated by COGERH under the State Government.

Table A2.2. Existing Dams Related to the Project.

Dam Name	Banabuiú	Gavião
Owner/ Operator	DNOCS	COGERH
River / Coordinates	Banabuiú River- 05º 19' 46,25" S and 38º 55' 16,54" W	Cocó River - 03º 54' 23.06" S and 38º 33' 20.08" W
Link to the Project	The Banabuiú Dam will supply the Banabuiú-Sertão Central Pipeline System.	The Gavião Dam supplies the main water treatment plant in the MRF.
Total Capacity (m3)	1,601 Mm3	33.29 Mm3
Max. High (m)	57.7	14,63
Year of Construction	1966	1973
Type	Zoned	Earth Homogenous

24. The Borrower retained an independent dam expert to: (a) inspect and evaluate the safety status of the existing dams, their appurtenances and performance history; (b) review and evaluate the owners' operation and maintenance procedures; and (c) provide written reports of findings and recommendations for any remedial work or safety related measures necessary to upgrade the existing dams to an acceptable standard of safety. The client also assessed the potential risk of dam cascade failure in the upstream of Banabuiú Dam and confirmed that there would be no significant impacts on the dam due to the upstream dams' size and distance.

25. The Independent Dam Safety Assessment Report concluded that none of the two large dams related to the Project exhibit major anomalies, which could lead to imminent failures but recommended some additional investigations and analyses for detailed safety inspection and preparation/upgrading of non-structural measures, including improvements in the O&M plans and development of Emergency Preparedness Plans. The Report recommended, also, the preparation of a safety periodic review in the Gavião Dam to assess in detail the causes of the flooding at the dam toe and define remediation measures.

26. The Report confirmed that the Banabuiú dam was subject to a comprehensive assessment by DNOCS in 2015/2016, following the requirements of the National Dam Safety Policy, which led to the preparation of a comprehensive rehabilitation work design, including the revamp of the gate's electrical and mechanical system, besides a series of works on the embankments, to be implemented by DNOCS. It endorsed the recommendations presented in Banabuiú rehabilitation studies. It noted, however, that Banabuiú demands special attention due to its size and current maintenance condition, and presented a series of additional recommendations, aiming to improve the safety status of the dams, including additional studies and technical investigation.

Dam Safety Regulatory Framework

The National Dam Safety Policy - NDSP (Law N° 12.334 of September 20, 2010) determines that the regulating entity, (government authority responsible for the oversight of the safety of the dam within its area of competence), has among its statutory duties, the authority to demand the dam owner to conduct studies, plans, and reports mentioned in the NDSP, as well as to complying with the recommendations made in the inspection reports and periodic safety reviews. Additionally, the regulating entity must immediately inform the National Water Agency (ANA) and the National Civil Defense System in the event of any non-compliance which involves an immediate risk to safety, or any accident occurring in dams under its jurisdiction.

The regulating entity in Ceará is the State Secretariat of Water Resources - SRH, (the Borrower), that has specific provisions for intervening in a dam, aiming to minimize potential risks in the case of omission or lack of action by dam

owner. The intervention, in these cases, is regulated by the Ceará State Normative 544/SRH/2018. The Borrower can, therefore, demand DNOCS (Banabuiú Dam owner) the presentation of the dam safety instruments defined in the NDSP, and conduct emergency measures on the referred dam, aiming to minimize potential risks, in the case of omission or lack of action by dam owner.

27. The Borrower agreed to engage an independent panel of experts (the Panel) consisting of three or more experts, with expertise in the various technical fields relevant to the safety aspects of the dams. The Panel would review and advise on matters relative to dam safety and other critical aspects of the dams. The TORs and composition of the PoE were defined and agreed with the client at Appraisal.

28. It was also agreed that the Project would fund institutional strengthening activities for SRH and COGERH, as well as specific measures related to the dams, including: preparation of a Dam Safety Periodic Review of Gavião; improvement of the Gavião dam safety plans, including a comprehensive instrumentation plan and installation of additional instrumentation equipment. The Borrower agreed to implement the rehabilitation measures proposed by the Gavião Dam safety periodic review.

29. For Banabuiú, it was agreed that the regulating agency, the Ceará Water Resources Secretariat, (Borrower) will demand the presentation of the dam safety instruments, (i.e. instrumentation plan, O&M plan and EPP), as well as the execution of the rehabilitation works proposed for Banabuiú⁴⁹. Additionally, the Borrower agreed to conduct immediate actions for improving the safety condition of the dam. The framework EPP and the preliminary O&M plans for both dams have been defined at Appraisal.

30. The Client agreed to develop direct measures⁵⁰ in Banabuiú, in the case DNOCS do not carry out the rehabilitation works by the fifth year of Project implementation, as well as prepare the dam safety instruments, if DNOCS do not submit the dam safety instruments to SRH by the fourth year of Project implementation.

31. A communication strategy related to the dam safety activities being implemented by the Project will be formulated and implemented.

Table A2.3. Dam Safety Activities Recommended for Banabuiú and Gavião Dams

Activity	Contracting year	Completion year
Dam Safety Panel of Experts - (PoE)	1	5
Gavião Dam Safety Periodic Review ⁵¹	2	3
Gavião Dam Safety Plans (instrumentation plan, O&M plan, EPP)	3	4
Banabuiú complementary studies	2	3
Banabuiú Dam Safety Plans (instrumentation plan, O&M plan, EPP)	3	4
Banabuiú dam rehabilitation Works	4	5
Development of a database to store the instrumentation data of the dams operated by COGERH, including automated alerts.	1	2

⁴⁹ In accordance with the Law and the Ceará State Normative 2747/SRH/CE/2017, which regulates dam safety at the State level.

⁵⁰ DNOCS is responsible for the Banabuiú Dam maintenance and for the preparation of the dam safety instruments defined by the National Dam Safety Policy – NDSP Law. According to the Law, the State of Ceará can intervene on the dam, aiming to minimize potential risks in the case of omission or lack of action by DNOCS. The intervention, in these cases, is regulated by the Ceará State Normative 544/SRH/2018.

⁵¹ Based on the results of the Periodic Review, the Borrower will implement the recommendations.

32. **Component 2. Improving the Efficiency of Water Services (US\$ 15.95 million).** This component will seek to improve water supply service efficiency in the city of Fortaleza, and CAGECE's operational efficiency. The component includes two main sets of activities:

33. *Water Losses Control and Reduction.* This set of activities will support CAGECE in improving water supply efficiency through the implementation of water losses control and reduction activities in the city of Fortaleza. The proposed activities will contribute to CAGECE's Water Losses Reduction Program with focus on controlling pressure, sectorization and creation of District Metering Areas (DMAs) in priority sectors of Fortaleza. Under its Water Losses Reduction Program, CAGECE presents structuring actions for progressive reduction of water losses in distribution also in alignment with other strategic projects such as the PPP for design, build and operation of a seawater desalination plant to increase water security in specific sectors of the city of Fortaleza, which are being prioritized for the creation of DMAs. Implementation will follow a design and build approach in line with the MFD approach bringing the private sector through performance-based contracts.

34. The creation of DMAs will allow CAGECE to have detailed knowledge of losses related problems in the system, provide better equalization of pressures, and contribute to manage the losses in smaller areas, bringing better returns both in relation to actual and apparent losses. The activities will reduce water shortages and increase water availability to other users of the system, thereby increasing the water supply sector's resilience to climate change-induced droughts. It may also reduce the need for water withdrawals from existing sources, thereby contributing to flexibility in the face of climate shocks and further increasing the residents' resilience to climate change. In addition, NRW reductions and the adequacy of the pressures in the network will lead to reductions in net GHG emissions due to energy efficiency gains.

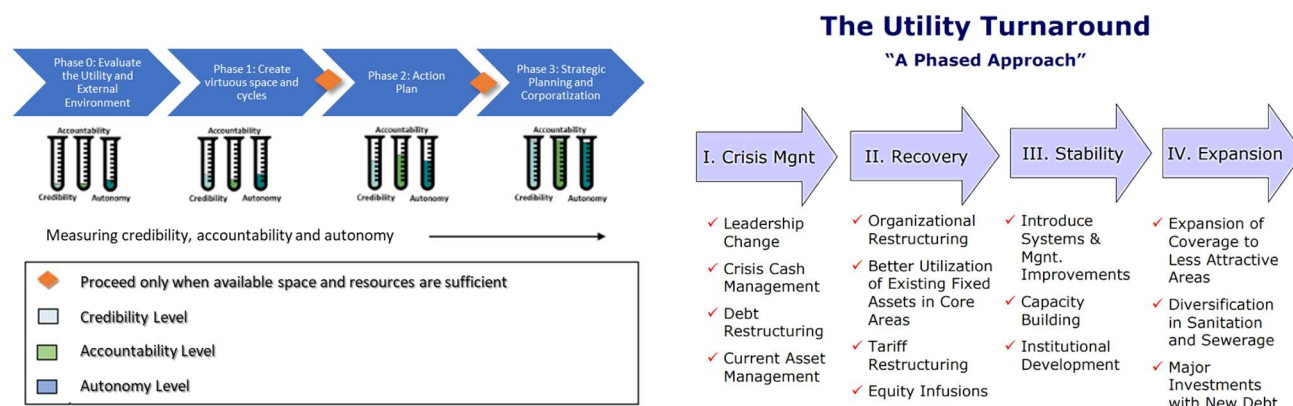
35. *Technical assistance support to CAGECE to improve governance capacity and operational efficiency.* This set of activities includes the preparation of (i) CAGECE's organization restructuring plan focusing on improving corporate governance through a broader approach, using the turnaround framework (see Figure A2.2) for a performance improvement plan, from short to long term; (ii) economic and social studies to revise CAGECE'S tariff structure with the objective of providing CAGECE with a new tariff structure⁵² by level of water consumption able to cover its operational and investment costs; and (iii) guidelines for improved infrastructure asset management processes.

36. Activities are in line with the MFD approach, especially with the preparation of a turnaround plan and development of a proposal for reforming the current tariff and subsidies. The operational efficiency improvement will also benefit from the strengthening of the regulatory functions of Ceará State Delegated Public Services Regulatory Agency (*Agência Reguladora de Serviços Públicos Delegados do Estado do Ceará – ARCE*) proposed under component 3. Better corporate governance and improved, sustainable operational efficiency will further reduce NRW and enable adequate maintenance of water infrastructure, thereby contributing to the sector's resilience to climate change.

37. Under the utility turnaround framework, Phase 0 is a preliminary phase in which the current state of CAGECE and its external environment are evaluated. Phase 1 will assist the utility's administration in implementing relatively small, low-cost interventions to increase the credibility, accountability and autonomy required to move to Phase 2. This following phase will allow CAGECE management to plan and implement the Action Plan. Finally, in Phase 3, management develops and implements measures that continue to improve the maturity of human resources, institutionalize best practices, and enable the utility to make long-term strategic plans. Some water utilities may be ready to proceed to Phase 2 or Phase 3 directly, others may have to start at Phase 1. Starting with Phase 1, all steps are sequential and must be performed in the order defined by the strategy.

⁵² The current tariff structure was designed in the 1970's and is based on Increasing Block Tariff (IBT) model with cross-subsidies between consumption level, category of users and municipalities, with a limited social tariff rule.

Figure A2.2. Utility Turnaround Framework.



Water Losses Control and Reduction in the Metropolitan Region of Fortaleza

38. The city of Fortaleza and the other municipalities of the Metropolitan Region of Fortaleza (MRF) are almost entirely supplied by the Water Treatment Plants - ETA Gavião and Oeste. However, the metropolitan system has shown considerable real and apparent loss rates. In 2018, water losses in Fortaleza represented 53.1 percent (out of which 21.5 percent are real water losses). Most of these losses are due to the difficulties of operational management, since its hydraulic sectors are very extensive and with a great number of connections. In addition, many sectors are not completely confined, which makes it difficult to manage pressures (causing leaks) and the concentration of loss reduction activities in areas with major problems, as it is not possible to identify them accurately in areas with large number of connections. The MRF's water supply system has several visible and hidden leak detection services, fraud-fighting teams and has a 10-year hydrometer renewal plan. Currently, the average age of the water meter park in Ceará is 5.01 years.

39. Despite all efforts, the loss ratio is still not considered adequate. The pressures in the MRF are controlled only at the exit of the macrosystem, being very difficult to maintain adequate pressures that allow to attend the bordering areas or in constant expansion, which causes a high rate of leaks.

40. The creation of District Metering Areas (DMAs) will provide a better equalization of the pressures, as well as contribute to manage the losses in smaller areas, bringing better returns both in relation to actual losses and apparent losses. Each DMA will have an input macro-meter, a pressure regulating valve (VRP) remote piezometric stations (EPZs) for critical pressure points (maximum and minimum), a VRP controller module, a VRP maintenance bypass and meter and a standard protection and hydraulic parts required for installation. In addition, it is planned to set up a control room to receive all the information and make decision-making, information management and supervise field and maintenance services. In a first stage, within the scope of the Project, the DMAs should be installed in priority sectors in the city of Fortaleza: Floresta, Vila Brasil, Aldeota and Expedicionários, which represent 35 percent of the water losses in the system.

41. The creation of DMAs is a methodology used worldwide and will allow for appropriate pressures for each specific area, as well as allowing to work with indicators, minimum nightly flows, localized fraud surveys, water balance and several other tools dedicated to the management of supply system losses. It is expected that the IPD (Distribution Loss Index) will be reduced from the current 52.20 percent to 41.76 percent after the implementation of the DMAs in the four sectors.

42. In addition to reducing losses and considering that the current average flow rate of the RMF water supply system is 8.5 m³/s, the implementation of the DMAs will provide a strong relief for the sources that supply water to the MRF. This has great environmental and social importance for regions with constant droughts, like the State of Ceará.



43. **Component 3. Strengthening Public Sector Management (US\$8.62 million).** This component will contribute to improving public sector governance, particularly in the water sector, through a set of activities aimed at embedding the use of evidence in planning and decision-making, improving service delivery and management of the State water resources, as well as increasing accountability. Better water governance—based on historical data, hydrological and economic models and forecasts of key climate variables—will indirectly contribute to a higher supply of water and a more efficient use and allocation, thereby further contributing to the water sector’s resilience to droughts. Component activities have been divided into three groups based on their primary objective.

44. *Use of evidence for better planning and decision-making.* The Bank will support capacity building activities, including for data analysis, particularly in those institutions that directly work in or with the water sector. This activity is aligned with the State’s recent decree⁵³ that establishes a statewide data policy encouraging the use of data for decision-making and addressing the overall deficit of personnel capable of processing and analyzing data. Activities within this group include support to establish, a dedicated and on-demand research group at the IPECE that would provide technical support in designing policies in the water and agribusiness sectors.

45. *Improving public sector investments and management.* Activities to be supported include the optimization, strengthening and modernization of ARCE’s management and regulatory activities to help improve the control and inspection processes of the Agency and its overall management. It will also finance a program in the Secretariat of Economic Development and Labor’s (*Secretaria de Desenvolvimento Econômico e Trabalho – SEDET*) to assess the efficiency of water usage in the agricultural sector in five basins of Ceará, helping prioritize agricultural activities; as well as the preparation of the State Water Supply and Sanitation Plan, including urban and rural water supply. It will also include the implementation of a Public Investment Management System (PMIS) to support decision making throughout the entire public investment cycle (proposal, design, implementation and evaluation), as well as improve the management and monitoring of investments.⁵⁴

46. *Improving accountability in public investment.* Support two main activities: the development and implementation of a contract management system in the State General Controller (*Controladoria Geral do Estado – CGE*) to assess performance and compliance across the State; and, the development of a public works management system that will enhance the State Court of Accounts’ (*Tribunal de Contas do Estado – TCE*) ability to oversee and monitor water infrastructure works by allowing for audits to be uploaded, monitored, analyzed and published. These two activities will help improve the audit of water infrastructure public works in Ceará.

47. **Component 4. Contingent Emergency Response Component (CERC).** This component will support the State of Ceará, following an Eligible Crisis or Emergency, to respond to emergency situations associated with natural disasters that affect water systems.

48. This disaster recovery contingency zero-fund component could be triggered following the declaration of a disaster or emergency. When triggered, funds may be reallocated from other components and activities to facilitate the rapid financing of goods and services under streamlined procurement and disbursement procedures. Eligible activities may include emergency rehabilitation works, supply of critical equipment, or any other critical inputs to ensure the continued operation of water infrastructure and provision of services. This component therefore directly enhances the residents’ resilience to climate change.

⁵³ Decree 32.555 of March 2018

⁵⁴ The World Bank’s PforR financed the development of the methodology behind the PMIS and successfully piloted it in the water sector (*Cinturão das Águas do Ceará*).

ANNEX 3: Economic and Financial Analysis

COUNTRY: Brazil Ceará Water Security and Governance

Rationale for Public Sector Investment

1. The Project interventions will invest in the Banabuiú and middle Jaguaribe river basins, by constructing a transmission pipeline and a Water Treatment Plant (WTP). The project will also improve water efficiency in the main urban areas of Fortaleza. These investments will increase the volume of water available while also improving the efficiency of water withdrawals and use. This will reduce unsustainable over-exploitation of the Banabuiú reservoir, while improving the quality of raw water for drinking purpose. The Fortaleza's metropolitan region will benefit from an optimization of the water distribution system. The Project will also help to improve energy efficiency. Public investments by the state are necessary for strengthening water security because of the limited financial return on these investments.

Rationale for Bank's Involvement

2. The World Bank has been a long-term partner of Brazil in the water supply, sanitation, and water resources management sectors. Over the past decades, the Bank has financed various water sector's projects. By addressing water scarcity in the poor Northeastern region and avoiding future pollution of raw water for drinking purpose, the Project will benefit from the Bank's vast experience in promoting equitable access to water supply services, designing interventions that help to control water losses, and addressing water resilience (through efficient distribution and storage).

Cost Benefit Analysis

3. The cost-benefit analysis focuses on project's subcomponents with investments, which benefits can be quantified, namely, interventions that will lead to strengthen water resources management in the State, improve reliability of water services in selected municipalities, and improve the operational efficiency of water services in metropolitan areas of Fortaleza. Project interventions aiming at building capacity, improving knowledge and technical expertise are not considered in the analysis.

Methodology

4. The economic analysis compares the stream of costs and benefits "with project" and "without project" scenarios. "Without project" scenario is characterized by: (i) lower reservoir water levels due to recurrent droughts particularly in smaller reservoirs; (ii) increased pollution of smaller reservoirs particularly during dry years; (iii) increased number of conflicts with farmers during dry years, making difficult to enforce restrictions on water use; (iv) substantial water losses resulting from evapotranspiration and infiltration by using rivers as means to transfer water to urban areas; and (v) increased reliance on "carros-pipa" or water-trucks to transport water far away from the sources. Current water treatment stations do not have the capacity for addressing current pollution loads, particularly of phosphorus pouring into water bodies, which shows an increasing trend of concentration. The Figure A3.1. below shows the increasing trend of phosphorous concentration in Banabuiú reservoir at monitoring sites.

5. The "with project" scenario is characterized by: (i) reduced reliance on "carros pipa "; (ii) increased volumes of safely managed water supply to secondary networks by using the Banabuiú-Sertão Central Pipeline System;⁵⁵ and (iii) reduction of water losses.

⁵⁵ According to the pre-feasibility study, by end of the Project's life, the beneficiary population (urban and rural) is estimated at 213,700 (by 2041).

6. The analysis includes the streams of costs and benefits during the Project's lifetime estimated at 25 years. Costs and benefits are expressed in constant prices as of 2018 at an exchange rate of 3.72 Reais per US dollar. The discount rate recommended by the World Bank guidelines is 6 percent, but the analysis uses a discount rate of 10 percent.

Benefits.

7. Without the project, there are approximately 101,000 inhabitants being supplied water from dubious quality from water tanker, with average route of 115 km. With the project, approximately 32,400 people will be supplied directly from the system at a lower price (based on the consumption household tariff bracket of US\$0.77/m³), and 68,950 people will be supplied with water from the water takers, with average route of 11 km, at a price of US\$0.32/m³. At present, close to 1,000 tankers are used in the 12 districts within the Banabuiú-Sertão Central. The water delivered by 13 m³-tanker with 115 km route costs R\$500 (US\$144), representing a unit cost of US\$11.1/ m³. Making water available at lower cost is critical to reduce the burden of water purchases from tankers: an average of 5.0 m³ of consumption per household per month (equivalent to 40 liters per capita per day) at a unit cost of US\$11.1/m³ represents an expenditure of US\$55.5, equivalent to 15 percent of average salary in Banabuiú municipality in Ceará (R\$2,070 or US\$556). Hence, the Project will provide benefits in the form of consumer surplus⁵⁶ moving from truckers to piped water services (adjusted with the connection charges). The additional volume of treated bulk water will be sold to urban users, and the tariff of US\$2.2/m³ is used as a proxy of the economic value of water. COGERH will also obtain benefits since the Project will increase average water storage by not having to rely on rivers to transfer water, estimated at 16.6 million m³ valued at US\$0.20/m³ – the cost of the next water alternative. The implementation of the measures to reduce water losses in Fortaleza will bring efficiency gains from total supply reaching 295.99 lit/sec or 9.3 million m³ of treated water per year valued at US\$0.5/m³.

Costs

8. *Investment costs.* The analysis includes the investment costs associated with the construction of the Banabuiú – Sertão Central Pipeline System⁵⁷ and measures to improve system's distribution efficiency by tackling commercial and physical losses.

9. *17. Operation and Maintenance Costs (O&M) /Recurrent costs.* The analysis includes the O&M cost of the Banabuiú-Sertão Central system estimated at US\$0.3/m³ and incremental O&M cost of the water loss reduction program estimated at 5 percent of the investment cost.

Results

10. The net present value (NPV) of net benefits reaches US\$59 million with a benefit to cost ratio of 1.42. Overall NPV of costs (capital, operation and maintenance costs) reaches **US\$140 million**, and NPV of benefits reaches **US\$199 million**. The Internal Economic Rate of Return (IERR) for the Project reaches 14.5 percent. The IERR per subcomponent is as follows: subcomponent 1.2 (water infrastructure—storage and availability) 14.2 percent and component 2 (loss control/efficiency improvements) 17.2 percent.

Sensitivity and Risk Analysis

11. Using a more conservative discount rate of 6 percent, the NPV of the Project reaches US\$193 million. The Project also yields positive NPV of net benefits under a 30 percent benefits reduction (US\$0.65 million) and a 30 percent

Most of this population already has access to water distribution services of some kind but depends heavily on water trucks. Total water flow is projected to reach 528 liter/sec by 2026.

⁵⁶ The average size the household is 4.2 members.

⁵⁷ This important infrastructure is part of the *Malha d'Água* project, a 1.4 billion US dollar investment.

investment cost overrun (US\$46 million); and satisfactory IERRs (between 11.1 and 10.0 percent). The Project is relatively more sensitive to benefit reductions.

12. The Project's NPV and IERR were estimated by adding potential health benefits derived from avoided cost of illness due to the Banabuiú – Sertão system, which will avoid water pollution and improve water availability. The analysis is based on the Disability Adjusted Life Years (DALY) Burden of Disease monetized through the Ceara poverty line (to avoid over estimation). The main diseases considered are diarrheal diseases, intestinal infectious diseases, vector transmitted diseases and leishmaniasis, and intestinal nematode infections. The figures are adjusted to the incidence rate of Ceara⁵⁸. Total burden of disease avoided for the entire State of Ceara is estimated at US\$52.7 million year and NPV of health benefits of the Project is estimated at US\$2.5 million per year. Thus, the NPV with health benefits increases from US\$59 million to US\$62 million. These figures consider the incidence rates of these diseases in the areas of influence of the project⁵⁹.

13. The GHG emission estimates were also included in the efficiency analysis of the Project. The annual net emissions from subcomponent 1.2 are estimated at -1,033 tCO₂-eq per year (-25,817 total tCO₂-eq) and for subcomponent 2 net emissions are -692 tCO₂-eq per year (-17,298) for the entire lifetime of the project. These figures were monetized using the shadow price of carbon, as recommended by the World Bank's guidelines. The shadow price of carbon uses a low estimate of US\$40/tCO₂-eq and a high estimate of US\$80/tCO₂-eq as baseline values for 2021. The average values between low and high prices are applied to the GHG emissions assuming a growth rate of 2.26 percent per year for the lifetime of the Project. Accounting for the GHG emission, the NPV of the Project increases from US\$59 million to US\$60.5 million. By adding both the GHG estimates and health benefits, the NPV of the Projects reaches US\$69.5 million.

Table A3.1. Sensitivity of Project Adding Health and GHG benefits

	NPV Total (US\$ million)	ERR
Baseline	59.0	14.5%
Adding health benefits	62.1	14.7%
Adding GHG estimates	60.5	14.6%
Adding GHG + Health Benefits	61.9	14.7%

14. *Implementation risks.* The Project's economic efficiency is reduced if implementation of the main works of subcomponent 1.2 are delayed or postponed. Because the Banabuiú – Sertão Central Pipeline System is a critical infrastructure for the region and for the long-term strategy of the *Malha d'Água* project, attention should be given to its timely implementation. These initial investments will be the basic works needed to make other subsystems more efficient in producing, treating, distributing and storing water.

15. In addition, COGERH and CAGECE would need to improve coordination to maximize the returns of the Project in terms of water management and resilience against scarcity, water infrastructure delivery, and water and sanitation services. Limited coordination will place additional risks on the effectiveness of the Project to reach its intended development goals. Decentralization from state to local levels for water management and services has been partial. Although COGERH and Cagece are decentralized administratively, the allocation of strategic reservoir waters to local

⁵⁸ Brazil is one of the few countries with disaggregated data of the Burden of Disease, published by the Institute of Health, Metrics and Evaluation. Access to the datasets by state in Brazil is available at: <http://ghdx.healthdata.org/gbd-results-tool>

⁵⁹ Health records and cases of the diseases included in the analysis were shared by CAGECE. These figures are based on DATASUS, Sistema de Informacoes Hospitalar. The figures are based on CID10-Categories of diseases, as follows: A09 Diarreia e gastroenterite infecc., 1A27 Leptospirose, A90 DengLiel, A91 Febre hemorragica dev virus do dengue, A92 Outr febres virais transm p/mosquitos, IA95 Febre amarela; B51 Malaria.

institutions, and many water management attributions continue under the state's or other agencies purview: water rights and permits, bulk water pricing, planning, operation and maintenance of hydraulic infrastructure, groundwater management, and control. This could place additional risks to the effective implementation and economic performance of the project.

Financial Analysis of CAGECE

16. The *Companhia de Água e Esgoto do Ceará (CAGECE)* is a Brazil state-run water utility responsible for providing water supply, wastewater collection and treatment services⁶⁰ within northeastern state of Ceará. The company supplies drinking water to 152 of the state's 184 municipalities. In the year 2017, CAGECE obtained net revenues from services rendered reaching R\$1.16 billion (US\$311.8 million) and in 2016 in the amount of R\$1.06 billion (US\$284.9 million). Gross revenue, or revenue before taxes in 2017 was R\$941.89 million (US\$253.2 million) for water supply services and R\$335.75 million (US\$ 90.2 million) for sanitation services. In 2016, it was R\$869.88 million (US\$233.8 million) with water supply and R\$298.07 million (US\$80.3 million) with sewage services. The increase in gross revenue took place under the following contextual factors⁶¹:

- In the third quarter of 2016, there was an increase of the consumption contingencies, from 10 percent to 20 percent (Contingency Tariff --established during drought periods). This led to a 20 percent increase of the average water tariff, aiming at managing demand in the face of scarcity of water resources;
- The application of an ordinary revision of 17.23 percent in water and sewage tariffs was performed in two steps. The first of 12.9 percent in June 2016 and the second of 4.33 percent in the third quarter of 2017. The objective of this review was to achieve the average tariff of R\$3.55 per cubic meter (US\$0.95 per cubic meter).

17. For the 2017-2018 period, CAGECE's Net Operating Revenues (NOR) from water and sewage totaled R\$981.5 million (US\$263.8 million), up 17.8 percent compared to the same period of 2016-2017. CAGECE is also showing an increase in net revenues over the last year. Net revenues for the third quarter of 2018 had an increase of R\$65.6 million (US\$17.6 million) compared to the same period in 2017. Tariffs have been adjusted to deal with the drought through water availability contingencies, which has improved CAGECE's finances and obtain a positive trajectory of revenues against the relatively small change in costs and expenses.

18. The Company is tackling losses by reviewing accounts receivable and other receivables and contractual assets for an amount equal to the expected credit loss, to ultimately improve its financial position based on increasing operating margins vis-a-vis debt and liabilities. Nevertheless, the Company's activities and debt structure exposes it to the following financial risks:

- Financial: exchange rate, interest rate risk and credit risk; and
- Risk management: risk management program of the Company focuses on the unpredictability of financial markets and seeks to minimize potential adverse effects on the Company's constant revenue based and limited financial performance.

19. Current financial liabilities expose CAGECE to risks and higher financial costs from variations in input prices and interest rate fluctuations. CAGECE built three financial scenarios to assess these financial risks and incorporate further variation in the US dollar and the respective future financial results that would be generated to cap with any increasing cost of financing. Under these scenarios the financial impact of international debt allocations for the period 2018-2020 reach 5, 20 and 33 percent, respectively, based on projected additional cost with respect to financial liabilities in foreign

⁶⁰ In the analysis no tariff projection changes were conducted because tariff changes respond only to legal and formal tariff revisions requested by state's regulators and CAGECE.

⁶¹ Based on *Relatório de Administração* CAGECE (2017). CAGECE. Estado do Ceará.



currency of the company. To address these risks, CAGECE is monitoring capital to financial leverage ratios. That index corresponds to net debt divided by total capital of the company. The net debt, in turn, corresponds to total loans and financing subtracted from the amount of cash and cash equivalents and financial investments. The total capital is determined through the sum of the shareholders' equity, as shown in the balance sheet, with net debt. The financial leverage ratio for 2017 was 13 percent and reduced due to stable financial indicators to 10 percent for 2018⁶². This indicates that the company has margin to inject debt for capital investments without threatening a substantial decline in operating margins.

20. Furthermore, CAGECE's financial positions are based on the expectation of future generation of taxable income and recognizes tax credits and tax losses. Also, the negative balances from social contributions and tariffs that follow statutory periods have a cap of 30 percent of annual taxable profits to prevent the company to rely on subsidies or transfers to cover for lost revenue due to these provisions. Hence, the deferred income tax is within the allowed rate of 15 percent and the company reported a deferred social contribution rate was a manageable 9 percent for the period of 2017 and 2018.

21. CAGECE is a cash-generating unit, with a single operating segment (water and sanitation), despite developing the provision of treatment service and water supply, collection and treatment of depletion municipalities located in the State of Ceará. The cash sources and operating segments depend on the following conditions:

- Although water and sewage revenues are distinct, since they are billed individually to the water, sewage, water, or sewage only, the corresponding can be segregated due to the existence of network / system sharing among the municipalities (cross subsidy);
- The decision-making by the managers of the Company's operations, related to its operational performance, are carried out jointly - water and sewage;
- There are no individualized financial of disbursements of resources linked to the provision of water and sewage service only individualized control by the Company's financial sector receivables from customer invoicing.

22. *Fortaleza's water and sanitation services---* The municipality of Fortaleza, through Municipal Law No. 8,716 granted onerous and exclusive rights to CAGECE for the delivery of water supply services and water depletion management and mitigation activities for 30 years. In addition to the investments that CAGECE does for Fortaleza, the State transferred to the Municipal Government 22 percent of its shares with the right to vote on water and sanitation issues. CAGECE assumed the commitment to pay the City concession, the equivalent of 1.5 percent of the monthly direct water and sewage revenues generated in Fortaleza. This remuneration, in the period ended September 30, 2018, was recorded under "cost of services rendered from the income statement". Water and sewage services charged according to tariffs approved by the agency regulator are also legally bounded between Fortaleza and CAGECE.

⁶² Based on: *Informações Trimestrais - 30/09/2018 – CAGECE*.



ANNEX 4: Gender Action Plan

COUNTRY: Brazil

Ceará Water Security and Governance

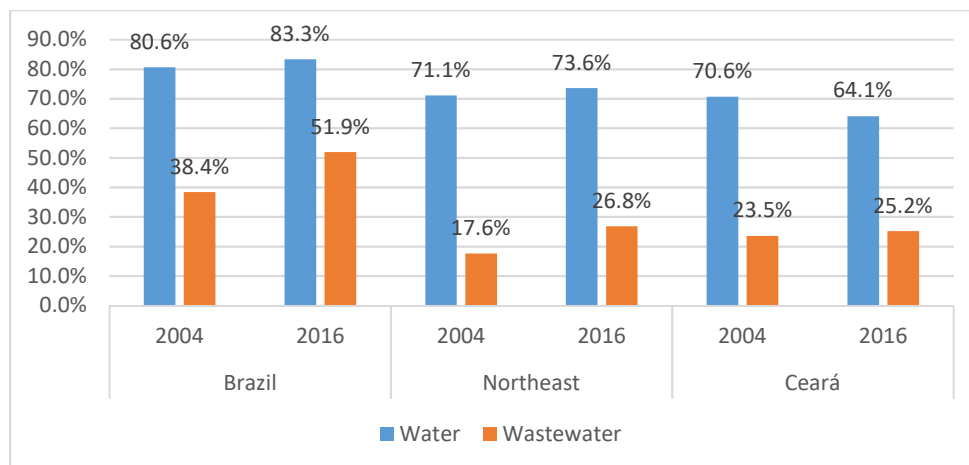
- 1. Project Social Impacts.** The overall envisaged social impacts of the expansion of the water infrastructure in the Banabuiú and Middle Jaguaribe River Basins are beneficial and socially inclusive. Worldwide, there is robust evidence that access to sanitation has immediate repercussions on health indicators such as infant mortality and longevity of the population. Access to sanitation is also positively associated with the Human Development Index.⁶³ The beneficiary municipalities remain largely rural (55%) and ridden by high rates of extreme poverty (a regional average equal to 28.6%), which is higher than the state average in all but one of the municipalities of the Sertão do Banabuiú region. Gender related impacts are also expected from the activities related with the expansion of the water infrastructure in the Banabuiú and Sertão Central regions.
- 2.** Prevailing social norms of social labor division patterns show that women are expected to benefit the most from more reliable water supply as they continue to hold the responsibilities for fetching water to the households, taking care of household tasks, and for caring for the health of the family. Reliability of water services are expected to reduce domestic workloads and the incidence of waterborne gastrointestinal diseases, contributing to improve the wellbeing of both men and women, but with a larger impact on the daily life of women than men.
- 3. Sanitation in Brazil.**⁶⁴ The share of the Brazilian population with access to reliable water services increased from 80.6% in 2004 to 83.3% in 2016. During this period, 33.7 million Brazilians gained access to this service. Simultaneously, the share of the Brazilian population with access to wastewater services rose from 38.4% to 51.9%, giving access to sewage systems to more 40.6 million people, which means an increase of 64.2% in the number of Brazilians served. Despite these undeniable advances, the number of Brazilians without access to reliable water and wastewater services remains huge and the challenge of universalization is growing. The challenge is still larger in the poor Northeast region of the country. Between 2004 and 2016, access to water services in the state of Ceará declined and remains lower than at the regional and national levels. Access to wastewater services have improved, but in a slower pace than at the regional and national levels. Consequently, the challenge of providing wastewater services in Ceará remains higher than at the regional and national levels as can be seen in Figure A4.1.
- 4. Sanitation and wellbeing in Brazil.** Lack of sanitation has immediate implications on the health and quality of life of the population because of the incidence of waterborne and gastrointestinal diseases (see Figures A.4.2 and A.4.3 below). In Brazil, there is robust evidence that the recurrence of waterborne and gastrointestinal diseases leads to socioeconomic costs related with (i) the withdrawal of routine activities (including labor, education, domestic and recreational hours) and (ii) public and private expenses with the treatment of infected people. There is also robust evidence linking the lack of access to reliable water and wastewater services and the recurrence of the associated diseases with direct impact on the labor market and school activities, affecting productive performance in detriment of career opportunities and income potential as well as hampering educational attainments in detriment to their future potential in the labor market. The incidence of gastrointestinal diseases reached 74.7/1,000 people in Brazil and

⁶³ Unicef and WHO, *25 years: Progresso n Sanitation and Drinking Water* (Geneva: 2015). UNDP, *Human Development Report 2015: Work for Human Development* (New York:2015).

⁶⁴ This analysis is based on Instituto Trata Brasil, *Benefícios Econômicos e Sociais da Expansão do Saneamento no Brasil 2018*. Available at <http://www.tratabrasil.org.br/estudos/estudos-itb/itb/beneficios-economicos-e-sociais-da-expansao-do-saneamento-brasileiro>. This study relies on three main official statistical sources: *Pesquisa Nacional por Amostra de Domicílios Contínua 2016* (IBGE, 2017); *Pesquisa Nacional de Saúde 2013* (IBGE, 2015); and Ministério das Cidades, Sistema Nacional de Informações sobre Saneamento (SNIS), available at <http://www.snis.gov.br/>.

88.0/1,000 people in the Northeast. In average, 3.32 days per year were lost due to these withdrawals. There were 353,500 hospitalizations and 2,193 deaths in consequence of gastrointestinal diseases.

Figure A4.1. Access to water and sanitation services in Brazil (percentage of total population)



Source: Instituto Trata Brasil (2018), based on data from SNIS.

Figure A4.2. Hospitalization due to gastrointestinal diseases among people with access to wastewater systems – Brazil, 2004-2016

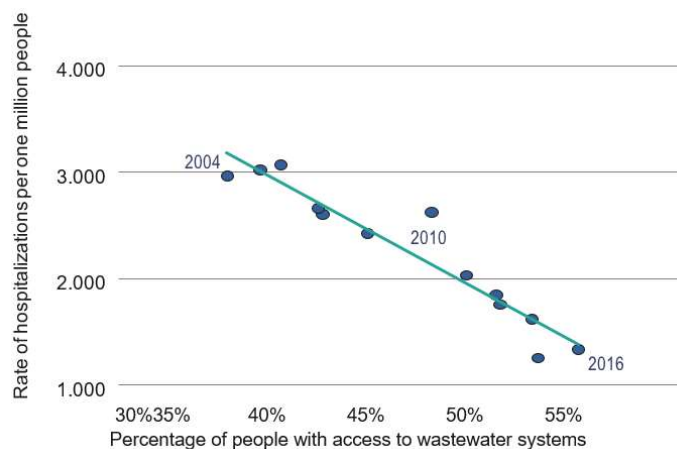
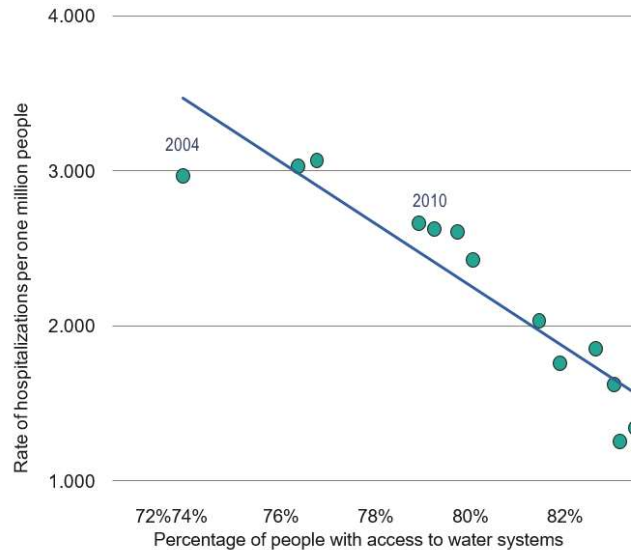


Figure A4.3. Hospitalization due to gastrointestinal diseases among people with access to water systems – Brazil, 2004-2016



Source: Instituto Trata Brasil (2018), based on data from SNIS and Datasus.

5. **Gender gaps in Brazil remain large.** The assessment of the social impacts and benefits of the Project incorporated a gender sensitive lens. Brazil has made significant progress towards education gender equity. However, gender gaps in economic opportunities and agency remain large. Like in many other countries, women remain the main responsible for non-remunerated household and care-taking tasks and more frequently employed in part-time jobs than men, leading to significant gaps in earnings from jobs. Nationwide data from 2016 shows that women spend 18.1 hours per week in

household and care-taking tasks, men spend 10.5 hours per week (meaning that women's workload with household and care-taking tasks are 73% higher than men's). In addition, 83% of the women and only 65% of men carried out domestic works, whereas 28% of women and just 19% of men were responsible for care-taking activities in their households. While 48% of the women at productive age remained out of the labor force, just 28% of men faced this situation. Women counted for just 48% of the total working force, 43% of the people with jobs, and 28% of them have only part-time jobs. Finally, the gender gap in average earnings from jobs reached 23 %.⁶⁵

6. **Gender Gaps related with sanitation.**⁶⁶ Lack of sanitation has immediate implications on the health and quality of life of the population. These implications are harsher among women than men. The adverse impacts are related with the incidence of waterborne and gastrointestinal diseases. Increasing such diseases, the lack of sanitation leads to withdrawals from routine daily activities, interferes with school education and leads to losses on productivity, opportunities of career development and incomes. In Brazil, there is also strong evidence – at the national, regional and state level – that access to water (on a regular basis) and wastewater services is (i) negatively associated with women's withdrawals from daily activities, hospitalization and deaths due to waterborne gastrointestinal diseases and (ii) positively associated with women's educational attainments and earnings from jobs.

7. The evidence shows that, in 2013: (i) the rate of hospitalizations due to gastrointestinal diseases reached 1.801/1,000 women and 1,721/1,000 men (a 5% gap); (ii) in average, each woman spent 3.48 days per year away from their routine activities due to diarrhea and vomiting and each men spent 3.15 days per year (a 10% gap); (iii) mortality rates due to gastrointestinal diseases were also higher among women than men (2.5/100,000 women vis-à-vis 2.3/100,000 men) - at the country level, 0.95/1,000 women died because of gastrointestinal diseases. At the state, this rate reached 1.61/1,000 women; and (iii) women counted for 54.4% of the deaths due to gastrointestinal diseases and men for 45.6% (a 19% gap).⁶⁷

8. In 2016, the rate of women who had to withdraw from their routine activities due to diarrhea or vomiting reached 76.0/1,000 women in the country and 101.2/1,000 women in the state of Ceará (peaking at 112.8/1,000 women at urban areas and falling to 58.7/1,000 women at rural areas). In average, each woman spent 3.48 days per year away from their routine activities due to diarrhea and vomiting. Among men, this average dropped to 3.15 days per year. Considering women's time burden as caretakers of sick people in their family members, these gaps in withdrawals from daily activities and hospitalization have a much higher impact among women than men. Withdrawals from routine activities were more frequent among the poor, and among the least educated people (Instituto Trata Brasil: 2018). These withdrawals were also more frequent among poor women who did not have access to water supply networks, regular access to water supply services on daily basis, sewage networks and toilets for exclusive household use (BRK Ambiental: 2018).

9. All these gender gaps on health conditions related with waterborne diseases are worse in the Northeast region,⁶⁸ among the poor, and among the least educated people (Instituto Trata Brasil: 2018), because that lack of access to water in a reliable way is highly concentrated among them. Indeed, these withdrawals from routine activities are more frequent among poor women who did not have access to water supply networks, regular access to water supply services on daily basis, sewage networks and toilets for exclusive household use (BRK Ambiental: 2018).

⁶⁵ BRK Ambiental, *O Saneamento e a Vida da Mulher Brasileira*. Available at <http://www.tratabrasil.org.br/images/estudos/itb/pesquisa-mulher/relatorio.pdf>.

⁶⁶ This analysis combines information and analytical outcomes presented on the reports of Instituto Trata Brasil (2018) and BRK Ambiental (2018). These studies rely on statistical analysis that isolated the effect of access to sanitation on school attainments and worker's income.

⁶⁷ IBGE, Pesquisa Nacional de Saúde 2015, quoted by BRK Ambiental (2018).

⁶⁸ The incidence of cases of withdrawing from routine activities equaled 74.7/1,000 inhabitants in the country and reached 88.0/1,000 inhabitants in the Northeast (Instituto Trata Brasil: 2018). At the Northeast region, the mortality rate due to gastrointestinal diseases peaked at 3.9/100,000 among women. In the state of Ceará, this rate equaled 2.7/100,000 among women (BRK Ambiental: 2018).

Figure A4.4. Incidence of withdrawals from routine activities because of diarrhea and vomiting, by gender and age, number of cases per 1,000 inhabitants (Brazil, 2013)

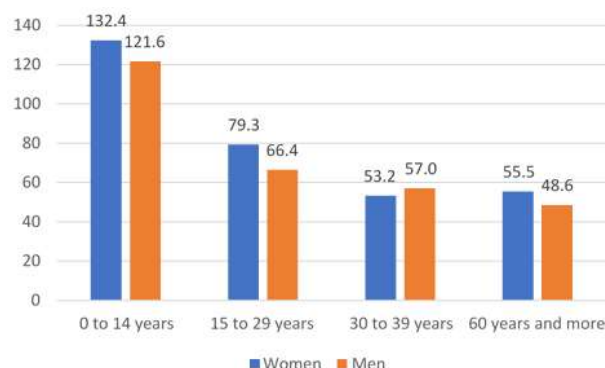
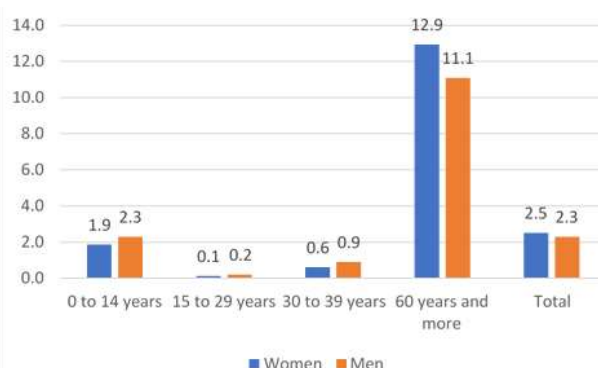


Figure A4.5. Incidence of deaths because diarrhea and vomiting, by gender and age, number of cases per 100,000 inhabitants (Brazil, 2013)



Source: BRK Ambiental (2018), based on data from *Pesquisa Nacional de Saúde 2013* (IBGE, 2015).⁶⁹

10. The evidence also shows that access to water supply networks and sewage collection networks reduced school delays among children and youth by 1.1 percent and 1.5 percent, respectively (see Figure A4.6). Furthermore, access to water supply networks and sewage collection networks increased worker's income in 3.2 percent and 6.8 percent, respectively, as shown in Figure A4.7 (Instituto Trata Brasil: 2018). These effects are still more relevant for women. Between women with and without access to water supply networks the later showed school delays 5.0 percent higher than the former and earned incomes 36.9 percent lower than them. Meanwhile, between women with and without access to sewage collection networks, the later showed school delays 2.6 percent higher than the former and earned incomes 34.8 percent lower than them (BRK Ambiental: 2018). All these gender gaps on health conditions related with waterborne diseases are worse in the Northeast region and the state of Ceará. Thus, and exemplarily, the incidence of cases of withdrawing from routine activities equaled 74.7/1,000 inhabitants in the country and reached 88.0/1,000 inhabitants in the Northeast (Instituto Trata Brasil: 2018). Furthermore, at the Northeast region, the mortality rate due to gastrointestinal diseases peaked at 3.9/100,000 among women. However, in the state of Ceará, this rate equaled 2.7/100,000 among women (BRK Ambiental: 2018).

Figure A4.6. School attainments – number of school grades completed – according to access to sanitation, 2016 (Brazil, 2013)

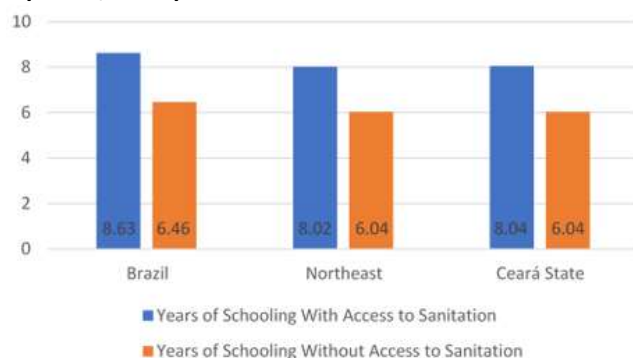
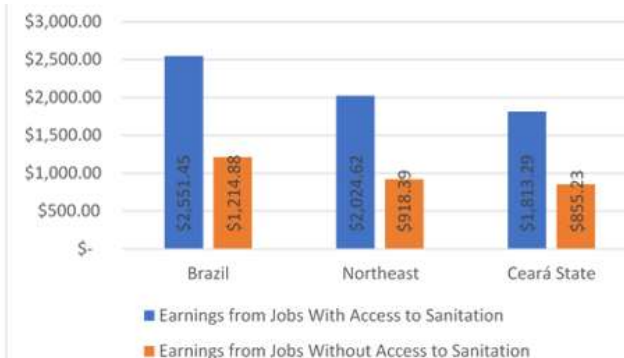


Figure A4.7. Average earnings from jobs according to access to sanitation, 2016 (Brazilian Reais)



Source: Instituto Trata Brasil, based on data from PNADC 2016 (IBGE: 2017)

⁶⁹ According with the analysis made by Instituto Trata Brasil (2018), information from PNADC 2016 corroborate these trends.



11. **Gender Related Actions included in the Project** will comprise three main activities: (i) physical infrastructure construction; (ii) social works at the local level; and (iii) monitoring and evaluation procedures.

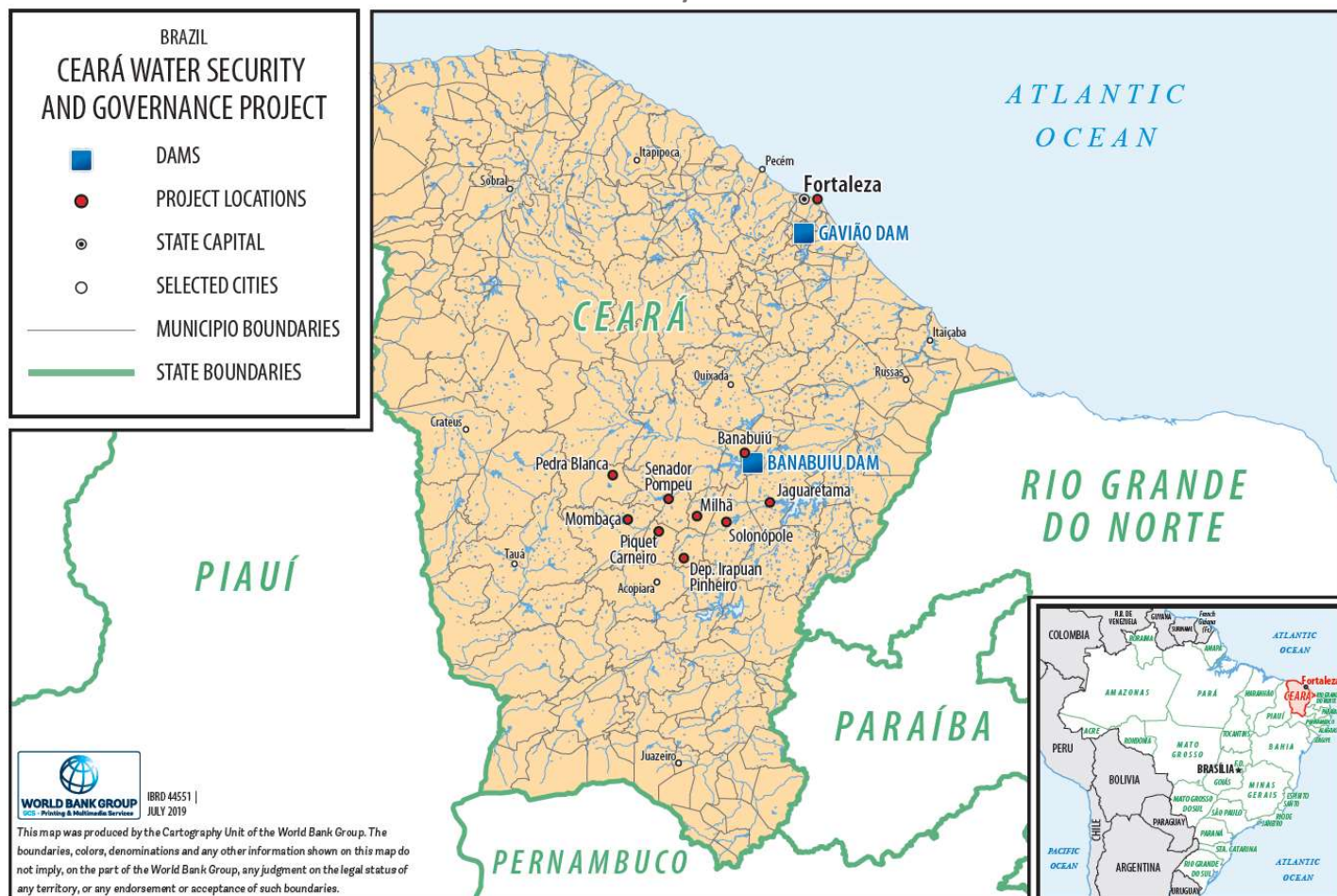
- (a) The expansion of water supply infrastructure in the Banabuiú and Middle Jaguaribe river basins is a core activity supported by the project. It is expected to improve reliability of water services for nine municipalities (including urban areas and selected rural districts).
- (b) The project's executing agencies will also carry out supportive social works at the local level. These works will promote educational campaigns/communication strategies targeting women groups to convey messages and information that promote improved health and hygiene practices and the rational use of water. This environmental and sanitary education efforts will also target teachers and community health professionals to leverage impact.
- (c) Project activities will include monitoring and evaluation of gender-sensitive indicators and potentially beneficial effects of increasing the reliability of access to water for human consumption. The M&E process will rely both on official statistical data and first-hand data collection at the local level on a random sample basis. First-hand data will be collected in three points in time (T_0 , T_1 and T_2): T_0 baseline data will be collected before the new water infrastructures start operation on a sample basis; T_1 data will be collected at mid-term; and T_2 data will be collected at the last year of project implementation. This will allow before and after comparisons, measuring the effect of increased water reliability on (i) the reduction of the incidence of waterborne/gastrointestinal diseases, (ii) its impact on time use and availability and (iii) the consequent creation of opportunities to (a) improve the wellbeing of both women and men and (b) reducing the current gender gap on these indicators.

12. **Expected Effects of the Project.** Reliability on access to water is expected to reduce incidence of waterborne diseases, which affects women wellbeing more than men. In addition, the project will carry out educational campaigns/communication strategy targeting women groups to convey messages and information that promote improved health and hygiene practices and the rational use of water. Project activities will include monitoring and evaluation of these gender-sensitive indicators and potentially beneficial effects of the construction of the Banabuiú – Sertão Central Pipeline System.

13. **Monitoring and Evaluation.** M&E process will mostly rely on first-hand data collection at the local level on randomly sample-based surveys with beneficiaries of the Banabuiú – Sertão Central Pipeline System. The survey will measure, but not limited to: (i) days of sickness or hospitalization due to water-borne and gastrointestinal diseases; (ii) time burden to secure access to water supply and to take care of sick family members due to water-borne disease; and, (iii) impression of water quality and safety. Information will be collected on a sample basis, disaggregated by gender, and analyzed three times during implementation: (i) at the first year of implementation, (ii) at mid-term, and (iii) after that of the construction of the Sertão do Banabuiú water system. Two key indicators are included in the Project's results framework.

ANNEX 5: MAP⁷⁰

COUNTRY: Brazil Ceará Water Security and Governance



⁷⁰ MAP IBRD44551