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Network on Water Technology in Asia and Pacific

Urban Water Supply and Wastewater Management Investment Program, Suva, Fiji

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Summary

With the substantial increment in population in urban areas of Suva City, the capital of Fiji, there is extreme demand of pure drinking water as well as proper sanitation. Moreover, the vulnerability to extreme droughts and flooding imposes a high demand for supply of pure drinking water. The strains, particularly due to frequent service interruptions and decreased water level in prevalent reservoirs, have demanded an establishment of new water treatment plant along with necessary pumping stations, reservoirs and pipeline connections to the Greater Suva Area (GSA) of Fiji. Concerned with these facts, the Ministry of Economy, Fiji and Water Authority of Fiji (WAF) have partnered with Asian Development Bank (ADB), Green Climate Fund (GCF) and European Investment Bank (EIB) worth a total cost of USD 405.1 million for Fiji Urban Water Supply and Wastewater Management Investment Program. The major objectives of the Program are improvement in supply and proper access to potable water in households of GSA, improvement in wastewater treatment and management capabilities in GSA and provision of sustainable service delivery in regards to drinking water in GSA. For that purpose, Water Authority of Fiji (WAF) has successfully designed to build a new water intake alongside Rewa River and a pumping station, water treatment plant, treated water reservoir as well as pipeline to assist water supply by 40,000 m^3 per day. The project duration has been adjusted for seven years beginning from December 2015 and lasting till December 2022.

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Acronyms and Abbreviations

ADB	Asian Development Bank
DN	Diametre Nominal
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
MFF	Multitranche Financing Facility
GAP	Gender Action Plan
GCF	Green Climate Fund
GoF	Government of Fiji
GSA	Greater Suva Area
NRW	Non-Revenue Water
OCR	Ordinary Capital Resources
USD	United States Dollar
WAF	Water Authority of Fiji
WSS	Water Supply System
WTP	Water Treatment Plant

1 Introduction

According to the census of 2007, the total population of Fiji accounted to 837,271 of which more than half of them resided in urban areas. Approximately 457,900 urban residents in Fiji lived in 2 cities, 12 incorporated towns and 7 unincorporated towns. Most of the residents are inhabited in the city of Suva, incorporated towns of Lami, Nasinu and Nausori and their peripheries. The expected rise indicates that about two-thirds of the population will be living in country's urban centres by 2030. This rapid urbanization has led to some serious pressure on existing water supply infrastructures and hence depleted the orderly drinking water supply. Other prominent cases such as intermittent water supply, water shortage and even total suspension of water services in major urban residents are in the rise. To cope up with the scenario, Government of Fiji (GoF) has actively collaborated with Asian Development Bank (ADB), European Investment Bank (EIB) and the Green Climate Fund (GCF) with objectives of improving the supply of reliable and safe water to the greater Suva region, increasing wastewater treatment and management capacity and helping in improvement of Water Authority of Fiji's (WAF) sustainable service delivery.

Figure 1: Prevalent water catchment system in East Suva (Rotary Showcase, 2012)

The total dependence of water supply from one major river has resulted in its high vulnerability to drought. Thus, to integrate the increasing population demands for water supply, the project intends to increase the water supply production capacity through installation of new water treatment plant (WTP) and blend the processes with routine maintenance of system and piping leakages. In addition, the program also focuses for diversification of raw water sources and catchment systems for improved water security and reduction in future climate impacts on the resources. Likewise, as the quality of drinking water is highly dependent on the site-specific sanitation systems, the program also aims for better sewerage system and treatment plans. The current degree of sewerage system coverage and limited wastewater treatment capacity pose limitations to urban growth and development. Similarly, the prevalence of shallow soil depths, high rainfall and lack of prompt maintenance, overflow from septic tanks have been significant contributing factors for degrading water quality.

Table 1: Overview of Fiji Urban Water Supply and Wastewater Management Investment Program

Items		Description
Project Name	:	Fiji Urban Water Supply and Wastewater Management Investment Program
Type	:	Water Supply and Water Treatment Upgradation
Donor Name	:	i) Asian Development Bank ii) Green Climate Fund iii) European Investment Bank iv) Government of Fiji
Project Components	:	i) Component A: Improved Supply and access to safe water in GSA ii) Component B: Increased wastewater treatment and management capacity in GSA iii) Component C: Improved WAF's management and sustainable service delivery
Project Fund	:	USD 405.1 million
Project Duration	:	From December 2015 to December 2022

2 Technical and Technological Brief

With major objectives on development of water supply and access to safe potable water, increased wastewater treatment and management capacity in greater Suva area and improved management and sustainable service delivery of Water Authority of Fiji, Urban Water Supply and Wastewater Management Investment Program was launched. Currently, Waila and Tamavua water treatment plants are the only supplier of drinking water to the residents of greater Suva region which sources the water from Waimanu River.

Figure 2: A) Tamavua Clarifier B) Waila Clarifier (Current Electrical Ltd, 2013)

However, because of rapid urbanization, both these water treatment plants operating at full capacity for 24 hours at times are unable to meet the peak demands of inhabitants in this region. As per the consequence, families in some of the peri-urban areas have been forced to depend on groundwater and rainwater for daily domestic and agricultural activities. Thus, to mitigate the problems, WAF proposed to design and build a new water intake alongside Rewa

River and a pumping station, water treatment plant, treated water reservoir as well as pipeline to assist water supply by 40,000 m^3 per day. Moreover, the proposed construction is also expected to provide flexibility in the maintenance of water supply during drought periods through new water intake at Rewa River.

The technicalities associated with the project is based on improved resilience through appropriate siting of new water intake higher than the river catchment beyond the projected limit of salinity wedge moving up the river system due to sea level rise. This arrangement leads to avoid saltwater intrusion from a rise in sea level and to cope up with likely shifts in river flows in future. In addition, the lower river flows during pronounced droughts would assist in providing a considerable water resource at such times.

Figure 3: Under construction site of water distribution (ADB, 2015)

Also, the water system has been ought to be climate proof through a number of measures like strengthening of piping systems such that they are resilient to flooding. Similarly, the project has also considered the reduction in technical as well as nontechnical losses through replacement of meters, improvement of leak detections and repairs, establishment of district metering and pressure management systems at critical points. Such noticeable reformations have been expected to reduce nonrevenue water on one hand while address the shortfalls in bulk water supply on the other. Similarly, as per the second major component of the project, it has been expected to increase the reliability of wastewater treatment processes in GSA by increasing the capacity of Kinoya sewerage treatment plant through designing and building of two primary sedimentation tanks and a digester as well as upgrading of dewatering plant. Likewise, this phase would also involve upgrading of 31 existing wastewater pumping stations and replace around 18 kilometres of wastewater trunk mains which have dilapidated in years with new ones. This arrangement has been focused for minimizing the cases of treatment plant bypassing such that water quality downstream is not deteriorated.

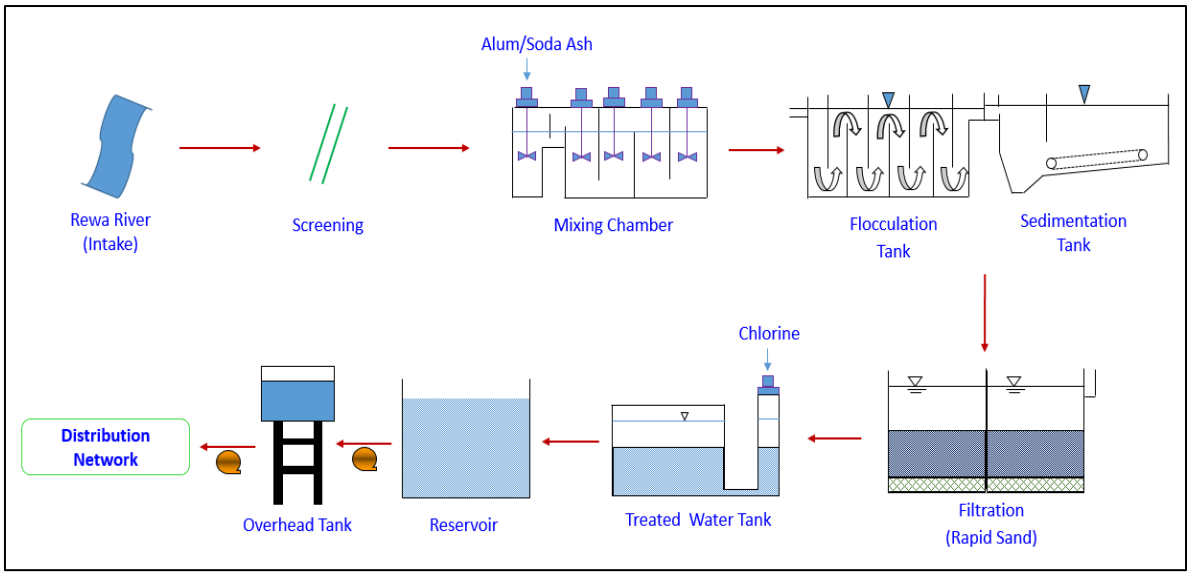

Figure 4: Layout of water treatment plant under Urban Water Supply and Wastewater Management Investment Program

3 Financial brief

The total estimated cost of the project at the time of proposal amounts to USD 222 million (ADB, 2015) financed by four sectors namely ADB with USD 67.7 million, EIB loan of USD 38 million, GCF grant of USD 31.04 million and Government of Fiji with the rest of USD 85.26 million. However, ADB made another concrete agreement with Government of Fiji for USD 42 million for the same project. The costs have been individually divided among each component as indicated in **Table 2**. Likewise, the consulting services have been allocated a total of USD 7.851 million individually divided as USD 2.53 million for project preparatory works, USD 1.99 million for the design of Rewa WSS and Kinoya WTP and USD 3.33 million for detailed design for sewerage extension (ADB, 2015).

With the request of multitranche financing facility (MFF), the Government of Fiji amounts a total budget for the project as USD 405.1 million with support of USD 184.2 million loan from ADB's ordinary capital resources (OCR) and grant cofinancing from GCF. Accordingly, the first tranche would constitute a loan of USD 42.1 million from OCR with a 21-year term including a grace period of 6 years and a grant equivalent to USD 31.04 million from GCF administered by ADB. The remainder of financing includes EIB loan of USD 26.6 million and government contribution of USD 80.7 million in the form of taxes, duties and land acquisition (ADB, 2016).

Table 2: Indicative Cost Summary Table by Component and Financier (million USD) (Green Climate Fund, 2015)

Component	Sub-component	ADB	EIB	GCF	GoF
Water Supply	Rewa Water Treatment Plant	15.91	10.61	26.99	10.37
	Non-revenue Water Production	1.55	1.03	-	7.42
Wastewater	Kinoya Wastewater Treatment Plant Upgrade	12.69	8.46	-	7.95
	Pump Station Upgrades	5.35	3.56	-	1.65
	Sewer Mains Upgrade	3.00	2.00	-	7.70
	Sewer Extension	3.93	2.62	-	25.12
Capacity Building	-	3.47	-	-	1.04
Others	-	21.79	9.72	4.05	24.02

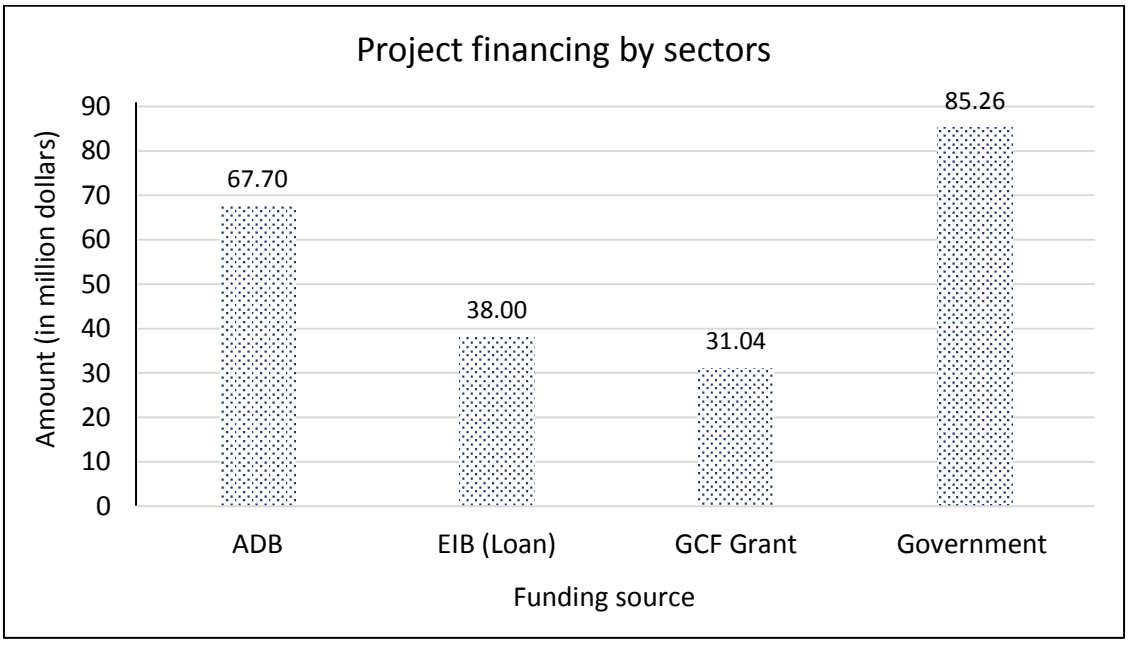

Figure 5: Proposed budget allocation for various components of the project (Green Climate Fund, 2015)

4 Project Features

4.1 Technical and technological features

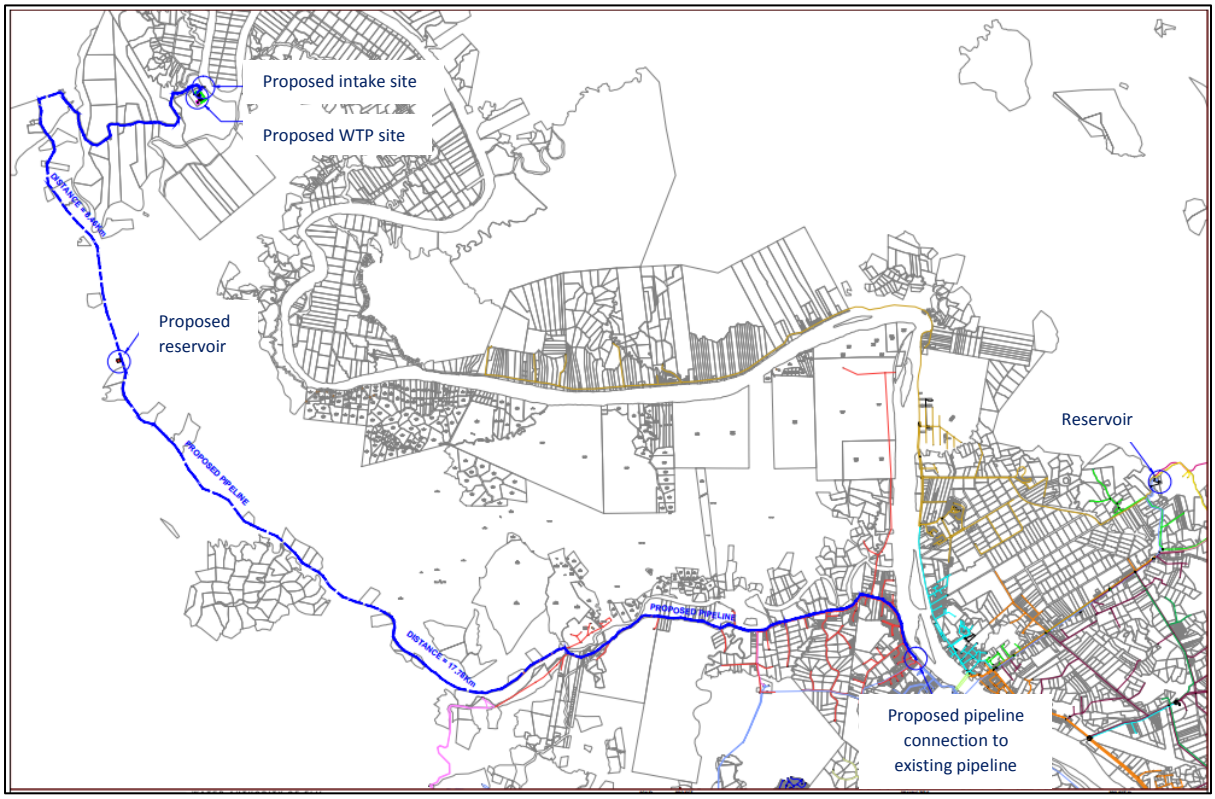

Figure 6: Proposed water distribution system under Suva-Nausori regional water supply scheme (Water Authority of Fiji, 2015)

According to the initial work structure, the project has been divided into three components running parallel to each other. In the first component, it is designed to make efforts on improved supply and access to safe water in GSA where the physical interventions include construction of Rewa river water supply station constituting a water treatment plant, reservoir, pumping station and transmission mains that have a connection to existing systems. Likewise, the second component is dedicated to increased wastewater treatment and management capacity in GSA comprising the physical interventions related to increment in the capacity of Kinoya wastewater treatment plant and wastewater system upgradation. In addition to this, the component also focuses on sewerage system extension in the GSA. Likewise, the third component is inclined towards improved WAF's management and sustainable service delivery through preparing a clear plan on supervision of wastewater system civil works, safeguard compliances and preparation of procurement documents.

The dimensions of the proposed site for water treatment plant has been allocated as 250m by 150m with space sufficient for sedimentation, filtration, backwash facilities, sludge handling, chemical dosing. Similarly, the plan constitutes a room for reservoir, treated water pumping station and related electrical and control arrangements. Also, with a view of emergency situations such as that in floods, provision of space has been proposed for residence for operators. As displayed in **Figure 6**, the WTP is expected to treat raw water extracted form Rewa River under different flow levels and quality conditions. The full functioning WTP would have a treatment capacity of 40,000 m^3 water per day. An indicative area of approximately 100m by 50m is proposed for construction of reservoir. Also, provisions are made for reservoir

in case of increased capacity of the plant. In addition, the treated water is to be connected to existing reservoir with 17.78 km pipelines which ultimately leads to households in GSA. The preliminary hydraulic analysis indicated a requirement of DN750 mains for transfer of treated water from new water treatment plant to existing supply system (Water Authority of Fiji, 2015).

4.2 Economic and financial features

For the smooth coordination between funding agencies and Water Authority of Fiji, the Ministry of Economy would play a vital role in disbursement of funds in the Project. Water Authority of Fiji is expected to work closely with Ministry of Economy, Fiji which would ultimately scheme permissions for disbursement of funds.

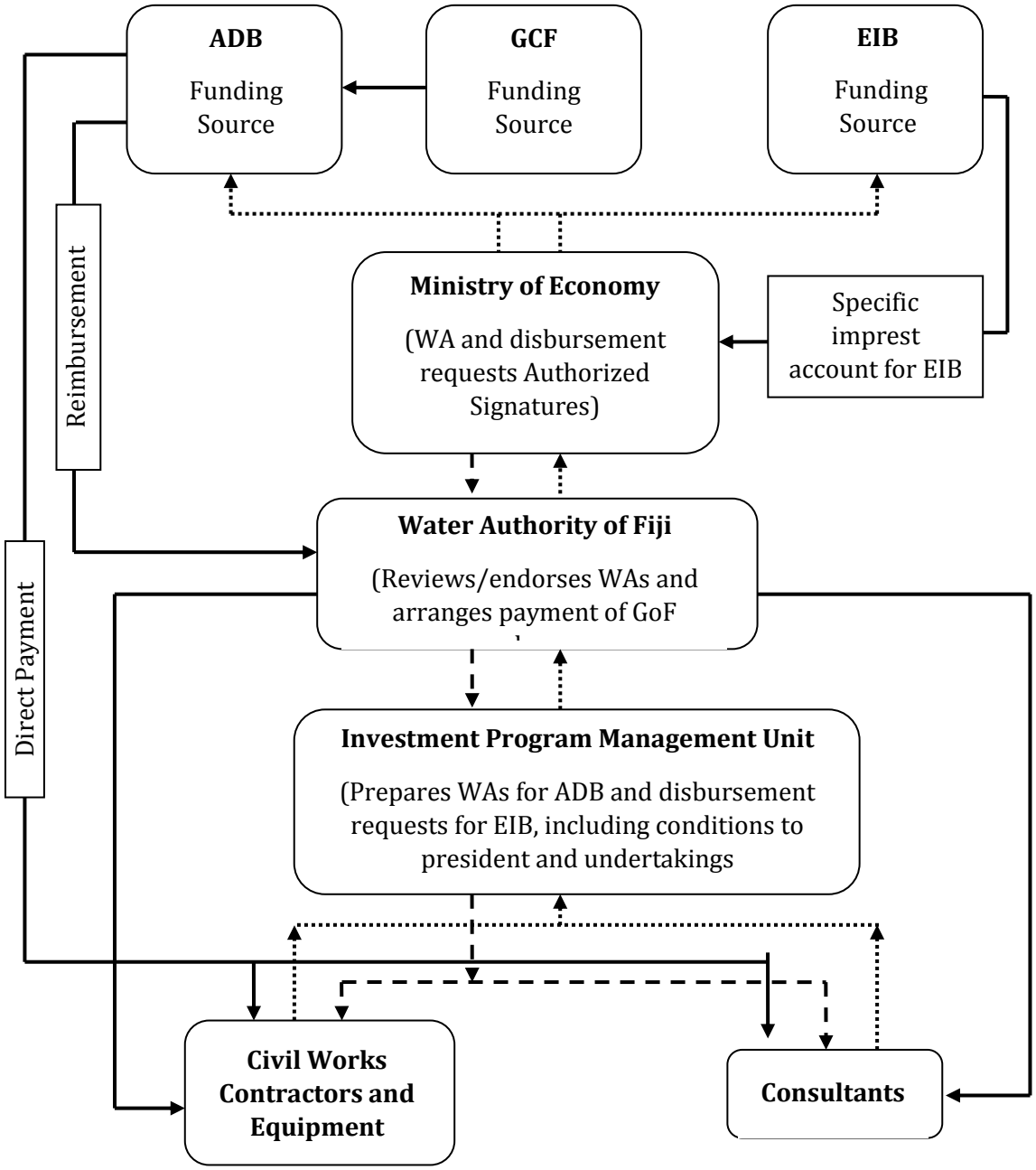

Figure 7: Fund flow schematic diagram (ADB, 2016)

The Government of Fiji and Water Authority of Fiji are highly concerned in regards of anticorruption measures, safeguards, gender biasness, procurement, consulting services and

disbursements. Assurances have been made for the applicability of policies in accordance with ADB. Apart from this, the initial economic analysis of the project indicated the overall investment would have an economic internal rate of return (EIRR) of 8.3% (ADB, 2016). The analysis has been based on the advantages resulting from changes in health of inhabitants and environmental conditions. Despite being under the threshold of 12% EIRR, the program still has sufficient economic merits as this project would serve to reduce the high levels of non-revenue water (NRW) of WAF indicating the availability of more drinking water at a relatively very low cost. Moreover, the major economic feature associated with this project is lack of redundancy in the maintenance of water treatment infrastructures due to improvement in facilities which significantly reduce the cost for inhabitants. Hence, the project is expected to allocate higher density development in the new areas to be served by achieving an operating ratio of less than 1 such that the tariff adjustments are made on the principle of cost recovery.

4.3 Social and environmental features

The major social feature allied with Urban Water Supply and Wastewater Investment Program is to mitigate the financial and social disparities associated with inhabitants of the region. According to the gender action plan (GAP) prepared for the project, the investment program aims for promotion for women's rights, formal sector employment and livelihood, equal participation in decision-making and access to basic services and infrastructures. As the local levels constitute merely a 25% involvement of women in governmental works, this project directs a new path for the participation of women in senior management levels. Thus, this investment program is expected to address gender disparities through improved awareness at all levels in WAF, employees, contractors and consultants involved within the project. Also, the capacity building component of this program would encourage active increment in number of women employed in technical positions as well. It would also provide opportunities to support women in key-decision making and implementing procedures (ADB, 2016). In addition, with improved water supply and its availability, the region would be well connected to nearby urban areas of Fiji thereby indirectly affecting the access to settlements and new growth areas in GSA. Thus, this investment program might aid in reducing poverty of inhabitants in GSA.

According to the initial environmental assessment for the project, it has been classified as category B or C for the environment indicating that there is no major threat resulting from the project implementation to the environment. Similarly, the project has kept a closer look for the land that will be employed for building of water treatment plant. The affected individuals and families have been accordingly identified in the resettlement plan. Also, no distinct impacts are expected under the project for indigenous peoples. If any unanticipated impacts are associated in later stages of the project, a planning framework would come into existence.

5 Project Benefits

The existing water supply has been unable to meet average day demands and considering the peak day demand, the water supply system is in the worst condition. Under effective maintenance, the current treated water production system should operate in full capacity so as to hardly quench the thirst of inhabitants in GSA. Thus, to accommodate the population growth and its demands for water in GSA, the completion of this project will serve as a boon for water security. The construction of new supply intake on the Rewa River along with enhanced water treatment plant, pumping station, reservoir and transmission mains is supposed to benefit as many as 315,947 people by 2023 at an average daily supply of 200 litres per capital per day. On another number, this project would ensure an access to clean water for 98% of households in Suva region (United Nations, 2017). The number of beneficiaries relative to total population

accounts to 32% of Fiji population among which 15% comes under the most vulnerable groups (Green Climate Fund, 2015). Moreover, its indirect advantages could be observed in improvements of public health as well through the provision of safe water. In terms of economy, the project is more likely to reduce the economic costs associated with water supply. The prevalent methods of water supply included expensive methods such as through tanker trucks. Thus, after the accomplishment of project, it would reduce the cost of water supply significantly. Likewise, through improved reliability and quality of water supply, this program would also facilitate in systematic plant operations and maintenance. Similarly, the loss in revenue due to leakage in systems and piping connections would be overcome after accomplishment of this program. It is estimated that the successful implementation of the program would reduce the WAF's treated non-revenue water production to 27% by 2033 from a current situation of 51%.

6 Status of implementation progress

The initial phase of the project had been dedicated for readiness of project activities with having major agreements between different sectors. During 2015 to mid of 2016, the project was highly intended for advanced recruitment actions for team members. In the second half of 2016, there was the establishment of MFF implementation arrangements and ADB Board approval for the project commencement. The first tranche of loan signing between Ministry of Economy, Fiji and ADB was accomplished in the former half of 2017 with loan effectiveness during August 2017. Similarly, the Government of Fiji also supported the project with its budget inclusion during August 2017. Thus, at present, all the project deliverables have been clearly defined and is ready for meeting the objectives regarding water and wastewater infrastructure development.

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