PROJECT TO PROVIDE PLANNING GUIDANCE FOR
THE WATER SUPPLY PROJECT

CAPCITYT DEVELOPMENT PROJECT ON
THE PLANNING AND OPERATION & MAINTENANCE
OF WATER SUPPLY SYSETM
IN THE WEST AND THE NORTH
IN THE REPUBLIC OF FIJI

FINAL REPORT

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MINISTRY OF HEALTH, LABOUR AND WELFARE

NIHON SUIDO CONSULTANTS CO., LTD.

PROJECT TO PROVIDE PLANNING GUIDANCE FOR THE WATER SUPPLY PROJECT

CAPACITY DEVELOPMENT PROJECT ON PLANNING AND OPERATION & MAINTENACE OF WATER SUPPLY SYSTEM IN THE WEST AND THE NORTH IN THE REPUBLIC OF FIJI

FINAL REPORT

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SUMMARY

S.1 INTRODUCTION

The Republic of Fiji (Fiji) is the central state of the Oceania and has a population of about 880,000 people and is composed of about 300 islands including the two major islands Viti Levu (Western division, Central division) and Vanua Levu Island (Northern division).

In 2017, "5 - Year & 20 - Year - NATIONAL DEVELOPMENT PLAN" was formulated as a short-term and long-term development plan for the nation.

In the water supply sector, implementation of Sustainable Development Goals (SDGs) are included in the "20-year national development plan". The same plan also states, "Every Fijian has a right to clean and safe water in adequate quantities. 100% access to clean and safe water will be realized by 2021 and for the rural and maritime areas by 2030." It also includes the conservation of water sources, the development of new water sources to cope with future demand in the western and northern areas, measures against climate change, etc.

"The 5-year national development plan" includes construction of a water treatment plant in the Central District (capital: Suva) and Expansion of the Nantou Water Treatment Plant in the Western Region (Nadi/Lautka), Development Study of New Water Source, etc are planned with joint financing support from ADB's Green Climate Fund and EIB (European Investment Bank)..

The above plan is prepared for development of the Viti Levu island in the West and the Central while Vanua Levu Island (in the North) was left behind. However, the population concentration on Viti Levu Island and requirement of development of the North are discussed as "Look North Policy" in the National Assembly, and the importance of development in the North is recognized. The development plan in the North includes construction of new airport shopping mall, university and others.

Fiji has environmental vulnerabilities particular to small island countries. It ranks 16th among 171 countries on the UNU disaster risk index (FY 2016), and cyclone damage occurs often. Damages sustained from Hurricane Winston in 2016 amounted to 30% of National GDP. Frequent recurrence of such events puts the country at risk of financial collapse and actions need to be taken.

As the secretariat of the Pacific Islands Forum (PIF), Fiji plays the central role in the Pacific countries. It is supportive of Japanese policies in the region and Fiji-Japan relations are good. In order to maintain cooperative relations with Fiji which has influence in the Pacific, continued support for the country is important.

The joint declaration "Fukushima · Iwaki Declaration; Building Prosperous Future Together" was adopted at the 7th Pacific Islands Summit (PALM 7) in May 2015. The declaration

prioritizes seven fields, namely; disaster prevention, climate change, environment, interpersonal exchange, sustainable development, marine/fishery, and trade, investment, tourism. Support in the water supply sector will contribute to fields of the climate change, sustainable development, and trade, investment, tourism priorities and lead to the achievement of Japan's commitment at the summit.

The government of Fiji positions the water supply sector as one of the priority sectors of the infrastructure sector. The Constitution of Fiji indicates "Constitution of the Republic of the Fiji Islands Section 36; right of every person to clean and safe water in adequate quantities (All people have the right to receive clean and safe water supplies)". Development of the water supply sector is one of the most important issues.

Since the income level of Fiji is classified as middle income country, application of grant aid cooperation shall be considered carefully. In project preparation, the appropriateness of the project should be reviewed according to the "effective use of grant aid for countries with relatively high income levels" policy of the International Cooperation Bureau, Ministry of Foreign Affairs of Japan.

Water supply and sewerage systems in Fiji are managed by Water Authority of Fiji (WAF) under the jurisdiction of the Ministry of Infrastructure and Transport (MoIT). While coverage ratio of water supply is very high, budget for rehabilitation is generally insufficient. Combined with the age of the system, delays in repair and maintenance need to be solved. Climate change also affects water supply system. Water source (river) salinization, water shortage during dry seasons and periodic turbid water due to local severe rain events all cause poor treated water quality and water shortage. As the president of COP23, Fiji gives high attention to natural energy and possibility of applying Japanese technology for energy production. Solar power generation and small hydropower generation, will also be considered.

Located in the West, Nadi and Lautoka are the third and the second largest cities in the country, respectively. Nadi is an important center for the tourism industry where the international airport is located. Lautoka is the center of the sugar industry. The demand for overseas travel by Japanese people is expected to increase since direct flights between Narita and Nadi are scheduled to resume from July 2018. "Nadi Lautoka Regional Water Supply Improvement Project" and "Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji" were implemented as Japanese assistance in Nadi and Lautoka. These projects have greatly contributed to the development of the water sector in Fiji and are highly appreciated. Therefore, continuation of Japanese cooperation in the future is anticipated. A new master plan was prepared by WAF but it is not necessarily feasible. The master plan should be reviewed and a feasibility study considering the effects of climate change should be implemented. Non-revenue water (NRW) reduction activities carried out by Fukuoka City are also needed to proceed to the next stage, and then spread to other areas.

Improvement and expansion of water facilities together with reduction of NRW will contribute to overcoming water shortage. Satisfaction of increasing water demand for industry and tourism will lead to promotion of the national economy including improvement of health and welfare of residents and tourism industry which is the country's largest source of foreign currency acquisition.

Water supply in the North is not stable. 24/7 supply is not possible and water supply is suddenly suspended due to poor condition of existing water facilities and water sources. In addition, it is difficult to supply safe water continuously. Water treatment plants cannot cope with high turbidity during heavy rains. During these times, clean water cannot be supplied and water supply is suspended. WAF has reviewed the master plan in 2014 for water supply in Labasa, the central city of the northern region, but the study is not necessarily feasible. Action for improvement of water supply in Labasa has not been taken following the master plan. Water supply in Taveuni Island and Savusavu Island in the North, which is a global tourist destination for yachtsman etc., also face many problems. Despite being a priority area as stated in the Look North Policy, measures to improve water supply in the North and capacity development of WAF staff are hardly taken. Under such circumstances, it is an urgent task to review the water supply improvement plan and prepare an emergency program, which includes support for improving existing facilities. Capacity development of WAF staff and dissemination of NRW reduction measures are also important and urgent tasks.

Expectations for Japan's technical cooperation on water supply are increasing in the West where rapid and major development is planned and also in the North where existing water supply system is in poor condition while importance of area is recognized in the new policy.

S.2. Problem and current status of water supply in the West and the North

S.2.1 The current status of water supply in the West

In the West, urban water supply is being implemented in 6 cities of Nadi and Lautoka, Sigatoka, Ba, Tavua, and Rakiraki. Nandi and Lautoka, the central cities of the West, are considered as the target area of the study. Water consumption in Nadi and Lautoka is summarized in the table below.

Table S.1 Water Consumption in Nadi and Lautoka

Region	Domestic Consumption (m^3/d) (2013)	Commercial Consumption (m^3/d) (2013)	Government Consumption (m^3/d) (2013)	Total (m^3/d) (2013)
Lautoka	19,340	6,020	1,270	26,640
Nadi	19,030	11,960	420	31,430
Total	38,380	17,990	1,690	58,070

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

Nadi and Lautoka has three water treatment plants, namely Nagado WTP (sourced from Vaturu Dam), Buabua WTP (sourced from Buabua and Nalau) and the Saru WTP (sourced from

Varaqe). All three water treatment plants are interconnected with and water is supplied to the entire Nadi and Lautoka area. The main water supply facilities of Nadi and Lautoka are as follows.

Table S.2 Major Facilities in Nadi and Lautoka

Category	Location/No.	Details
Sources	4	Vaturu Dam supplies water to Nagado WTP Buabua and Nalau Intake supplies water to Buabua WTP Varaqe Intake supplies water to Saru WTP
WTP	Nagado WTP Buabua WTP Saru WTP	104 ML/d 9 ML/d 5 ML/d
Service and Clear Water Reservoirs	20 Reservoirs	3 Clear Water Storage 2 Bulk Reservoirs 15 Service Reservoirs
Pumping Stations	1	Momi Pumping station owned by FNPF development
Distribution/Reticulation		1,059 km of trunk mains and distribution pipes
Water Meters		36,512 active meter connections

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

S.2.2 The problem of water supply in Western Division

1) Planning

Water demand forecasts in the western region (Nadi and Lautoka) are as follows.

Table S.3 Water Demand Forecast in Nadi and Lautoka

Item	2013	2018	2023	2028	2033
Population (person)	169,643	194,366	222,776	244,888	269,179
Served population (person)	152,272	174,459	203,259	223,407	245,550
Water supply rate (%)	90	90	91	91	91
NRW rate (%)	39.51	20	20	20	20
Consumption (daily average) (m^3/day)	960,000	104,970	117,220	127,380	142,050
Consumption (daily maximum) (m^3/day)	102,000	113,000	127,000	138,000	153,000
WTP Capacity (m^3/day)	104,000	134,000	144,000	144,000	154,000
Nagado WTP	90,000	120,000	120,000	120,000	120,000
Saru WTP	9,000	9,000	14,000	14,000	14,000
Buabua WTP	5,000	5,000	10,000	10,000	10,000
New WTP	-	-	-	-	10,000
Expansion capacity (m^3/day)	-	30,000	10,000	-	10,000

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

In order to satisfy increasing future water demand, it is required to expand Nagado WTP by 2018, Saru WTP and Buabua WTP by 2023 together with development of new water sources. It is necessary to review the plan in the near future with consideration of the 2017 census results, the resort development plan, and the realistic reduction plan of NRW ratio.

2) Water Source and Raw water transmission

Vaturu Dam, the main water source of of the area, was built in 1982. Currently, algae growths are increasing and causing odor problems in the Nagado WTP. Since there is no access restriction to the water source basin, the dam water is being contaminated by people, livestock, and others. As for the water sources of Buabua WTP and Saru WTP, there are farmlands in the upstream areas and contamination by agricultural chemicals and fertilizer are suspected. These water sources have high turbidity during rain events, and the intake facilities are vulnerable to flooding. It is also pointed out that the current intake configuration is insufficient to secure water during the dry season.

In raw water transmission system, a part of the pipeline from Vaturu Dam to Nagado WTP is damaged and reliability of the system is low, such as during emergency use. However, no major problems have been pointed out at present.

3) Water Treatment Plants

Survey on water treatment plant performance resulted in two divergent views. One view stating that treatment plants are overloaded and operated above capacity, and another stating that there is excess capacity were heard. However, actual production volumes are not known due to malfunctioning flowmeters.

In addition, countermeasures for power failure are insufficient since generators are not installed. Safety management of chemical dosage and countermeasures for power failures of dosing equipment are also insufficient.

4) Transmission and distribution Pipeline

Some of the water distribution pipes are 50 years old and require replacement. About 100 km of asbestos cement pipe (ACP) is installed and its susceptibility to leakage is one of the main reasons of water leakage and water suspension. In addition, it is thought that insufficient capacity of the pipelines and leakages are one of the reasons for lack of water pressure and failure to achieve 24 hour continuous water supply.

5) Operation and Maintenance

While chlorine gas is used for disinfection, safety measures are not taken. Education and training on safety is also required. Activities of NRW reduction are being promoted through “Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji” by Fukuoka City. The activities are expected to proceed to the next step of countermeasures such as detection of underground water leakage.

In addition, it is necessary to improve water quality management, including measurement of residual chlorine at the end of the water supply system (water faucet) and chlorine injection control including during power suspension.

S.2.3 The current status of water supply in the North

Urban water supply in the North is implemented in five central cities: Labasa Town, Savusavu, Nabouwalu, Seaqaqa and Taveuni. Labasa Town. This region is designated as the main study target area. Recent water consumption in Labasa is shown in the table below.

Table S.4 Water Consumption in Labasa

	2013	2014	2015	2016	2017
Consumption (m^3/year)	4,251,433	4,471,673	4,737,155	4,945,591	5,089,324

Source: WAF

The water system of Labasa Town is largely divided into two systems; the Benau WTP system which supplies water to the center of Labasa town and a tube well system which serve water to the mountain areas. Benau WTP system is the major system in which water is transmitted from WTP to Benau Reservoir, Naseakula Reservoir, and Volanau Reservoir and then distributed to most of the major area. In the tube well system, water is distributed after chlorination at each water source.

The main water facilities in the current Labasa Town are as follows.

Table S.5 Major Facilities in Labasa

Distribution Area	Water Source	WTP	Reservoir
Labasa town Nasarava area Nakama area	Nasealevu Source Navau Source Nasarava Source Nakama borehole	Benau WTP	Benau Reservoir Naseakula Reservoir Volanau Reservoir
Nasalasala area	Nasalasala Source	-	Nasalasala Reservoir
Nabekavu area	Nabekavu Borehole	-	Nabekavu Reservoir
Vunicuicui area	Vunicuicui Borehole	-	Vunicuicui Reservoir
Vunika area	Vunika Source, Vunika Borehole	-	Vunika Reservoir

Source: Survey Team

S.2.4 The problem of water supply in Northern Division

1) Planning

Water demand forecasts in Labasa are as follows.

Table S.6 Water Demand Forecast in Labasa

Item	2013	2018	2023	2028	2033
Population (person)	53,310	56,276	59,426	62,773	66,329
Served population (person)	42,355	50,950	59,426	62,773	66,329
Water supply rate (%)	79	90	100	100	100
NRW rate (%)	29.72	20	20	20	20
Consumption (daily average) (m^3/day)	11,850	18,150	20,650	21,980	24,120
Consumption (daily maximum) (m^3/day)	14,820	22,690	25,810	27,470	30,140
WTP Capacity (m^3/day)	10,000	15,000	15,000	15,000	15,000
Expansion capacity (m^3/day)	5,000	8,000	11,000	13,000	15,000

Source: Master Plan for Labasa Regional Water Supply

Development of new water sources and construction of new WTP together with new distribution pipeline system are required to satisfy future water demand. The above water demand was forecasted in the master plan. It is an estimate assuming that countermeasures are taken and NRW rate will be reduced to 20% by 2018. Since there is a deviation from the current demand values, it is necessary to review the plan.

2) Water Source and Raw water transmission

Due to the impact of climate change in recent years, there are variations in water intake capacity from year to year, and available water from some of the sources is insufficient especially during drought. Raw water form exiting water sources for Benau WTP is insufficient in dry period, which is just enough for treatment capacity in 2013. During heavy rain period, earth and sand entered from the surrounding area into the intake and the turbidity of the raw water rises. The sludge in the water supply facility causes poor treated water quality and shortage of treated water due to frequent backwash of filter.

About 50 years have passed since the water pipelines were laid, and it is time to replace them. Exposed iron and PVC pipes are laid along the river from water source. Since scale of flood is escalating in recent years, risk of damage to these pipes from drifting materials such as earth and sand, wood, and rocks is expected to increase.

3) Water Treatment Plants

There are two water treatment systems in Benau WTP, System 1 and System 2. Since the clarifier is out of order in System 1, and it is not installed for System 2, direct filtration is applied for water treatment. Serious problems are not reported in normal operation when the turbidity of raw water is low. However, when the turbidity rises during rain events and seasons, water cannot be treated properly and clear water cannot be distributed. Frequent back washing of the filter is also required, which cause shortage of water. Therefore, it is necessary to re-establish the flocculation and sedimentation system. It is also necessary to investigate the composition of thickness, material and evenness of filter media and then to review the backwash method.

4) Transmission and distribution Pipeline

Transmission and distribution pipes were laid over 50 years ago and the consequences of the advanced age is cause for concern. About 33 km of asbestos cement pipe (ACP) are in the system. Due to its susceptibility to leakage and pipe burst, WAF is now undertaking replacement of ACP. It is also necessary to control hydraulic pressure of pipes in order to reduce water loss through drain valves for pressure control. WAF has installed a pressure reducing valve, but they are not necessarily installed at an appropriate position. It is pointed out that water transmission pipes from the Benau WTP to Volanau reservoir burst frequently due to difficulty of pressure management. Technical advice and assistance on water pressure

management will be required to reduce water loss and suspension of water supply. Insufficient capacity and vulnerability of existing pipes shall also be settled in a proper manner in order to keep adequate water pressure and to achieve 24 hour continuous water supply.

Leakage from reservoirs is also observed, which affects to water shortage. While WAF takes this problem seriously and plans to repair cracks on walls, if methods such as crack filling with mortar cement are used, the effects of the repair works will not last long.

5) Operation and Maintenance

Screen at the inlet of intake facility is clogged with fallen leaves and other materials when it rains and designed water intake volume cannot be transmitted. In order to cope with the problem, care takers are assigned at each intake facility to inspect and clean the facility periodically. While WAF takes measures against high turbidity during rainfall in an improved manner, there is a room for additional improvement. Further arrangement of water intake facilities and improvement of management methods can be considered. In addition, it is required to review methods of pipe cleaning and pressure control using drain valves from the viewpoint of reducing water loss.

It is also required to improve operation methods of water treatment plant. Operation manual and drawings of the facilities in WTP cannot be found on the plant site, O&M section, or even headquarters. Therefore, it is difficult to find proper manners of operation. It is required to find adequate treatment capacity and then to repair broken water flow meters at inlet in order to control water flow rate. Function of flocculation and sedimentation is not available at the WTP and it is very difficult to treat water especially when turbidity of raw water is high. Therefore frequent back wash of filter is required and water loss is significant. Control of chemical dosage ratio and handling of chlorine gas shall also be improved in order to manage treatment process, cost, and safety.

6) Finance

Income of WAF though tariff collection is fully delivered to the national treasury, and expenses are covered by the government's budget. Since the water rate is kept very low, income can cover only about 40% of the expenses. Cost for operation and maintenance are paid to each district from the headquarters in response to request from each district.

Since WAF manages water supplies for all of Fiji, funds for services and development tend to concentrate in the West and the Central regions where population is high and economic scale and development are concentrated. ADB's assistance is also concentrated in the capital city of Suva and major cities. On the other hand, allocation of WAF funds to rural cities is limited. Therefore, the budget for improvement and development of water supply facilities is not secured. There also is a problem that support by donors was difficult to enter in the North until now, even though water supply facilities have not been improved or developed for a long

period. It is expected to get assistance by donors for the improvement of the situation in the North where importance of development is reconsidered in Look North Policy as national tactics.

S.3 Project Plan

S.3.1 Outline of project scope

The project contents of Technical Cooperation for Development Planning are as follows.

Table S.7 Project Outline

Project Achievement		Activity
Review of Master Plan for Nadi/Lautoka and Labasa Regional water supply	The status of existing water supply facilities and water supply services in the project target area will be analyzed	Review of existing water supply M/P Collection and analysis of existing data and information including: Urban Planning and Land Use Plan, Nature, society, economic conditions Survey on current situation of water source/water supply facilities Review of problems in water supply system Review basic target including population, unit consumption, service area and others Review of water demand forecast Review of water source plan Review of water supply pipeline plan (raw water transmission pipe, clear water transmission pipe, and distribution pipe) Review of water reservoir facility plan Review of water treatment plant plan Stepwise water supply improvement plan Revision of estimated project cost Environmental and social considerations Proposal of priority project F/S of the priority project Selection of urgent project
	Forecast of water demand and plan of utilization of water resources in project target area will be reviewed	
	The water supply master plan will be reviewed	
Feasibility study of priority projects and selection of urgent project	Improve planning ability of WAF staff	
	Priority project is identified and its F/S will be implemented	
Improve WTP maintenance and water quality management ability	Staff capacity of WAF's maintenance department will be improved	Review of water treatment development plan Suggestion on operation and maintenance of water treatment plan and pipes for improvement. Assistance on preparation of operation and maintenance manual of water treatment plant, Support for improvement of drawings Assistance on preparation of water quality management manual Guidance on safety measures
	Communication between WAF district charge and WAF headquarters will be improved	
NRW Reduction Activity (pilot project, equipment provision)	The ability for NRW management will be improved	Education and training of basic knowledge for reduction of NRW Support on preparation of pilot activity plan Promotion on installation of water meter Assistance on capacity development of meter readers Training on Leak detection and repair activities (OJT) Promotion of dissemination of NRW reduction measures in the North Evaluation and recommendation of effect
	Ability to detect water leakage will be improved	

Source: Survey Team

S.3.2 Urgency and Priority in Fiji with regard to this Project

(1) Urgency in Fiji with regard to this Project

1) The West (Nadi and Lautoka)

The water demand in the Nadi and Lautoka region, where rapid development is expected, is rapidly increasing and expansion of water supply facilities is an important and urgent issue to assist the development. In the region, Fukuoka City is implementing measures to reduce NRW as Grants for Grassroots Projects, and WAF is attempting to take advanced measures for reducing NRW, appreciating the activities of Fukuoka city. There is a desire to develop NRW reduction activities with further advanced measures such as underground leak detection and quick attendance to leakage, technical assistance on which is expected.

2) The North (Labasa and other areas)

Upgrading of facilities, and improvement and expansion of water supply systems were planned in the master plan. However, donors were not found for implementation. Repair of facilities are not done properly due to lack of funds. Sufficient amount of raw water cannot be secured steadily. Moreover, due to malfunctioning of aging facilities the capacity of existing the facilities have been reduced. It is desired to find countermeasures for high turbidity during rain events and also for insufficient water during drought. Dissemination of NRW reduction activities in the North is also expected.

(2) Priority in Fiji with regard to this Project

Nadi and Lautoka is an important region as the centre of tourism and sugar industry in Fiji and rapid development is predicted. Continuous support from Japan to the region is awaited considering the extremely high priority of implementation. In addition, the priority and expectation of implementation of technical assistance projects in the North is also high since water supply facilities and operation and maintenance capabilities are not developed in a proper manner despite being prioritized in the Look North Policy.

S.4 Conclusion

The basic policy of Japanese ODA for Fiji is summarized below aiming support for sustainable economic growth with environmental consideration and improvement of living standards of the people.

(1) Environment/Climate Change: To support the improvement of ambient environment and public health by strengthening ability to respond to natural disasters and treating waste in a proper manner.

(2) Overcoming vulnerability: To improve infrastructure, control infectious diseases to improve health standards, improve basic academic ability, support relating to development of rural areas and remote island departments.

The plan of the water supply facilities development project in Nadi/Lautoka and the North clearly meets (2) Overcoming vulnerability, i.e. "To improve infrastructure, control infectious diseases to improve health standards, improve basic academic ability, support relating to development of rural areas and remote island departments".

In addition WAF executives explained that high turbidity at the time of floods which exceed water facilities capacity in both areas and water shortages due to prolonged drought period are occurring as the effects of climate change. Therefore, it will be consistent with (1) Environment/Climate Change, i.e. "To support the improvement of ambient environment and public health by strengthening our ability to respond to natural disasters and treating waste in a proper manner."

Considering the current situation in Nadi/Lautoka and the North together with the necessity of developing capacity and water supply facilities, it can be concluded that urgency and relevance to the policy are high in supporting formulation of water supply project and technical assistance on operation and maintenance. Continuation and dissemination of NRW reduction activities are also important. The proposed project will match to the basic policy of Japanese ODA to Fiji countries. Capacity development on management and upgrading of water supply service will contribute to improvement of living environment of local residents and to reduction of climate change impact.

BASIC INDICATOR

Table－1 Main Economic Indicators in Fiji

	Main Economic indicator (2015)	(1990)
Population	89 millions	73.6 millions
GNI (per person)	4,800 USD	1,910 USD
Economic growth rate	3.4%	3.6%
External debt balance	8.64 billion USD (2014)	412.7million USD
DAC Category	High middle income country	Low middle-income countries
World Bank Category	iii/High middle income country	IBRD loan (redemption period 17 years) eligible country

Source: Japan ODA Country Data Book, Ministry of Foreign Affairs 2016、2005、2002

Table－2 Millennium Development Goals

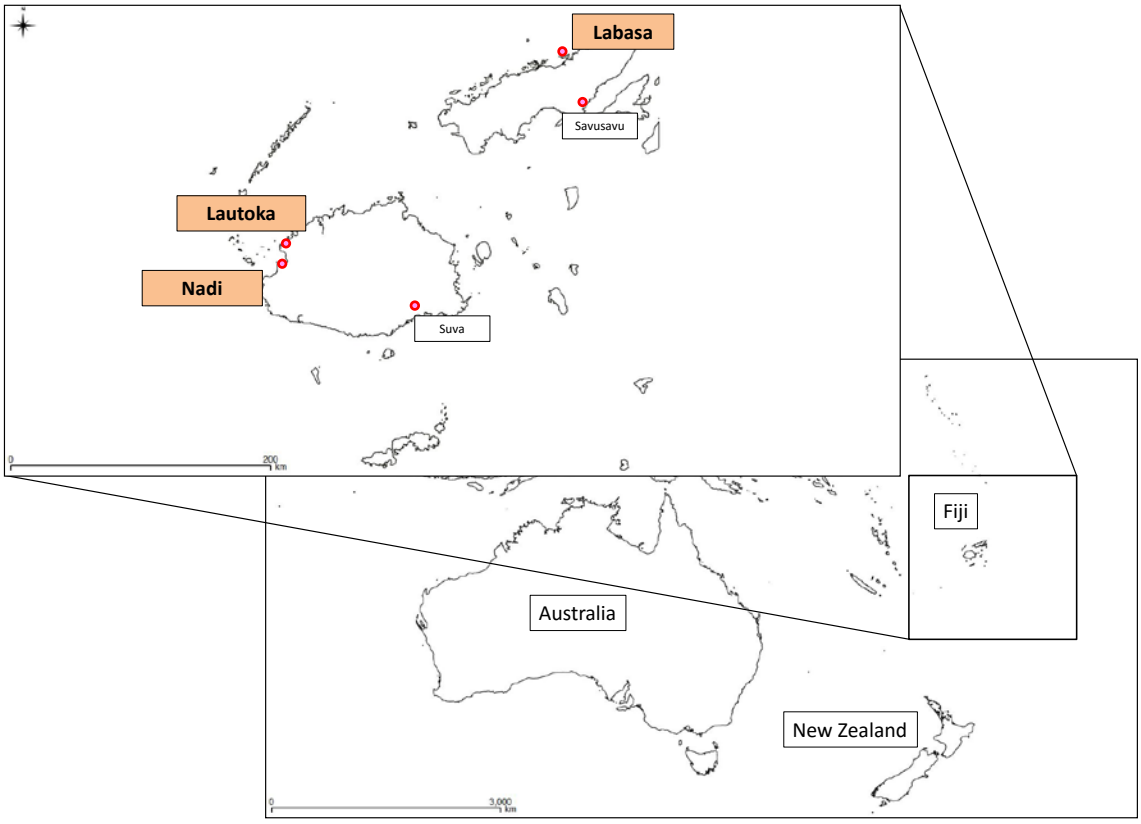
Millennium Development Goals	Latest Data	Previous Data
MDG 1: Eradicate extreme poverty and hunger	5.9% (2008)	29.2% (2002)
MDG 2: Achieve universal primary education	98.7% (2012)	96.7% (1992)
MDG 3: Promote gender equality and empower women	1.01 person (2012)	1.00 person (1991)
MDG 4: Reduce child mortality	23.6 person (2013)	30.0 person (1990)
MDG 5: Improve maternal health	30 person (2015)	63 person (1990)
MDG 6: Combat HIV/AIDS, Malaria and other major diseases	0.01% (2013)	-
MDG 7: Ensure environmental sustainability	95.7% (2015)	86.0% (1990)

Source: Japan ODA Country Data Book

Table－3 Infant Mortality Rate, Under-Five Mortality Rate, Maternal Mortality Rate, Life Expectancy At Birth

Fiji	1990	2000	2010	2015
Infant Mortality Rate (/1,000 births)	25	18	15	19
Under-Five Mortality Rate (/1000 births)	30	22	17	22
Maternal Mortality Rate (/100,000 births)	-	-	59 (2010-2015)	30 (2015)
Life Expectancy at Birth (Years)	-	69	69	70

Source: The state of the world's children 2002, 2012, 2016



Location Map

Photos

Northern Division (Labasa)
Nasealevu Source

Northern Division (Labasa)
Nasarava Source

Northern Division (Labasa)
Benau WTP; Clarifier

Northern Division (Labasa)
Benau WTP; AVG filter

Northern Division (Labasa)
Benau WTP; Benau Reservoir

Northern Division (Labasa)
Volanau Reservoir

The current condition of DMA meter

The current condition of water meter (house connection)

Meeting with Mr.Apete Radrodrolagi (Manager North)

Meeting with Ministry of rural&maritime depevelopment and national disaster management

Meeting with Mr. Nemani Waqanivalu (General Manager Planning Design & Construction))

Meeting with Mr. Taitusi Vakadravuyaca (General Manager Special Projects)

ABBREVIATIONS

ADB	Asian Development Bank
ACP	Asbestos Cement Pipe
AVG	Automatic Valve-less Gravity Filter
COP	Conference of the Parties
DWS	Department of Water and Sewerage
EIA	Environmental Impact Assessment
EIB	European Investment Bank
FNDWQ	Fiji National Drinking Water Quality
EPS	Ecological Purification System
FSC	Fiji Sugar Corporation
FEA	Fiji Electricity Authority
F/S	Feasibility Study
GCF	Green Climate Fund
GDP	Gross Domestic Product
LRPD	Department of Land Resource Planning & Development
LWRM	Land &Water Resource Management
MDGs	Millennium Development Goals
MEF	Ministry of Economy and Finance
MFA&IC	Ministry of Foreign Affairs & International Co-operation
MLGUDH	Ministry of Local Government, Urban Development, Housing & Environment
MOE	Ministry of Environment
MoIT	Ministry for Infrastructure and Transport
M/P	Master Plan
ODA	Official Development Assistance
OJT	On The Job Training
PALM7	The 7th Pacific Islands Leaders Meeting
PIF	Pacific Islands Forum
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SPCZ	South Pacific Convergence Zone
TC	Tropical Cyclone
WAF	Water Authority of Fiji

1. INTRODUCTION

1.1 Background and Purpose

In the year 2000, the United Nations (UN) and its member states agreed to the Millennium Development Goals (MDGs), which included a goal of halving the proportion of people without sustainable access to safe drinking water by the year 2015. According to a joint news release by UNICEF and WHO in March 2012, this goal was achieved in 2010.

As a new, Post MDGs target, the UN is targeting ensuring access to water for all by the year 2030, as one of its Sustainable Development Goals (SDGs)

In Japan, service coverage ratio of water supply drastically improved after 1952. The present nationwide service coverage ratio is about 98%, and it can be said that providing safe water to all people in Japan has been achieved. In the process of improving service coverage, water supply utilities in Japan faced issues including water quality deterioration and insufficient water resources attributed to rapid economic growth, population increase, and high non-revenue-water (NRW) ratio. Considering that many developing countries are facing similar challenges, Japan's past experiences may be valuable for the improvement of water supply infrastructures in developing countries. The Japanese government, as a member of the international community, has an opportunity to contribute to improving water supply sector in developing countries with its advanced technology and abundant experience and knowledge.

On the other hand, in order to realize a project under the Japanese ODA scheme, it is necessary for an applicant country to make a formal request to Japanese Government. A future water supply plan is a key component in the application and approval process. However, in many developing countries, water supply plans (e.g., master plans and feasibility studies) are not elaborated enough to clear the appraisal process of the Japanese government, and this is regarded as a major factor hindering formulation of development projects. Accordingly, it is necessary for the Japanese government to assist in the formulation of such projects cover the deficiencies in planning capacity in recipient countries, making full use of technologies and experiences of water supply utilities in Japan.

The purpose of this work is:

- to provide assistance to central and regional government of developing countries in improving capacity of water development project planning

- to promote formulation of project that has a room to make full use of knowledge and experience of water utilities in Japan.

1.2 Survey Schedule and Survey Contents

The overall survey schedule is shown in **Table 1.2.1**. The total duration of the survey is about 5 months, and reports will be submitted in the end of March. The Survey activities are summarized in **Table 1.2.2**.

Table 1.2.1 Survey Schedule

Item	2017			2018		
	Oct	Nov	Dec	Jan	Feb	Mar
Preparation in Japan						
Survey in Fiji						
Interview Survey						
Reporting in Japan						
Briefing to Fiji Side						
Submission of Final Report						△
Key Meeting with Fiji Side		●			●	

Source: Survey Team

Table 1.2.2 Survey Activities

Stages	Period	Activities
First Assignment (Work in Japan)	From end of Oct 2017 to end of Jan 2018	· Review of existing plan · Preparation of study contents and schedule · Preparation of Draft Final Report · Interview survey to comprehend current situation, etc.
Second Assignment (Work in Fiji)	From end of Jan 2018 to middle of Feb 2018	· Explanation and discussion with the Fijian side · Data collection and analysis
Third Assignment (Work in Japan)	From end of Feb 2018 to end of Mar 2018	· Preparation and submission of Final Report

Source: Survey Team

1.3 Survey Team

The Survey Team consists of the following members:

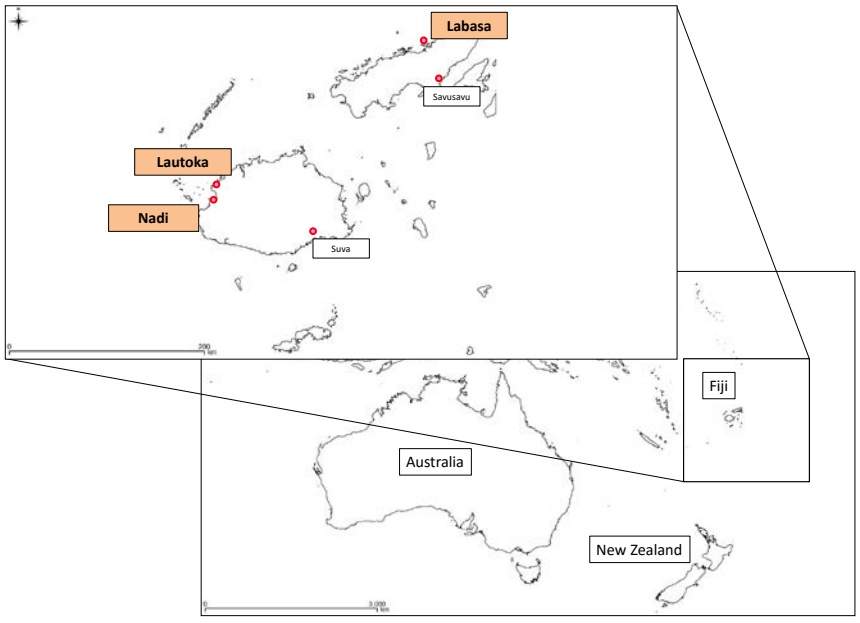
Table 1.3.1 Survey Team members

Name	Job title	Occupation
Mr. Toru KAJIWARA	Project Planning	The Ministry of Health, Labour and Welfare of Japan (MHLW)
Mr. Ryota Ushio	Project Planning	The Ministry of Health, Labour and Welfare of Japan (MHLW)
Mr. Shinkichi KOBAYASHI	Chief Consultant	Nihon Suido Consultants Co., Ltd.
Mr. Takahiro NAKATA	Deputy Chief Consultant/ Water Supply Engineer	Nihon Suido Consultants Co., Ltd.
Mr. Keita SHINJYO	Water Supply Engineer	Ryusei Consultant Co., Ltd
Mr. Wataru HASEGAWA	Water Supply Engineer	Ryusei Consultant Co., Ltd
Mr. Kenta IMAI	Coordination and local logistics	Omae Co., Ltd
Mr. Keizo WATANABE	Water supply management operation and maintenance	Fukuoka City Waterworks Bureau
Mr. Yuji NISHIYAMA	Water supply management operation and maintenance	Fukuoka City Waterworks Bureau

Source: Survey Team

1.4 Survey Area

Survey area is shown in **Figure 1.4.1**.



Source: Survey Team

Figure 1.4.1 Survey Area

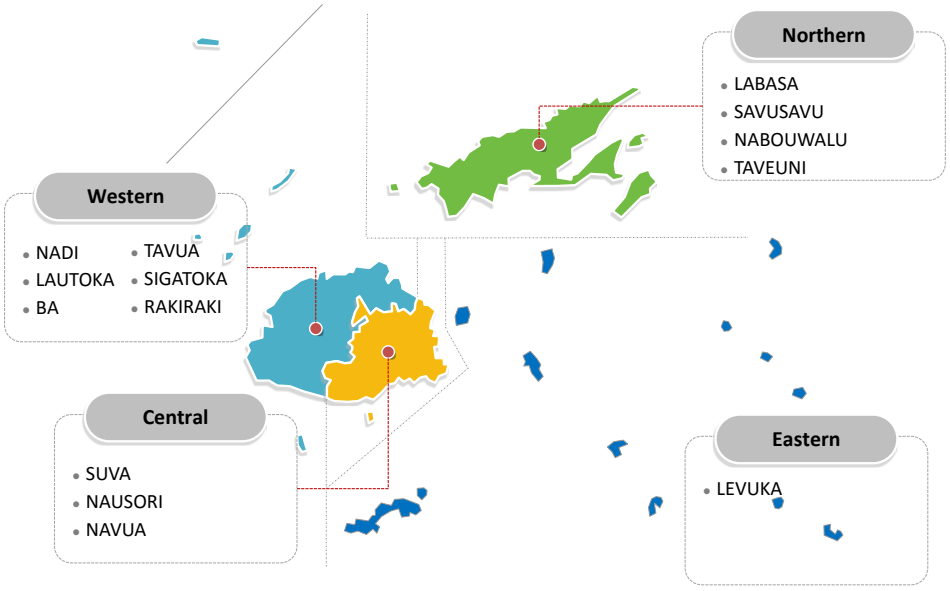
2. Understanding of the Current State of Target Projects

2.1 Current situation and problems of water supply project in Fiji

2.1.1 Current status of water supply (at the National Level)

Water supply facilities in Fiji are divided into urban water supply systems targeting urban areas and village water supply targeting rural communities. The water supply penetration rate in 2015 is 98% in urban areas and 58% in rural areas. In urban areas, the penetration rate is high, but in rural areas the water supply service rate is still low.

Urban water supply is under WAF, covering the northern area, central area, eastern area, and western area. Target areas are as follows.



Region	Contents
Central Region	Nasinu, Suva, Lami, Navua, Nausori, Korovou 332 villages in the Central Division
Northern Region	Savusavu, Labasa 292 villages in the Northern Division
Western Region	Ba, Lautoka, Nadi, Tavua, Sigatoka, Rakiraki 331 villages in the Western Division
Eastern Region	Levuka, 219 villages in the Eastern Division
Rural and Outer islands	
Rotuma and Rabi	

Source: WAF Strategic Plan 2017-2019

Figure 2.1.1 WAF Service Area

Many water supply systems for urban water supply have been started since the UK rule era. In general, gravity flow from a clean upstream surface water source was applied, and only filtration was introduced for water treatment process. However, in recent years, due to turbidity increases especially in rainy seasons that are supposed to be attributed to impact by deforestation, introduction of rapid sand filtration has become a main stream in water treatment process..

The water supply coverage ratio is high, but water supply facilities have problems such as aging, shortage of the water source in the dry season, the high NRW ratio (more than 30% in Nadi and Lautka), the lack of capacity of the main trunk line, high electricity bill and equipment failure.

Rural water supply in rural areas is under the jurisdiction of the Department of Water and Sewerage (DWS) belonging to the Infrastructure and Transport Ministry.

With the support of JICA, rural water supply scheme with EPS (Ecological Purification System) was implemented in 2013. After that, the MoIT has been promoting introduction of EPS for Rural Water Schemes since 2015.

2.1.2 Problem in water supply (at the National Level)

The problems of the water supply sector in Fiji are summarized in **Table 2.1.1**.

Table 2.1.1 Outline of Problems for Water Supply Sector in Fiji

Category		Problem	Severity Level[*1)]			Remark
			L	M	H	
System and Organization	a)	The institutional definition of the water service is unclear	○			Organization and institutions are in place.
	b)	There is no apparent will for self-supporting endeavor.	○			The intention of self-help efforts at the work site is high. However, budget is insufficient
	c)	The organizations to implement projects are not set up.	○			Organization exists nationwide.
	d)	The number of engineers is insufficient compared with the number of water service facilities to be developed.		○		Shortage of water supply engineers.
		The policy decision division and the working division are separated due to privatization		○		It is not privatized. However, the policy decision division is in the headquarters and is a separate organization from the local operation division.
Planning and Coordination	e)	No high-level plans (such as master plan) are provided.		○		Master plan is in place. However, revision is also necessary.
	f)	There is no coordination between the recipient country and the international organization.			○	Organization has not been adjusted.
	g)	There is no balance between water service facilities (in terms of water quantity and level of progress)			○	The disparity between major urban cities and local areas is large.
	h)	There is no balance between related fields (water resources, sewerage and urban plans).			○	Sewerage maintenance is also done, but maintenance is delayed. Conservation of water sources is an issue in particular.
Management and Finance	i)	Funding is insufficient for the size of the projects.			○	Insufficient funds for projects to be maintained.
	j)	There is no established policy or system of water charge collection.		○		The collection system and the charge system are in place. However the water charge is kept low.
	k)	Independent profitability is not maintained.			○	Instead of independent profitability, income from the water tariff is put in the national treasury and the necessary budget for operation and maintenance is paid from the country.

Category	Problem	Severity Level*1)			Remark
		L	M	H	
	l) The repair costs are not provided.		○		Although repair expenses are secured, they are inadequate, and appropriate and necessary repair is not possible.
	m) The purchase cost of chemicals has not been acquired.		○		Cost is secured.
Operation and Maintenance	n) There are no established operating and maintenance standards.		○		Manuals and guidelines for operation and maintenance management of WTP are not in place.
	o) Facilities are not maintained in an appropriate manner.			○	Systematic operation maintenance is necessary.
	p) The number of engineers is insufficient compared with the amount of maintenance necessary.		○		Shortage of skilled technicians.
Technology	q) There are no established design standards.			○	Fiji's design standards are not maintained and international standards are used for each project.
	r) The technologies in use are not appropriate.		○		It is not necessarily appropriate.
	s) The engineering level is inappropriate for the level of development required.			○	Shortage of engineers and skills..
	t) The engineering level is inappropriate for the level of operation and maintenance required.			○	Shortage of engineers and skills.
Others	u) Lack of water source due to decrease in rainfall		○		Due to changes in the rainfall patterns, water shortages occurr during the dry season.
	v) Lack of equipment		○		Required equipment may be supplied from the center but it takes time.
	w) Transfer of water supply business to city/enterprise	○			WAF is implementing and transfer is not considered.

*1): Severity level: L = Low, M = Middle, and H = High
Source: Survey Team

2.1.3 Problems with Sanitation and Water-borne Infectious Diseases (at the National Level)

Identified numbers of waterborne diseases during 2013 to 2016 are shown in **Table 2.1.2**.

Table 2.1.2 Rate of Waterborne Diseases in Fiji (by Disease)

Name of Disease	Unit	2013	2014	2015	2016
Diarrhea	person	25,805	34,670	27,328	33,720
Typhoid	person	492	698	423	390
Infectious Hepatitis	person	225	324	318	159

Source: Annual Report of Ministry of Health and Medical Services.

2.1.4 Current status of water supply in the West and the North

(1) The current status of water supply in the West

In the West, urban water supply is being implemented in 6 cities of Nadi and Lautoka, Sigatoka, Ba, Tavua, and Rakiraki. Nandi and Lautoka, the central cities of the West, are considered as the target area of the study. Water consumption in Nadi and Lautoka is summarized in the table below.

Table 2.1.3 Water Consumption in Nadi and Lautoka

Region	Domestic Consumption (m^3/d) (2013)	Commercial Consumption (m^3/d) (2013)	Government Consumption (m^3/d) (2013)	Total (m^3/d) (2013)
Lautoka	19,340	6,020	1,270	26,640
Nadi	19,030	11,960	420	31,430
Total	38,380	17,990	1,690	58,070

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

Nadi and Lautoka has three water treatment plants, namely Nagado WTP (sourced from Vaturu Dam), Buabua WTP (sourced from Buabua and Nalau) and the Saru WTP (sourced from Varaqe). All three water treatment plants are interconnected with and water is supplied to the entire Nadi and Lautoka area. The main water supply facilities of Nadi and Lautoka are as follows.

Table 2.1.4 Major Facilities in Nadi and Lautoka

Category	Location/No.	Details
Sources	4	Vaturu Dam supplies water to Nagado WTP Buabua and Nalau Intake supplies water to Buabua WTP Varaqe Intake supplies water to Saru WTP
WTP	Nagado WTP Buabua WTP Saru WTP	104 ML/d 9 ML/d 5 ML/d
Service and Clear Water Reservoirs	20 Reservoirs	3 Clear Water Storage 2 Bulk Reservoirs 15 Service Reservoirs
Pumping Stations	1	Momi Pumping station owned by FNPF development
Distribution/Reticulation		1,059 km of trunk mains and distribution pipes
Water Meters		36,512 active meter connections

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

(2) The current status of water supply in the West

Urban water supply in the North is implemented in five central cities: Labasa Town, Savusavu, Nabouwalu, Seaqaqa and Taveuni. Labasa Town. This region is designated as the main study target area. Recent water consumption in Labasa is shown in the table below.

Table 2.1.5 Water Consumption in Labasa

	2013	2014	2015	2016	2017
Consumption (m^3/year)	4,251,433	4,471,673	4,737,155	4,945,591	5,089,324

Source: WAF

The water system of Labasa Town is largely divided into two systems; the Benau WTP system which supplies water to the center of Labasa town and a tube well system which serve water to the mountain

areas. Benau WTP system is the major system in which water is transmitted from WTP to Benau Reservoir, Naseakula Reservoir, and Volanau Reservoir and then distributed to most of the major area. In the tube well system, water is distributed after chlorination at each water source.

The main water facilities in the current Labasa Town are as follows.

Table 2.1.6 Major Facilities in Labasa

Distribution Area	Water Source	WTP	Reservoir
Labasa town Nasarava area Nakama area	Nasealevu Source Navau Source Nasarava Source Nakama borehole	Benau WTP	Benau Reservoir Naseakula Reservoir Volanau Reservoir
Nasalasala area	Nasalasala Source	-	Nasalasala Reservoir
Nabekavu area	Nabekavu Borehole	-	Nabekavu Reservoir
Vunicuicui area	Vunicuicui Borehole	-	Vunicuicui Reservoir
Vunika area	Vunika Source, Vunika Borehole	-	Vunika Reservoir

Source: Survey Team

2.1.5 Problem and current status of water supply in the West and the North

(1) The problem of water supply in Western Division

1) Planning

Water demand forecasts in the western region (Nadi and Lautoka) are shown in **Table 2.1.7**.

Table 2.1.7 Water Demand Forecast in Nadi and Lautoka

Item	2013	2018	2023	2028	2033
Population (person)	169,643	194,366	222,776	244,888	269,179
Served population (person)	152,272	174,459	203,259	223,407	245,550
Water supply rate (%)	90	90	91	91	91
NRW rate (%)	39.51	20	20	20	20
Consumption (daily average) (m^3/day)	960,000	104,970	117,220	127,380	142,050
Consumption (daily maximum) (m^3/day)	102,000	113,000	127,000	138,000	153,000
WTP Capacity (m^3/day)	104,000	134000	144,000	144,000	154,000
Nagado WTP	90,000	120,000	120,000	120,000	120,000
Saru WTP	9,000	9,000	14,000	14,000	14,000
Buabua WTP	5,000	5,000	10,000	10,000	10,000
New WTP	-	-	-	-	10,000
Expansion capacity (m^3/day)	-	30,000	10,000	-	10,000

Source: Master Plan for Nadi/Lautoka Regional Water Supply Scheme

In order to satisfy increasing future water demand, it is required to expand Nagado WTP by 2018, Saru WTP and Buabua WTP by 2023 together with development of new water sources. It is necessary to review the plan in the near future with consideration of the 2017 census results, the resort development plan, and the realistic reduction plan of NRW ratio.

2) Water source and raw water transmission

Vaturu Dam, the main water source of the area, was built in 1982. Currently, algae growths are increasing and causing odor problems in the Nagado WTP. Since there is no access restriction to the water source basin, the dam water is being contaminated by people, livestock, and others. As for the water sources of Buabua WTP and Saru WTP, there are farmlands in the upstream areas and contamination by agricultural chemicals and fertilizer are suspected. These water sources have high turbidity during rain events, and the intake facilities are vulnerable to flooding. It is also pointed out that the current intake configuration is insufficient to secure water during the dry season.

In raw water transmission system, a part of the pipeline from Vaturu Dam to Nagado WTP is damaged and reliability of the system is low, such as during emergency use. However, no major problems have been pointed out at present.

3) Water Treatment Plants

Survey on water treatment plant performance resulted in two divergent views. One view stating that treatment plants are overloaded and operated above capacity and another stating that there is excess capacity were heard. However, actual production volumes are not known due to malfunctioning flowmeters.

In addition, countermeasures for power failure are insufficient since generators are not installed. Safety management of chemical dosage and countermeasures for power failures of dosing equipment are also insufficient.

4) Transmission and distribution Pipeline

Some of the water distribution pipes are 50 years old and require replacement. About 100 km of asbestos cement pipe (ACP) is installed and its susceptibility to leakage is one of the main reasons of water leakage and water suspension. In addition, it is thought that insufficient capacity of the pipelines and leakages are one of the reasons for lack of water pressure and failure to achieve 24 hour continuous water supply.

5) Operation and Maintenance

While chlorine gas is used for disinfection, safety measures are not taken. Education and training on safety is also required. Activities of NRW reduction are being promoted through “Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji” by Fukuoka City. The activities are expected to proceed to the next step of countermeasures such as detection of underground water leakage.

In addition, it is necessary to improve water quality management, including measurement of residual chlorine at the end of the water supply system (water faucet) and chlorine injection control including during power suspension.

(2) The problem of water supply in Northern Division

1) Planning

Water demand forecasts in Labasa are shown in **Table 2.1.8.**

Table 2.1.8 Water Demand Forecast in Labasa

Item	2013	2018	2023	2028	2033
Population (person)	53,310	56,276	59,426	62,773	66,329
Served population (person)	42,355	50,950	59,426	62,773	66,329
Water supply rate (%)	79	90	100	100	100
NRW rate (%)	29.72	20	20	20	20
Consumption (daily average) (m^3/day)	11,850	18,150	20,650	21,980	24,120
Consumption (daily maximum) (m^3/day)	14,820	22,690	25,810	27,470	30,140
WTP Capacity (m^3/day)	10,000	15,000	15,000	15,000	15,000
Expansion capacity (m^3/day)	5,000	8,000	11,000	13,000	15,000

Source: Master Plan for Labasa Regional Water Supply

Development of new water sources and construction of new WTP together with new distribution pipeline system are required to satisfy future water demand. The above water demand was forecasted in the master plan. It is an estimate assuming that countermeasures are taken and NRW rate will be reduced to 20% by 2018. Since there is a deviation from the current demand values, it is necessary to review the plan.

2) Water Source and Raw water transmission

Due to the impact of climate change in recent years, there are variations in water intake capacity from year to year, and available water from some of the sources is insufficient especially during drought. Raw water form exiting water sources for Benau WTP is insufficient in dry period, which is just enough for treatment capacity in 2013. During heavy rain period, earth and sand entered from the surrounding area into the intake and the turbidity of the raw water rises. The sludge in the water supply facility causes poor treated water quality and shortage of treated water due to frequent backwash of filter.

About 50 years have passed since the water pipelines were laid, and it is time to replace them. Exposed iron and PVC pipes are laid along the river from water source. Since scale of flood is escalating in recent years, risk of damage to these pipes from drifting materials such as earth and sand, wood, and rocks is expected to increase.

3) Water Treatment Plants

There are two water treatment systems in Benau WTP, System 1 and System 2. Since the clarifier is out of order in System 1, and it is not installed for System 2, direct filtration is applied for water treatment. Serious problems are not reported in normal operation when the turbidity of raw water is low. However, when the turbidity rises during rain events and seasons, water cannot be treated properly and clear water cannot be distributed. Frequent back washing of the filter is also required, which cause shortage of water. Therefore, it is necessary to re-establish the flocculation and

sedimentation system. It is also necessary to investigate the composition of thickness, material and evenness of filter media and then to review the backwash method.

4) Transmission and distribution Pipeline

Transmission and distribution pipes were layed over 50 years ago and the consequences of the advanced age is cause for concern. About 33 km of asbestos cement pipe (ACP) are in the system. Due to its susceptibility to leakage and pipe burst, WAF is now undertaking replacement of ACP. It is also necessary to control hydraulic pressure of pipes in order to reduce water loss through drain valves for pressure control. WAF has installed a pressure reducing valve, but they are not necessarily installed at an appropriate position. It is pointed out that water transmission pipes from the Benau WTP to Volanau reservoir burst frequently due to difficulty of pressure management. Technical advice and assistance on water pressure management will be required to reduce water loss and suspension of water supply. Insufficient capacity and vulnerability of existing pipes shall also be settled in a proper manner in order to keep adequate water pressure and to achieve 24 hour continuous water supply.

Leakage from reservoirs is also observed, which affects to water shortage. While WAF takes this problem seriously and plans to repair cracks on walls, if methods such as crack filling with mortar cement are used, the effects of the repair works will not last long.

5) Operation and Maintenance

Screen at the inlet of intake facility is clogged with fallen leaves and other materials when it rains and designed water intake volume cannot be transmitted. In order to cope with the problem, care takers are assigned at each intake facility to inspect and clean the facility periodically. While WAF takes measures against high turbidity during rainfall in an improved manner, there is a room for additional improvement. Further arrangement of water intake facilities and improvement of management methods can be considered. In addition, it is required to review methods of pipe cleaning and pressure control using drain valves from the viewpoint of reducing water loss.

It is also required to improve operation methods of water treatment plant. Operation manual and drawings of the facilities in WTP cannot be found on the plant site, O&M section, or even headquarters. Therefore, it is difficult to find proper manners of operation. It is required to find adequate treatment capacity and then to repair broken water flow meters at inlet in order to control water flow rate. Function of flocculation and sedimentation is not available at the WTP and it is very difficult to treat water especially when turbidity of raw water is high. Therefore frequent back wash of filter is required and water loss is significant. Control of chemical dosage ratio and handling of chlorine gas shall also be improved in order to manage treatment process, cost, and safety.

6) Finance

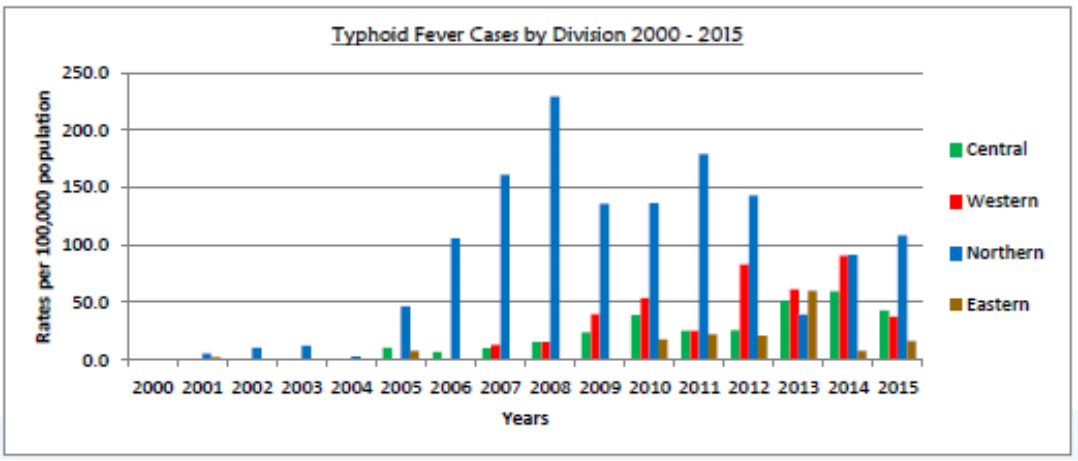
Income of WAF though tariff collection is fully delivered to the national treasury, and expenses are covered by the government's budget. Since the water rate is kept very low, income can cover only about 40% of the expenses. Cost for operation and maintenance are paid to each district from the headquarters in response to request from each district.

Since WAF manages water supplies for all of Fiji, funds for services and development tend to concentrate in the West and the Central regions where population is high and economic scale and development are concentrated. ADB's assistance is also concentrated in the capital city of Suva and major cities. On the other hand, allocation of WAF funds to rural cities is limited. Therefore, the budget for improvement and development of water supply facilities is not secured. There also is a problem that support by donors was difficult to enter in the North until now, even though water supply facilities have not been improved or developed for a long period. It is expected to get assistance by donors for the improvement of the situation in the North where importance of development is reconsidered in Look North Policy as national tactics.

2.1.6 Problems with Sanitation and Water-borne Infectious Diseases (Western Division and Northern Division)

Waterborne disease outbreak rate per 100,000 population during 2000 and 2015 by region is shown in **Table 2.1.9**.

Table 2.1.9 Waterborne Disease Rate per 100,000 Population in Fiji (by Region)



Source: Annual Report of Ministry of Health and Medical Services.

In the North, the incidence of waterborne diseases tends to be higher than the other areas. In the Central, the West and East infrastructure development is progressing due to urbanization and the incidence of waterborne infectious diseases is low, but in the North incidence of waterborne disease is relatively high. In the future, improvement of sanitation environment is expected by improvement of water supply facilities.

Table 2.1.10 presents water quality standards for drinking water in Fiji stipulated by the Fiji National Drinking Water Quality (FNDWQ).

Table 2.1.10 Drinking Water Quality Standard in Fiji

Parameters	Unit	FNDWQ Standards (Maximum desirable level)	Parameters	Unit	FNDWQ Standards (Maximum desirable level)
Temperature	° C	Acceptable	Iron (Total)	mg/L	<0.3mg/L
pH	0-14	6.5 to 8.5	Iron (Soluble)	mg/L	<0.3mg/L
Conductivity	uS/cm	<1,000 uS/cm	Manganese (Total)	mg/L	<0.1mg/L

Parameters	Unit	FNDWQ Standards (Maximum desirable level)	Parameters	Unit	FNDWQ Standards (Maximum desirable level)
Salinity	ppt	<1 ppt	Manganese (Soluble)	mg/L	<0.1mg/L
Color	TCU	≦5 TCU	Aluminum	mg/L	<0.2mg/L
Turbidity	NTU	≦5 NTU	Calcium	mg/L	<100 mg/L
Alkalinity	mg/L	<200 mg/L	Magnesium	mg/L	<180 mg/L
Bicarbonate	mg/L	<100 mg/L	Copper	mg/L	<1.0mg/L
Carbonate alkalinity	mg/L	<100 mg/L	Total Available	mg/L	NA
Total Hardness	mg/L	<200 mg/L	Free Available	mg/L	0.2-0.5mg/L
Calcium Hardness	mg/L	<100 mg/L	Nitrate Nitrogen	mg/L	<50 mg/L
Magnesium Hardness	mg/L	<100 mg/L	Ortho-phosphates	mg/L	NA
Total Dissolved Solids	mg/L	<500 mg/L	BOD	mg/L	NA
Total Suspended Solids	mg/L	NA	Total Coliforms	1cfu/100mL	<1cfu/100mL
Dissolved Oxygen	mg/L	>5 mg/L	Fecal Coliforms	1cfu/100mL	<1cfu/100mL
Chlorides	mg/L	<250 mg/L	E-coli	1cfu/100mL	<1cfu/100mL
Fluorides	mg/L	<1 mg/L			

Source: the Fiji National Drinking Water Quality (FNDWQ)

WAF conducts water quality measurement. The issues of water quality are as follows.

- Turbidity of treated water and water distribution network often exceeds water quality standard 5 NTU
- Residual salt concentrations in treated water and water distribution network were often undetected (criterion was 0.2 to 0.5 mg/L), and the number of E. coli groups was sometimes detected.
- Residual salt concentration in treated water and water distribution network may be too high (2 to 9.8 mg/L).

In order to improve the above-mentioned water quality issues, studies on introduction of high turbidity raw water countermeasures (for example, water withdrawal facility, sedimentation basin and high speed fiber filtration facility, etc.), a study on improvement method of chlorine injection control, etc. are necessary.

2.2 Related Plans

2.2.1 Outline of Development Plans

The government of Fiji positions the water supply sector as one of the priority sectors of the infrastructure sector. Even in the Constitution of Fiji "Constitution of the Republic of the Fiji Islands Section 36; right of every person ... to clean and safe water in adequate quantities (All people have the right to receive clean and safe water supplies) It can be said that the water supply sector is the most important project.

Initiatives for sustainable development goals (SDGs) in Fiji countries are "The People Charter for Change, Peace and Progress", "Strategic Development Plan 2007 to 2011", "Roadmap for Democracy and Sustainable Socio-Economic Development 2010-2014 , "A Green Growth Framework for Fiji:

Restoring the Balance in Development That is Sustainable for Our Future, 2014"and "5 - Year & 20 - Year - NATIONAL DEVELOPMENT PLAN".

Table 2.2.1 National Development Plans Formulated between 2007 to 2017

Year	Title of Development Plan
2007	「Strategic Development Plan 2007 to 2011」
2008	「The People Charter for Change, Peace and Progress」
2010	「Roadmap for Democracy and Sustainable Socio-Economic Development 2010-2014」
2014	「A Green Growth Framework for Fiji: Restoring the Balance in Development that is Sustainable for Our Future, 2014」
2015	「Fiji National Development Plan 2015」
2017	「5-Year & 20-Year-NATIONAL DEVELOPMENT PLAN」

Source: Survey Team

In 2017, "5 - Year & 20 - Year - NATIONAL DEVELOPMENT PLAN" was formulated as a short - term plan and long - term development plan for Fiji development plan.

Regarding the water supply sector, "20-year national development plan" has efforts to sustainable development goals (SDGs). In the same development plan, "Every Fijian has a right to clean and safe water in adequate quantities. 100% access to clean and safe water will be realized by 2021 and for the rural and maritime areas by 2030." It also states the conservation of water sources, the development of new water sources to cope with future demand in the West and the North, measures against climate change, etc.

"The 5-year national development plan" is planned for the construction of a water purification plant in cooperative financing support project of ADB's green climate fund and EIB (European Investment Bank) GCF (Green Climate Fund) in the Central (capital Suuba) and Expansion of the Nantou Water Purification Plant in the West (Nadi/Lautka), Development Study of New Water Source, etc.

Table 2.2.2 National Development Targets to Achieve SDGs

	2015	2021	2026	2031	2036
Inclusive Socio-economic Development					
Access to clean and safe water in adequate quantities (% of population) (SDG 6.1)	78	90	95	100	100
Access to clean and safe water in adequate quantities, rural (%of population) (SDG 6.1)	58	85	90	100	100
Access to clean and safe water in adequate quantities, urban (% of population) (SDG 6.1)	98	100	100	100	100
Access to central sewerage system (% of population) (SDG 6.2)	25	40	50	60	70
Access to central sewerage system, urban (% of population) (SDG 6.2)	25	40	50	60	70
Access to central sewerage system, rural (% of population) (SDG 6.2)	0	40	50	60	70

Source: 5-Year & 20-Year-NATIONAL DEVELOPMENT PLAN

The above development plan is just on the Viti Levu island in the West and the Central, and the North (Vanua Levu Island) was left behind politically. However, in recent years the population concentration on Viti Levu Island and the development of the North are discussed as issues of "Look North Policy" in the National Assembly, and the importance of development in the North is recognized. Therefore, the construction of new airports, the construction of commercial facilities, etc. were planned.

2.2.2 High-Level Plans and Projects Relevant Plans

High-Level Plans are followings;

(1) WAF Strategic Plan 2017-2019

(2) Master Plan for Water Supply

2.2.3 Urgency and Priority in Fiji with regard to this Project

(1) Urgency in Fiji with regard to this Project

1) The West (Nadi and Lautoka)

The water demand in the Nadi and Lautoka region, where rapid development is expected, is rapidly increasing and expansion of water supply facilities is an important and urgent issue to assist the development. In the region, Fukuoka City is implementing measures to reduce NRW as Grants for Grassroots Projects, and WAF is attempting to take advanced measures for reducing NRW, appreciating the activities of Fukuoka city. There is a desire to develop NRW reduction activities with further advanced measures such as underground leak detection and quick attendance to leakage, technical assistance on which is expected.

2) The North (Labasa and other areas)

Upgrading of facilities, and improvement and expansion of water supply systems were planned in the master plan. However, donors were not found for implementation. Repair of facilities are not done properly due to lack of funds. Sufficient amount of raw water cannot be secured steadily. Moreover, due to malfunctioning of aging facilities the capacity of existing the facilities have been reduced. It is desired to find countermeasures for high turbidity during rain events and also for insufficient water during drought. Dissemination of NRW reduction activities in the North is also expected.

(2) Priority in Fiji with regard to this Project

Nadi and Lautoka is an important region as the centre of tourism and sugar industry in Fiji and rapid development is predicted. Continuous support from Japan to the region is awaited considering the extremely high priority of implementation. In addition, the priority and expectation of implementation of technical assistance projects in the North is also high since water supply facilities and operation and maintenance capabilities are not developed in a proper manner despite being prioritized in the Look North Policy.

2.3 Responsible Agencies and Implementing Agency

The relevant government offices in the project implementation are as follows.

Table 2.3.1 Related Agencies

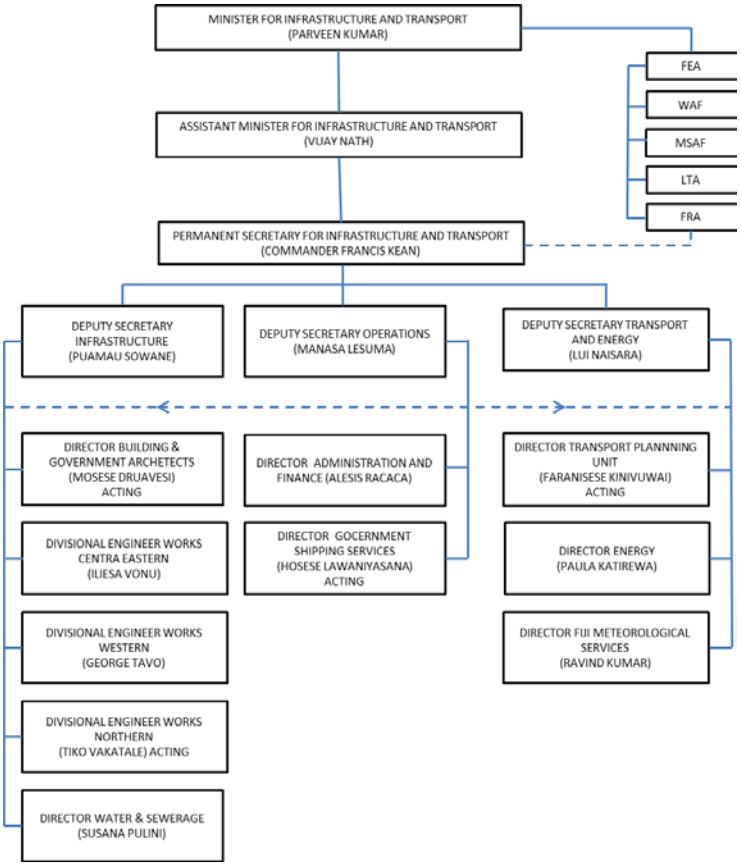
	Related Agencies
Water Supply	WAF: Water Authority of Fiji
Infrastructure	MoIT: Ministry for Infrastructure and Transport

Source: Survey Team

2.3.1 Related Agencies

Water supply in Fiji is under jurisdiction by MoIT. MoIT is engaged in the projects related to public works, meteorology, transportation, utilities in Fiji, policy development on projects, policy planning, design, regulation, coordination and project implementation, water supply projects and related water resources. MoIT has experience in conducting large-scale public works projects, has technical staff, equipment, etc. that can cope with large-scale public works, and has the ability to implement such public works.

WAF under the jurisdiction of MoIT is the responsible authority for administration of water supply and sewerage services. For remote areas such as villages where the WAF does not cover, the Department of Water and Sewerage (DWS) under MoIT is in charge of administration of water supply and sewerage services. The organization chart of MoIT is shown below.

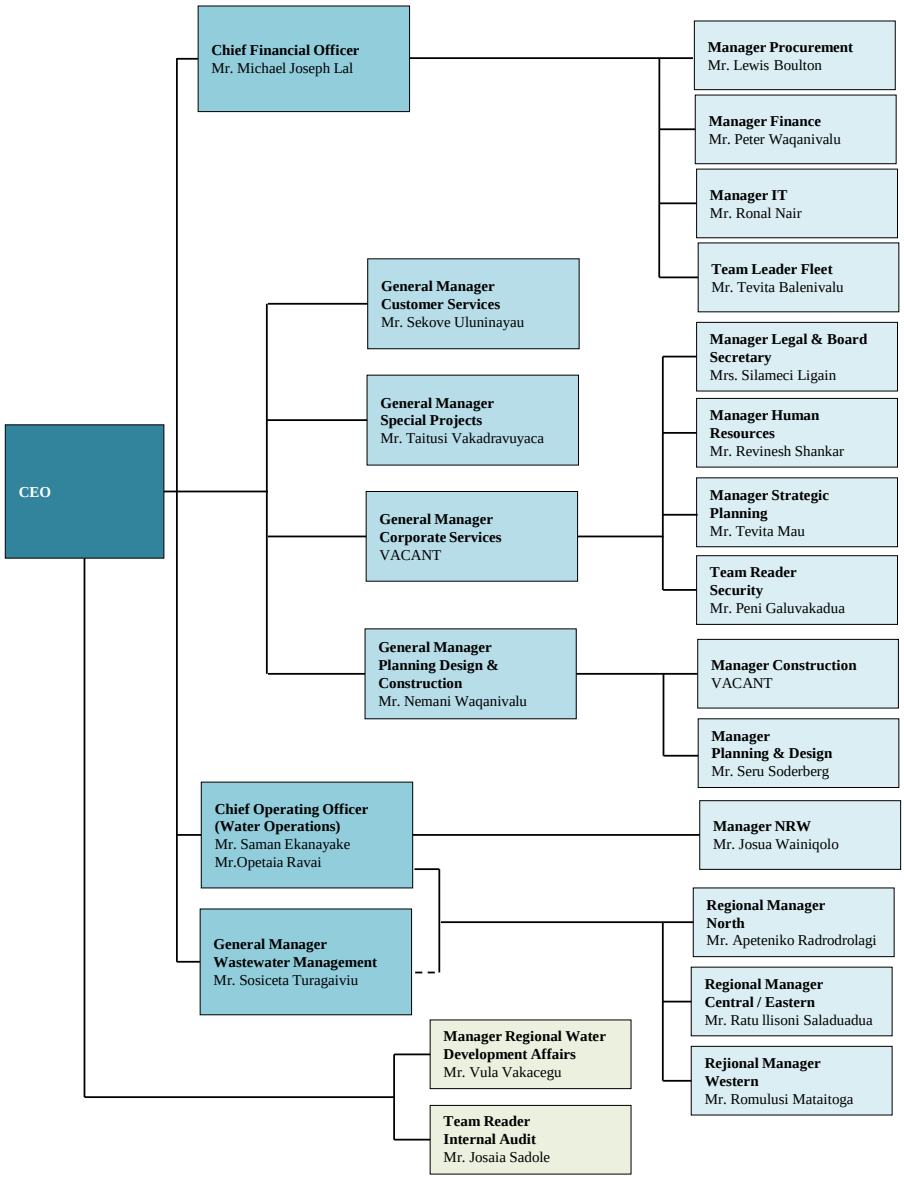


Source: Survey Team

Figure 2.3.1 Organization Chart of MoIT

2.3.2 Organization of Implementing Agency

WAF is the executing agency of Fiji water supply and sewer system. WAF was founded in 2007 by the Government of Fiji. From January 1, 2010, water service responsibility, function and operation of water supply service was officially transferred from the Water & Sewerage Department (WSD) to WAF.. The organization chart of WAF and the management structure arrangement system is shown below.



Source: Survey Team

Figure 2.3.2 Organization Chart of WAF

2.3.3 Task of Implementing Agency

WAF's strategic direction for the future is based on the following two main objectives;

- Providing quality water and waste water services 24/7, nationwide.
- To become financially viable water supply and waste water service provider.

The main function of WAF are shown in **Table 2.3.2**

Table 2.3.2 Function of WAF

a) to harvest, treat and reticulate water for supply to its customers
b) to comply with standards in relation to the supply and quality of water in its Water System
c) to collect, transport, treat and discharge waste water
d) to establish, operate and maintain systems for the provision of water and wastewater services
e) to maintain any State assets transferred to and vested in it by the Government pursuant to the Promulgation or any other

written law
f) to provide technical or expert advice to any other person on matters relating to its functions and powers
g) to progressively achieve economic viability in the provision of water supply and sewerage services
h) to be environmentally responsible in the performance of all its activities
i) to assist in protecting, managing and conserving water resources
j) to assist in the formulation and implementation of national policies or urban and rural land use planning, relating to the use and control of water bodies and resources

Source: WAF Strategic Plan 2017-2019

2.4 History of Japanese Assistance

2.4.1 History of Grant and Loan Aided Project

Cumulative amount of Japanese official development assistance (ODA) including grant and loan aided projects up to 2015 and record of 2015 are presented in **Table 2.4.1**.

Table 2.4.1 Record of Japanese Assistance in Value Terms

Category of Assistance	Assistance in 2015	Cumulative Total up to 2015
Loan Aid	-	22.87 billion Yen
Grant Aid	9.82 billion Yen	199.22 billion Yen
Technical Cooperation Project	6.99 billion Yen	285.21 billion Yen

Source: Japan ODA Country Data Book, Ministry of Foreign Affairs

History of Japanese ODA for water supply and disaster prevention sectors is outlined in **Table 2.4.1**.

Table 2.4.2 History of Japanese ODA Projects for Water Supply and Disaster Prevention

Category of Assistance	Name of Project	Period
Loan Aid	Regional Water Supply Project	Feb 1998; L/A Jul 1999 to Jun 2003
Technical Cooperation Project	The Strengthening Community-based Disaster Risk Management Project in the Pacific Region	Oct 2010 to Oct 2013
Technical Cooperation for Development Planning	The Project for the Planning of the Nadi River Flood Control Structures in the Republic of Fiji	Jul 2014 to Jul 2016
Technical Cooperation Project	Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji	Mar 2014to Mar 2017
Dispatch of Expert	Advisor for Rural Water Supply by Ecological Purification System (EPS) Technology	Nov 2014 to Oct 2018
Feasibility Survey with the Private Sector for Utilizing Japanese Technologies in ODA Projects	The Feasibility Survey for Introduction of Dirty Water Treatment System in Overseas Island Region	Sep 2015 to Sep 2016

Source: Japan ODA Country Data Book, Ministry of Foreign Affairs

In the Nadi and Lautoka region, water supply capacity failed to catch up with the growing water demand, and facilities improvement and expansion were tight tasks. Therefore, as a Japanese loan project detailed design was prepared in 1999 reviewing the plan and implementation of the project for improving and expanding water facilities was completed in 2003. As a result of this project, capacity of water treatment plant was improved and water transmission facilities were rebuilt. It achieved settling of water supply shortage, increase of water supply time, and increase of the number of connections. Although it has contributed to improving the living environment such as the health and

welfare of local residents and the development of industries such as tourism industry, water capacity become insufficient due to further development of the area after that.

The JICA grassroots technical cooperation project is being implemented to compensate for the shortage of water volume by reducing the amount of ineffective water such as leakage. As a result, support in cooperation of schemes, which are improvement of water supply sustem and effective use of tap water by reducing NRW, is continuing. It can be said that they support the water supply from both aspects of hardware and software. Other than urban water supply, cooperation by grant aid, village water supply, youth overseas cooperation party, senior volunteer is also being implemented. In particular, biological purification (EPS) is accepted as an effective means for water treatment in the village water supply section and Fiji State actively promotes its spreading.

2.4.2 History of Technical Cooperation

(1) Technical Cooperation

Table 2.4.3 shows the technical cooperation projects and the development plan that Japan has supported for Fiji countries.

Table 2.4.3 History of Japanese Technical Cooperation Projects

Category	Name of Project	Period
Technical Cooperation	Information and Communication Technologies(ICTs) Capacity Building at the University of the South Pacific	July 2002 to June 2005
	Project for Strengthening EPI in Pacific Region	Feb 2005 to Feb 2010
	In-service Training of Community Health Nurses	Apr 2005 to Mar 2008
	Project for food and nutrition policy	Feb 2007 to Mar 2009
	Meteorology Training	Sep 2007 to Mar 2010
	Operation of Earthquake Observation Network	Nov 2007 to Oct 2011
	Waste Minimization and Recycling Promotion	Oct 2008 to Apr 2012
	ICT for Human Development and Human Security Project	Feb 2010 to Jan 2013
	The Strengthening Community Disaster Risk Management Project in the Pacific Region	Oct 2010 to Sep 2013
	The Project for Strengthening The Need-Based In-Service Training for Community Health Nurses	Oct 2010 to Apr 2014
	System Improvement of Expanded Programme on Immunization in the Pacific Region	Feb 2011 to Feb 2014
Technical Cooperation for Development Planning	The Project for the effective and efficient use of renewable energy resources in power supply. The Project for the Planning of the Nadi River Flood Control Structures in the Republic of Fiji	Aug 2013 to Feb 2015 Jul 2014 to Jun 2016

Source: Japan ODA Country Data Book, Ministry of Foreign Affairs

(2) Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji

In response to JICA senior volunteers (September 2010 to September 2012), Fukuoka City was informed of Fiji's request for technical cooperation on water supply. Fiji was suffering from a high leakage rate (over 50%) and technical cooperation was started by Fukuoka city, which leakage ratio is 2.3% and has the world's top leakage prevention technology.

In this technical cooperation, it covers the water service in Nadi and Lautoka of Fiji. Gravity flow is used for water transmission and distribution. In low altitude areas, the water pressure became excessive and leakage from the water pipe is obvious. There was a problem that the water supply business management. As a countermeasure, Fukuoka City has provided technical support such as demonstration and guidance of leakage investigation and leakage pipe repair technology while improvement of water distribution facilities and water charge collection, meter management, improvement of operation are also expected later. Fukuoka City Waterworks Bureau has dispatched officials about 60 people in over three years, and about 15 trainees was executed in Fiji in the past 3 years for Fiji National Waterworks Engineers (Water Authority Fiji (WAF) officials). In addition, equipment and materials such as ultrasonic flow meters and water leak detectors were also donated. Through technical cooperation, it is thought that Fukuoka city greatly contribute to improving water technology in Fiji crating trust to Japan. Project to support strengthening water supply service in NANDI/LAUTOKA regional is required to be implemented in order to continue this achievement.

2.4.3 Opinions of the Fiji Government and Agencies with regard to this Project

WAF stated to Fukuoka city grass-roots grant aid in Nadi and Lautoka as follows.

"This program has also contributed to the action of WAF and we have reduced the NRW rate from 51.9% to 31.6% in three years, and this reduction amount is worth noting. In this partnership, WAF learned a lot from the best organization (Fukuoka City Waterworks Bureau) and had a great harvest. "

As for the West (Nadi and Lautoka), WAF strongly hopes cooperation by Japan's aid in the future as the Nadi and Lautoka Regional Water Supply Improvement Project by Fukuoka City's Grassroots Technical Cooperation had a big achievement. WAF also noted that it is necessary to implement the project in the North since improvement project has not been undertaken by any donors even if it is not possible to handle the situation by WAF. It is strongly hoped that Japan's future cooperation will come.

2.5 History of Cooperation by Third Countries/International Donors

2.5.1 Record of Assistance and Its Type Related to this Project

(1) The West

Past donor aid projects related to the water supply in the West were ADB's "knowledge and innovation support for ADB's water financing program". ADB also provided piping materials for improvement throughout Fiji.

(2) The North

As assistance from other past donor relating to water supply in the North, Labasa town master plan development work prepared by Australian companies and rapid filtration equipment introduction project introduced throughout Fiji (introduced in Labasa Town and Savu Savu Town).

In 2014 master plan (revised edition) was prepared but there is no aid donor.

(3) The Central

As assistance for water supply and sewerage projects in Suva, ADB and EIB conducted " Urban Water Supply and Wastewater Management Investment Program". Cooperation by third countries /international organizations is as follows.

Table 2.5.1 Major Development Partners

Development Partner	Project Name	Duration	Amount ($ million)
Urban Water Supply and Sanitation			
ADB	Suva–Nausori Water Supply and Sewerage Development	1998–2000	0.8
	Capacity Building in Water and Sewerage Services	2003–2007	0.8
	Suva Nausori Water Supply & Sewerage Project	2003-2013	47.0
	Knowledge and Innovation Support for ADB's Water Financing Program	2008-2020	26.6[1]
	Suva–Nausori Water Supply and Sewerage Project (Supplementary Loan)	2009-2015	23.0
	Project Design Advance Urban Water Supply and Wastewater Management Project	2015-2017	2.7
NZ Foreign Affairs & Trade Aid Programme	Pacific Technical Assistance (Training & Capacity Building)	2015-2016	0.8
Rural Water Supply, Sanitation and Hygiene			
Australian Government (DFAT)	Fiji Community Development Program (Health including WASH)	2012-2015	2.1
	TC Winston WASH Recovery Program	2016-2017	4.0
UNICEF	WASH Resilience Programme SM149910	2015-2017	0.5

ADB = Asian Development Bank, JICA = Japan International Cooperation Agency, UNICEF = United Nations Children's Rights and Emergency Relief Fund.
Sources: Asian Development Bank estimates, UNICEF estimates, Ministry of Economy.

Source: Urban Water Supply and Wastewater Management Investment Program (RRP FIJ 49001-002); DEVELOPMENT COORDINATION

2.5.2 Request for this Project and the Result

According to interview with the relevant officials during the field survey, WAF has no plans for improving water supply in the West (Nadi and Lautoka) and the North (Labasa) at the moment. WAF has not yet sent Japan or other donors the request for cooperation on this matter.

2.5.3 Consistency with Japanese ODA Policy (in terms of Aid Policy by Country, Water and Sanitation Broad Partnership Initiative (WASABI), and Report on Review Meeting on the Evaluation of International Cooperation Projects (in Water Supply Field))

Oceania region is a neighbouring region that shares the Pacific Ocean with Japan and has a vast exclusive economic zone, so it is a maritime transport route for natural resource supply areas and energy resources. It is strategically important for Japan. Also, many countries have historically deep connection with Japan mostly in a sense of society and are important partners in the international community.

The joint declaration "Fukushima · Iwaki Declaration; Prosperous Future to Create together" was adopted at the 7th Pacific Islands Summit (PALM 7) in May 2015. The priority support fields are seven areas of "disaster prevention", "climate change", "environment", "human exchange", "sustainable development", "marine/fishery" and "trade, investment, tourism".

Supports in the water supply field contribute to "the climate change", "sustainable development", "trade, investment, tourism", contributing to the achievement of our country's commitment at the summit.

The basic Japanese ODA policy for Fiji is mainly on support for sustainable economic growth that takes environmental consideration and improvement of living standards of the people;

(1) Environment/Climate Change; To improve ambient environment and to support public health by strengthening our ability to respond to natural disasters and appropriately treating waste."

(2) Overcoming vulnerability; To improve infrastructure, control infectious diseases to improve health standards, improve basic academic ability, support relating to development of rural areas and remote island departments.

2.5.4 Necessity of Collaboration and Coordination with Other International Donors

There is no schedule for the project in the West (Nadi and Lautoka) and the North by aid or collaboration by other donors.

2.5.5 Reasons for the Other International Donors Not to Show Interest to this Project

Interview with representatives of other countries or international donors was not conducted in this survey. Therefore it is necessary to confirm the reason in the future why other donors have interest at the moment. However, it cannot be said that ADB and others are unlikely to extend the assistance done by Suva to Nadi and Lautoka in the West. In the North there are small towns with population of less than 100,000, geographically separated from the Central and the West. Therefore rapid development has not progressed just like Suva, Nadi and Lautoka. This may be the reason why third countries and international organizations have not considered cooperation.

3. Outline of Proposed Plan/Project

3.1 Approach to Remedy Problems

3.1.1 Problems in Water Supply Sector (National Level)

Major problems (national level) identified in water supply sector are as follows.

- Although water demand is increasing as population is increasing and service area is expanding, available water source volume is not secured, and there are areas where water supply is not available for 24 hours.
- The turbidity of raw water rises especially during the rainy season, and it cannot be dealt with existing WTP
- Degradation of WTP function due to aging of facilities, lowering of water distribution function, and lowering of water quality
- NRW countermeasures are being implemented and they are found to be effective. However assistance is required for the NRW reduction activities to be improved and disseminated to other areas in Fiji.
- Operation and maintenance is in poor condition due to lack of knowledge, equipment and materials

3.1.2 Present Status of the Water Supply Business, Problems with the Drinking Water Supply, and Relevance between them and this Project

While problems in the West (Nadi and Lautoka) and the North (Labasa) water supply project are described in Section 2.1.5 above, the relationship of the problems in the water supply and the target in proposed project is shown in **Table 3.1.1**.

Table 3.1.1 Identified Problems and Possible Remedial Approaches in the Proposed Project

Region	Problem	Remedial Approach of Proposed Project
Western division	In order to cope with increasing water demand, expansion of the facility is required. Prepared future plan was not necessarily feasible.	Improve planning ability
	In the dry season, the amount of raw water is insufficient, there are areas where 24 hours of water supply has not been achieved, and there are water breakdown etc.	Improve WTP maintenance and water quality management ability
	The operation management of the water purification plant is not necessarily performed properly. Treatment facilities are inoperative	
	The operation management of the WTP is not necessarily performed properly	
	There are vulnerable water transmission and distribution pipes, causing NRW. Repeated accidents interrupt water supply	Activities for NRW reduction
Northern Division	The existing WTP cannot handle high turbidity intake water that occurs during rain events and rainy season.	Improve WTP maintenance and water quality management ability
	The operation management of the water treatment plant is not necessarily performed properly due to overload operation and deterioration of facilities	
	The facility has also malfunctioned due to shortage of equipment and materials.	
	Water pressure management and water quality management of piping are not	

Region	Problem	Remedial Approach of Proposed Project
	necessarily performed properly	
	There are vulnerable water transmission and distribution pipes, causing NRW. Frequent accidents cause suspension of water supply	Activities for NRW reduction
	Degradation of WTP function due to aging of water supply facilities, lowering of water distribution function, lowering of water quality. Prepared plan was not necessarily feasible.	Improve planning ability

Source: Survey Team

3.1.3 Scope of Cooperation

The cooperation scope of the Japanese side shall be Technical Cooperation for Development Planning including utilization of Japanese technology so that water operation can be efficiently and effectively carried out.

3.1.4 Form of Cooperation

The form of cooperation in Japan shall be technical development cooperation based on development planning survey.

Technical cooperation will support technology transfer of investigation/analysis method and planning method to counterparts while supporting preparation of future plan . The contents of cooperation are the following four points.

① Review of master plan (M/P)

Review the master plan created for Nadi/Lautoka in the West and Labasa in the North to improve the capacity for formulating long-term plan of the WAF headquarters planning department

② Feasibility study assuming commercialization (F/S)

Implementation of feasibility study (F/S) of the water supply expansion plan for Nandi Lautoka in the West will be supported to improve capability of WAF staffs to prepare feasible plan.

In the North, emergency measures will be selected to improve the existing water supply situation due to climate change etc. that leads to grant aid project.

③ Improve WTP operation and water quality management ability

Improvement of operation & maintenance capacity of the water treatment plant is targeted at Nandi and Lautoka in the West and Labasa in the North. Operation & maintenance manual for WTP will be prepared for improving water quality management. Communication of the district manager and the headquarters on maintenance problems shall also be improved.

④ NRW reducing activity

"Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji" is being promoted by Fukuoka city. It is expected to improve the measures by developing the ability of the meter readers and training to acquire the skills of the underground leakage exploration technology. It will aim to improve comprehensive capability to reduce NRW. The

activities shall be disseminated in the North and others. For this reason, training will be conducted using training facilities prepared by Fukuoka City in Nadi and training fields where WAF plans to construct in Suva. There are possibilities of deploying training to waterworks officials in neighbouring countries in the future. Measures to reduce NRW will include water pressure management and pipeline maintenance.

After the completion of the above cooperation, Fiji side is expected to conduct:

1) Establish a water supply improvement plan utilizing the content of recommendations

2) Implement water supply improvement project by securing finance from international organizations.

3.1.5 Implementation Schedule

Proposed implementation schedule is presented in **Table 3.1.2**.

Table 3.1.2 Proposed Implementation Schedule

	1year												2year												3year												Total
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Review of Master Plan																																					12
Feasibility study (F / S)																																					14
Improve WTP maintenance and water quality management																																					7
Reducing non-revenue																																					15

Source: Survey Team

3.2 Objectives of the Project

3.2.1 Short-term Objectives

The short term objective is to improve the living environment and the hygiene environment, corresponding to current water demand by renovation/renewal of aging existing facilities. For the achievement it is necessary to improve water operation efficiency by lowering NRW ratio especially by reducing leakage volume through leakage survey. It is also necessary to improve the safety and stability of water supply by improving management capacity of facility of the northern and western WAF officials and to ensure that safe drinking water is supplied to residents.

3.2.2 Middle- and Long-term Objectives

Middle- and Long-term Objectives is improvement of the living environment and sanitation in the future, and further development of tourism industry and industry. For the achievement it is necessary refurbish and renew old facility that has deteriorated and to respond to the increasing future water demand, by developing new water source, construction of new water treatment plant, and expansion of existing facilities.

3.3 Details of the Project

3.3.1 Overview of the project

(1) Background

The Republic of Fiji (Fiji) is the central state of the Oceania and has a population of about 880,000 people and is composed of about 300 islands including the two major islands Viti Levu (Western division, Central division) and Vanua Levu Island (Northern division).

In 2017, "5 - Year & 20 - Year - NATIONAL DEVELOPMENT PLAN" was formulated as a short-term and long-term development plan for the nation.

In the water supply sector, implementation of Sustainable Development Goals (SDGs) is included in the "20-year national development plan". The same plan also states, "Every Fijian has a right to clean and safe water in adequate quantities. 100% access to clean and safe water will be realized by 2021 and for the rural and maritime areas by 2030." It also includes the conservation of water sources, the development of new water sources to cope with future demand in the western and northern areas, measures against climate change, etc.

"The 5-year national development plan" includes construction of a water treatment plant in the Central District (capital: Suva) and Expansion of the Nantou Water Treatment Plant in the Western Region (Nadi/Lautka) , Development Study of New Water Source, etc are planned with joint financing support from ADB's Green Climate Fund and EIB (European Investment Bank)..

The above plan is prepared for development of the Viti Levu island in the West and the Central while Vanua Levu Island(in the North) was left behind. However, the population concentration on Viti Levu Island and requirement of development of the North are discussed as "Look North Policy" in the National Assembly, and the importance of development in the North is recognized. The development plan in the North includes construction of new airport shopping mall, university and others.

Fiji has environmental vulnerabilities particular to small island countries. It ranks 16th among 171 countries on the UNU disaster risk index (FY 2016), and cyclone damage occurs often. Damages sustained from Hurricane Winston in 2016 amounted to 30% of National GDP. Frequent recurrence of such events puts the country at risk of financial collapse and actions need to be taken.

As the secretariat of the Pacific Islands Forum (PIF), Fiji plays the central role in the Pacific countries. It is supportive of Japanese policies in the region and Fiji-Japan relations are good. In order to maintain cooperative relations with Fiji which has influence in the Pacific, continued support for the country is important.

The joint declaration "Fukushima · Iwaki Declaration; Building Prosperous Future Together" was adopted at the 7th Pacific Islands Summit (PALM 7) in May 2015. The declaration prioritizes seven fields, namely; disaster prevention, climate change, environment, interpersonal exchange, sustainable development, marine/fishery, and trade, investment, tourism. Support in the water supply sector will

contribute to fields of the climate change, sustainable development, and trade, investment, tourism priorities and lead to the achievement of Japan's commitment at the summit.

The government of Fiji positions the water supply sector as one of the priority sectors of the infrastructure sector. The Constitution of Fiji indicates "Constitution of the Republic of the Fiji Islands Section 36; right of every person to clean and safe water in adequate quantities (All people have the right to receive clean and safe water supplies)". Development of the water supply sector is one of the most important issues.

Since the income level of Fiji is classified as middle income country, application of grant aid cooperation shall be considered carefully. In project preparation, the appropriateness of the project should be reviewed according to the "effective use of grant aid for countries with relatively high income levels" policy of the International Cooperation Bureau, Ministry of Foreign Affairs of Japan.

Water supply and sewerage systems in Fiji are managed by Water Authority of Fiji (WAF) under the jurisdiction of the Ministry of Infrastructure and Transport (MoIT). While coverage ratio of water supply is very high, budget for rehabilitation is generally insufficient. Combined with the age of the system, delays in repair and maintenance need to be solved. Climate change also affects water supply system. Water source (river) salinization, water shortage during dry seasons and periodic turbid water due to local severe rain events all cause poor treated water quality and water shortage. As the president of COP23, Fiji gives high attention to natural energy and possibility of applying Japanese technology for energy production. Solar power generation and small hydropower generation, will also be considered.

Located in the West, Nadi and Lautoka are the third and the second largest cities in the country, respectively. Nadi is an important center for the tourism industry where the international airport is located. Lautoka is the center of the sugar industry. The demand for overseas travel by Japanese people is expected to increase since direct flights between Narita and Nadi are scheduled to resume from July 2018. "Nadi Lautoka Regional Water Supply Improvement Project" and "Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji" were implemented as Japanese assistance in Nadi and Lautoka. These projects have greatly contributed to the development of the water sector in Fiji and are highly appreciated. Therefore, continuation of Japanese cooperation in the future is anticipated. A new master plan was prepared by WAF but it is not necessarily feasible. The master plan should be reviewed and a feasibility study considering the effects of climate change should be implemented. NRW reduction activities carried out by Fukuoka City are also needed to proceed to the next stage, and then spread to other areas. Improvement and expansion of water facilities together with reduction of NRW will contribute to overcoming water shortage. Satisfaction of increasing water demand for industry and tourism will lead to promotion of the national economy including improvement of health and welfare of residents and tourism industry which is the country's largest source of foreign currency acquisition.

Water supply in the North is not stable. 24/7 supply is not possible and water supply is suddenly suspended due to poor condition of existing water facilities and water sources. In addition, it is

difficult to supply safe water continuously. Water treatment plants cannot cope with high turbidity during heavy rains. During these times, clean water cannot be supplied and water supply is suspended. WAF has reviewed the master plan in 2014 for water supply in Labasa, the central city of the northern region, but the study is not necessarily feasible. Action for improvement of water supply in Labasa has not been taken following the master plan. Water supply in Taveuni Island and Savusavu Island in the North, which is a global tourist destination for yachtsman etc., also face many problems. Despite being a priority area as stated in the Look North Policy, measures to improve water supply in the North and capacity development of WAF staff are hardly taken. Under such circumstances, it is an urgent task to review the water supply improvement plan and prepare an emergency program, which includes support for improving existing facilities. Capacity development of WAF staff and dissemination of NRW reduction measures are also important and urgent tasks.

Expectations for Japan's technical cooperation on water supply are increasing in the West where rapid and major development is planned and also in the North where existing water supply system is in poor condition while importance of area is recognized in the new policy.

(2) Target of proposed plan

The results of the master plan and feasibility study are approved by the government of Fiji.

(3) Achievement target by utilization

Improvement of water service in the West (Nadi and Lautoka) and Northern

(4) Achievement

Review of the water master plan in the West (Nadi and Lautoka) and Northern (Labasa)

- The status of existing water supply facilities and water supply services in the project target area will be analysed
- Forecast of water demand and plan of utilization of water resources in project target area will be formulated
- Improve planning ability of WAF staff
- The master plan will be reviewed

Feasibility study of priority project

- A priority project is selected and its F/S plan is formulated
- Urgent projects are identified and request forms are made (for JICA’s assistance)
- Capability of WAF staff for water supply planning will be strengthened
- NRW reduction activity (pilot project, equipment provision)
- Knowledge of NRW reduction methods by WAF staff deepens
- Water leakage detection and repair ability of WAF staff be strengthened

- NRW reduction measures spread to the northern area

(5) Main activities

- Implementation of basic survey
- Review of water supply master plan in Western division (Nadi and Lautoka) and Northern division (Labasa)
- Formulation of F/S for priority project
- Technology transfer to counterparts (OJT, training, cooperation with Fukuoka's activity)

(6) Implementation system

Executing agency; WAF

Related institution; Ministry of Foreign Affairs & International Co-operation; MFA&IC and Ministry for Infrastructure and Transport

(7) Implementation period

The project implementation period is about 3 years.

3.3.2 Details, Scale and Quantities of the Project

The project contents of Technical Cooperation for Development Planning are as follows.

Table 3.3.1 Project Outline

Project Achievement		Activity
Review of Master Plan for Nadi/Lautoka and Labasa Regional water supply	The status of existing water supply facilities and water supply services in the project target area will be analyzed	Review of existing water supply M/P Collection and analysis of existing data and information including : Urban Planning and Land Use Plan, Nature, society, economic conditions Survey on current situation of water source/water supply facilities Review of problems in water supply system Review basic target including population, unit consumption, service area and others Review of water demand forecast Review of water source plan Review of water supply pipeline plan (raw water transmission pipe, clear water transmission pipe, and distribution pipe) Review of water reservoir facility plan Review of water treatment plant plan Stepwise water supply improvement plan Revision of estimated project cost Environmental and social considerations Proposal of priority project F/S of the priority project Selection of urgent project
	Forecast of water demand and plan of utilization of water resources in project target area will be reviewed	
	The water supply master plan will be reviewed	
Feasibility study of priority projects and selection of urgent project	Improve planning ability of WAF staff	
	Priority project is identified and its F/S will be implemented	
Improve WTP maintenance and water quality	Staff capacity of WAF's maintenance department will be improved	Review of water treatment development plan Suggestion on operation and maintenance of water treatment plan and pipes for improvement.

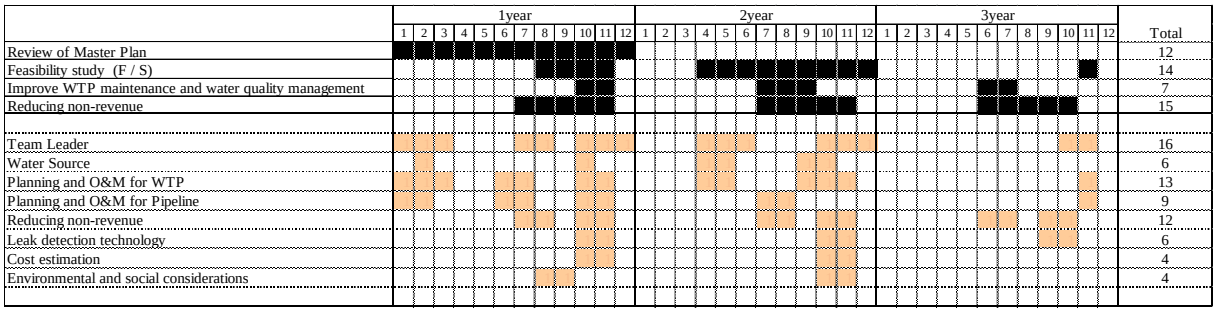
Project Achievement		Activity
management ability	Communication between WAF district charge and WAF headquarters will be improved	Assistance on preparation of operation and maintenance manual of water treatment plant, Support for improvement of drawings Assistance on preparation of water quality management manual Guidance on safety measures
NRW Reduction Activity (pilot project, equipment provision)	The ability for NRW management will be improved	Education and training of basic knowledge for reduction of NRW Support on preparation of pilot activity plan Promotion on installation of water meter Assistance on capacity development of meter readers Training on Leak detection and repair activities (OJT) Promotion of dissemination of NRW reduction measures in the North Evaluation and recommendation of effect
	Ability to detect water leakage will be improved	

Source: Survey Team

3.3.3 Dispatch of Experts and Equipment to be provided

Dispatch of Experts and Equipment to be provided are as follows.

Table 3.3.2 Dispatch of Experts and Equipment



Source: Survey Team

(1) Required Experts

Expert	Tasks
① Team Leader/Water supply planning	• Project implementation • Master plan formulation • Feasibility study of priority project
②Water source plan	• Evaluation of new water sources and existing water sources • Groundwater exploration
③ WTP planning and maintenance	• Master plan formulation • Feasibility study of priority project (Including repair plan) • Guidance on operation and maintenance (manual creation) • Water quality management
④Planning and maintenance of pipeline	• Master plan formulation • Feasibility study of priority project (Including repair plan) • Water pressure management plan • Maintenance guidance
⑤ NRW reduction plan	• NRW reduction plan • Basic education for reducing NRW • Proposed organization reform plan

Expert	Tasks
	• Training plan for meter reader
⑥Leak detection technology	• Pilot project implementation • Leakage exploration technology training
⑦Cost estimation	• Master plan formulation • Feasibility study of priority project
⑧ Environmental and social considerations	• Master plan formulation • Feasibility study of priority project

Source: Survey Team

(2) Required Equipment

・Providing and setting up equipment for water meter equipment

・Providing equipment for leakage exploration equipment

・Equipment for water quality inspection equipment

・Measures for improving WTP and equipment required for activities for countermeasures against NRW

3.3.4 Estimated Project Cost

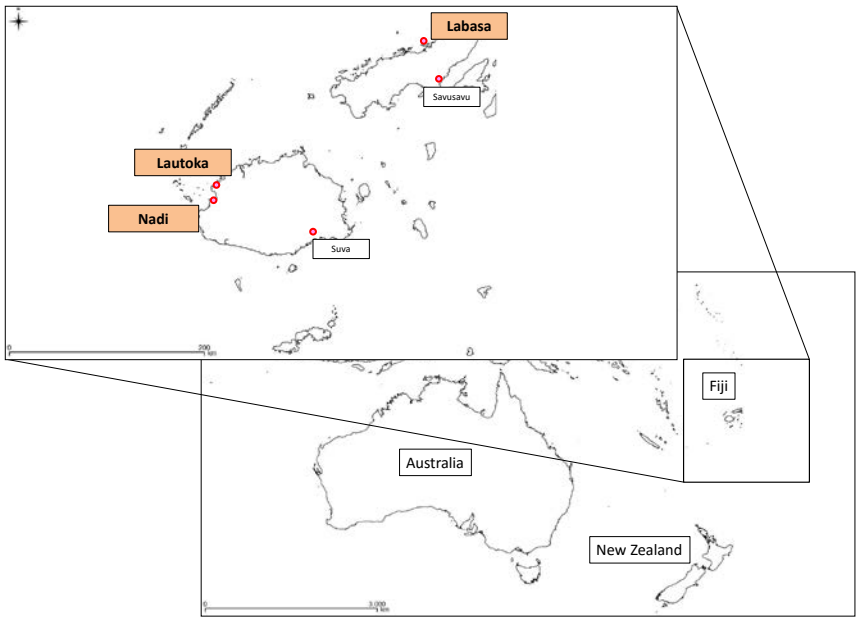
Estimated Project Cost for Technical Cooperation for Development Planning is JPY 2.9 billion.

3.4 Site Conditions

3.4.1 Location (Land Acquisition, Land Use, Facilities as Sources of Pollution)

Fiji is located in the central part of the Southwest Pacific Ocean about 3,200 km northeast of Sydney and 2,100 km north of Auckland. Of the total area, the land is composed of about 3% of the area, 18,270 km^2, about 300 islands. The main island is the two islands, i.e. Viti Levu (area about 10,000 km^2), Fiji's largest island, followed by Vanua Levu Island (area is about 5,500 km^2). It accounts for about 90% of the whole country's land with two major islands.

The survey area are Nandi and Lautoka in the state of Ba, which is the center of the West (Viti Levu island) and Labasa Town in Macuata State which is the center of the North (Vanua Levu Island).



Source: Survey Team

Figure 3.4.1 Site Location

3.4.2 Natural Conditions

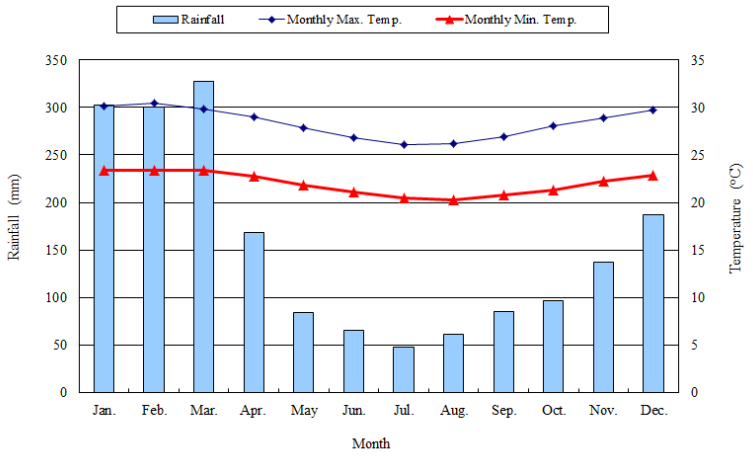
The climate in Fiji is tropical. There is significant rainfall throughout the year in Nadi and Labasa. Even the driest month still has a lot of rainfall. The rainfall in Labasa averages 2,396 mm. The driest month is July, with 78 mm of rain. Most precipitation falls in March, with an average of 336 mm. The rainfall averages 2,396 mm in Nadi less than Labasa.

The average annual temperature in Labasa is higher than in Nadi. February is the warmest month of the year. August is the lowest average temperature of the whole year.

Table 3.4.1 Climatic Characteristics in Nadi

Month	Max. Temp. (°C)	Min. Temp. (°C)	Rain (mm)
Jan.	30.1	23.4	302
Feb.	30.4	23.4	300
Mar.	29.8	23.4	327
Apr.	29	22.8	168
May.	27.8	21.8	84
Jun.	26.8	21.1	65
Jul.	26.1	20.5	48
Aug.	26.2	20.3	61
Sep.	26.9	20.8	85
Oct.	28	21.3	97
Nov.	28.9	22.2	137
Dec.	29.7	22.9	187
Average (Total)	28.3	22.0	(1861)

Source: TourismFiji.com and internet (https://en.climate-data.org/location/27805/)



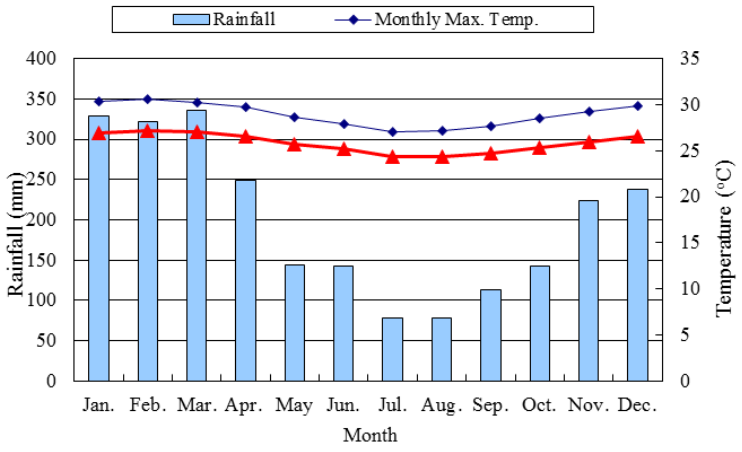
Source: https://en.climate-data.org/location/27805/

Figure 3.4.2 Temperature and Rainfall in Nadi

Table 3.4.2 Climatic Characteristics in Labasa

Month	Max. Temp. (°C)	Min. Temp. (°C)	Rain (mm)
Jan.	30.3	26.9	329
Feb.	30.6	27.2	322
Mar.	30.2	27.0	336
Apr.	29.7	26.6	249
May.	28.7	25.7	144
Jun.	27.9	25.2	143
Jul.	27.1	24.4	78
Aug.	27.2	24.3	78
Sep.	27.7	24.7	113
Oct.	28.5	25.3	142
Nov.	29.2	25.9	224
Dec.	29.9	26.6	238
Average (Total)	28.9	25.8	(2,396)

Source: TourismFiji.com and internet (https://weather-and-climate.com/suva-January-averages-fahrenheit)



Source: https://en.climate-data.org/location/27805/

Figure 3.4.3 Temperature and Rainfall in Labasa

3.4.3 Access

There is Fiji 's first international airport, which is the gateway to Fiji, in Nandi in the West. Domestic flights fly from Nadi to Suva and various places. Fiji Airways is scheduled to resume direct flights between Narita and Nadi from July 3, 2018, and Japanese demand for overseas travel is expected to be expanded.

There are access to Viti Levu Island and Vanua Levu Island (Northern area) by air and sea. Labasa Airport can be accessed from major airports such as Suva and the international airport of Nadi. The island also has sabot airports, Taveuni airports, as sightseeing spots, and a couple of flights per day are on service. Seaqaqa also has a plan to construct a new airport. As sea routes, ferries from Suva are cruising, as well as Nabowalu Port and Savusavu Port. The main road in Vanua Levu is connected to Savusavu in Province Bua and Cakaudrove Province.

3.4.4 Electricity and Means of Communications

Electricity is supplied by the Fiji Electricity Authority (FEA) to the three main islands (Biliref Island, Vanua Levu Island, and Ovalau Island). Commercial demand accounts for 40% of the total electricity consumption, and about 25% for household and industrial use. Approximately half of the power is generated by hydraulic power and the other half is supplied by diesel power generation.

It is stated in the Annual Report 2010 that the Fiji Electricity Authority (FEA) has set the goal of making 90% of the electricity derived from renewable energy by 2015. However, the status of progress toward achieving the goal is not in a good condition at present.

Further exploitation and development of renewable energy, especially hydroelectric power generation, was sought in the power industry. In the JICA survey "Electric power supply project using renewable energy in Fiji", the hydropower development plan and the best mix of renewable energy until 2025 is recommended.

3.4.5 Safety

Fiji is regarded as a relatively safe country. Overseas Safety Information (Danger Information) by Ministry of Foreign Affairs of Japan is set as "Level 1: Please be careful", which is the lowest among the four categories across the country of Fiji, and there is no special information on danger.

3.4.6 Other Items

(1) Population

In Fiji, the census is carried out every ten years, and in the 2017 census, the population of Fiji was 884,887, 191,910 households, 1,224 facilities (Table 3.4.3). The average population growth rate decreased to 0.8% in 1996 and 0.6% in 2017 compared with 2% in 1986, mainly due to the declining birth rate and migration. The proportion of the Fiji population living in urban areas is 37.2% in 1976, 38.7% in 1986, 46.4% in 1996, 50.7% in 2007 and 55.9% in 2017. Compared with 2007 Census, the urban population has increased by 69,406 (16.3%), and the rural population has decreased by 21,790 (5.3%).

Table 3.4.3 Changes in Population

	1976	1986	1996	2007	2017
Population (person)	588,068	715,375	775,077	837,271	884,887
Annual Growth Rate (%)	2.1	2.0	0.8	0.7	0.6
Median Age (years)	17.8	20.6	21.2	25.1	27.5
Urban (person)	218,495	277,025	359,495	424,846	494,252
Urban (%)	37.2	38.7	46.4	50.7	55.9
Rural (person)	369,573	438,350	415,582	412,425	390,635
Rural (%)	62.8	61.3	53.6	49.3	44.1

Source: CENSUS 2017, Fiji Bureau of Statistics; Total population by urban and Rural, 1976-2017

(2) Industry

The main industries of Fiji are the tourism industry and the sugar industry.

Nadi and Lautoka is the region that is focusing mostly on tourism among Fiji, and about 340,000 tourists visit each year. When preparing the master plan of Nadi and Lautoka, new large hotel/resort development plans are expected, which include Denarau Island, Fantasy Island Resort, Naisoso Island, Momi Bay Developments by FNPF, 100 Sands Limited Resort and Casino (Grand Fijian), Vuda Saweni Integrated Tourism Investment Project.

In the North, Savusavu and Taveuni are famous as tourist attractions. In recent years tourism development has progressed, and resort hotels and yacht harbours have been constructed, and Sabu Sab is grown as a resort area. Although hot springs in the city of Savusavu, they are not utilized as tourism resources at the moment, and there are plans to use hot springs for geothermal power generation, etc. Taveuni is called the "garden island" blessed with one of the world's most diving spots, lush landscapes of nature. It has the national flower of Fiji, there are Tangimodaia flowers and Bowma National Historical Park which only bloom here, resort development is proceeding as a tourist destination of Fiji.

The sugar industry is developing nationwide. Fiji Sugar Corporation (FSC) sugar factory is also deployed in the West and the North.

4. Guidance Project, and Effects and Impacts of the Project

4.1 Effects of the Project

4.1.1 Degree of Resolution of Problems in the Water Service Field

Table 4.1.1 shows the indication of the solution by implementing technical cooperation planned in **Table 3.3.1** against the current situation in the water supply field.

Table 4.1.1 The Solution by Implementing Technical Cooperation

Project Achievement		After Project
Review of Master Plan for water supply	The status of existing water supply facilities and water supply services in the project target area will be analyzed	The water supply master plan will be reviewed
	Forecast of water demand and plan of utilization of water resources in project target area will be reviewed	
	The water supply master plan will be reviewed	
	Improve planning ability of WAF staff	
Feasibility study of priority projects	Priority project is identified and its F/S will be implemented	F/S of priority project will be implemented
	Improve planning ability of WAF staff	
Improve WTP maintenance and water quality management ability	Staff capacity of WAF's maintenance department will be improved	WTP operation maintenance manual is prepared
	Communication between WAF district charge and WAF headquarters will be improved	A water quality management manual is prepared
NRW Reduction Activity (pilot project, equipment provision)	The ability for NRW management will be improved	Water supply time will be extended
	Ability to detect water leakage will be improved	Underground leak detection technology can be acquired and its utilization plan is created

Source: Survey Team

4.1.2 Degree of Resolution of Problems with the Drinking Water Supply

The objective of this project is to conduct technical assistance in order to use a limited amount of water source efficiently and effectively. Providing even and stable water supply service will also be assisted..

Specifically, the following results are expected.

(1) Improvement of water supply situation

By technical assistance, operation and maintenance capacity of water supply facility will be improved. Effective water distribution management will lead to stable water supply by reducing waste of water for pressure management..

(2) Improvement of leak detection technology

Since the amount of water source limited, leakage shall be reduced. The activities will, lead to effective utilization of water resources. In addition, the activities will lead to improve stability of water supply service by WAF.

4.1.3 Degree of Resolution of Problems relating to Sanitation-related and Water-borne Infectious Diseases

By improving water treatment management and water distribution management capability, safety and stability of water supply can be improved. The ability to use hygienic water improves sanitary environment and leads to a reduction in health damage caused by waterborne disease.

4.2 Impacts from the Implementation of the Project

4.2.1 Political Impact

The major industries of Fiji are tourism and sugar industry. In order to attract tourists from overseas, improvement of water quality and stability of the infrastructure are important. Therefore, it is expected that the implementation of projects in Nadi/Lautoka and the North will have a great political impact.

4.2.2 Social Impact

If the water treatment facility does not function well, it will affect to water use and then it will be difficult to maintain a good living level.

In the rural areas in Fiji, Activities are underway to disseminate EPS and provide safe water purification to residents. It is impossible to improve the living environment by realizing water supply improvement which is an urgent task in urban areas. Spread of EPS and improvement of urban water supply shall have synergistic effect, and the impact on community is considered to be great.

4.2.3 Economic Impact

Delay in water infrastructure development will have serious negative impacts on the tourism industry and sugar industry, which are major industries.

Improvement of water supply can be promoted by implementation of projects, and it is expected to have a great positive economic impact.

4.2.4 Technical Impact

Implementing technical assistance by taking advantage of Japan's experience will lead to improvement of capability of water supply management and maintenance. The project will assist improvement of the technical level and the technical impact is very high.

By implementing technical assistance by Japan, it is possible to develop NRW reduction capability of engineers who have fundamental knowledge and skill in operation and maintenance of Fukuoka city's activity (under the Project to Support Reducing Unaccounted for Water Control on NADI/LAUTOKA Regional Water Supply in Fiji). In addition, disseminating the activities in the North is meaningful and gives great technical impact.

Implementation of this project will have a great impact on improvement of water supply service and improvement of technical skills of WAF.

4.2.5 Diplomatic and Publicity Impact

The implementation of Japan's cooperation with the water and sanitation sector of Fiji is a bridge to solve the problems of island countries with climate change and geographical disadvantage, creating a ripple effect. The project will provide a diplomatic and publicity impact on the whole island country region. In addition, Japan, as the same island country, can increase its presence for island countries, and can make further contributions.

Improving urban water supply in Nandi/Lautoka and the North can contribute to industrial development, since Nadi/Lautoka is the center of the tourism industry and the sugar industry and in the North development is expected to take place and there are important sightseeing spots. There is also the possibility that diplomatic impact will be expanded if NRW reduction measures are disseminated to neighbouring countries.

5. Matters relating to Relevance of Project Requiring Guidance

5.1 Results of Comparative Analysis against Main Alternative Projects

There is no alternative project to this Project as proposed.

5.2 Organizational Relevance and Sustainability of the Project

Result of evaluation of organizational capacity of WAF for in terms of operational management, construction, operation and maintenance is shown in Table 5.2.1 to Table 5.2.4. The evaluation criteria are given as “High: 3, Medium: 2 and Low: 1”.

5.2.1 Organizational Management Capacity

Table 5.2.1 Result of Evaluation of Capacity (for Organizational Management)

Issue	Criteria (High⇔Low)			Description
	3	2	1	
Organizational strength				
・ Dependence on higher level and superiors	○			At the O&M level. problems are recognized and informed to higher level for allocation of budget
・ Demoralization	○			Aggressive attitude
Attitude of top officials				
・ Accurate grasp of the problems	○			Understand problems such as facility aging, lack of income, budget, human resources, technical skills, but budget is in short
・ Vision for the future		○		The long-term plan prepared by the WAF but it is not necessarily feasible
・ Will to undertake self-help efforts	○			
Authority to operate independently				
・ Authority to form an organization		○		
・ Authority to employ and appoint staff members.		○		
・ Authority to conclude contracts		○		
・ Authority to decide income and expenditure through independent accounting			○	All income is paid to the national treasury and the necessary expenditure is provided from the government
Establishment of an organization to manage water service users				
・ User information management			○	Database is not constructed
・ Billing and collection management		○		It is difficult to say that sufficient billing and collection management is done
Organization in place to manage accounting information and draw up the budget, accounts and long-term plan				
・ Budget, accounts and long-term plan		○		It depends largely on the national treasury
・ Materials management		○		
・ Assets (land, facilities and buildings)		○		WAF is beginning to introduce GIS
・ Organization in place to manage personnel		○		

Source: Survey Team

5.2.2 Organizational Construction Capacity

Table 5.2.2 Result of Evaluation of Capacity (for Construction)

Issue	Criteria (High⇔Low)			Description
	3	2	1	
A department in place to control construction work	○			
Does the department have an influential voice and authority?		○		
Reliance on donor countries for construction work	○			A management unit is organized according to the project
A positive willingness to participate in planning, design and construction work	○			
Accumulation of experience in similar projects implemented so far			○	Information tends to be dispersed

Source: Survey Team

5.2.3 Organizational Operation and Maintenance Capacity

Table 5.2.3 Result of Evaluation of Capacity (for Operation and Maintenance)

Issue	Criteria (High⇔Low)			Description
	3	2	1	
A department in place to control maintenance management	○			
Does the department have an influential voice and authority?		○		
A center for the storage and supply of equipment and materials	○			
Equipment and materials stored and supplied coherently		○		There is room for improvement of storage. It takes time for supply of materials
A center for the control of repair works and repair shops		○		
Accumulation of experience in similar projects implemented so far			○	Information tends to be dispersed

Source: Survey Team

5.2.4 Relations with Local Residents

Water supply facilities are indispensable lifeline for local residents, whose interests and expectations are extremely high. At the time of construction work, it may affect the traffic of the residents and in that case it is necessary to gain the residents' understanding.

5.3 Financial Relevance and Sustainability in Project Implementation

5.3.1 Financial Source for the Cost to be borne by the Fiji Side

The counterparts and leakage repair materials are provided by the Fiji side.

5.3.2 Present Status of Water Service Project Indicators

As WAF does not have data on project indicators, it is necessary to collect it at the time of future project implementation.

5.3.3 Change in Financial Balance

A financial system of WAF is not self-dependent. Collected water tariff from customers is deposited in the national treasury, and the government provide all the necessary money for operation and maintenance to WAF.

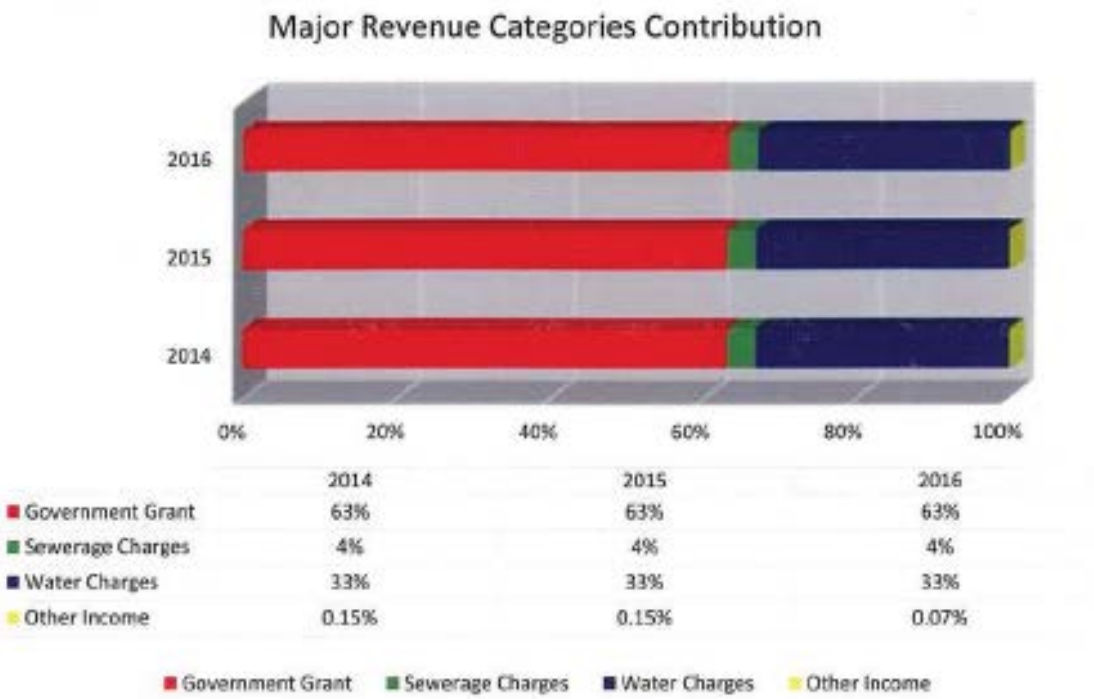
Table 5.3.1 shows the Tariff Structure. Water Tariff has not been revised since 2000.

Table 5.3.1 Tariff Structure

Category	Range	Tariff rate/Fees and changes (FJD)
Domestic	0-50 units	0.153
	51-100 units	0.439
	100 units	0.838
	Sewerage (flat rate)	0.200
Commercial	Water	1.060
	Sewerage	0.200
Domestic with free water allowance	0-23 units	0.000
	24-50 units	0.153
	51-100 units	0.439
	100 units	0.838
	Sewerage (flat rate)	0.200
Government, school/places of worship	Water	0.529
	Sewerage	0.200
Water rates changes	Reconnection fee	10.00
	Testing fee	12.75
	SP disconnection	10.00
	SP reading fee	9.88
New connections application fee	Domestic	21.95
	Commercial	101.00

Source: WAF

The financial situation of WAF is summarized in **Figure 5.3.1**, About FJD 50 million is collected each year as water tariff, which covers about 30% of the income. About 60% or more amount is required as subsidies from the country, which is a large proportion.

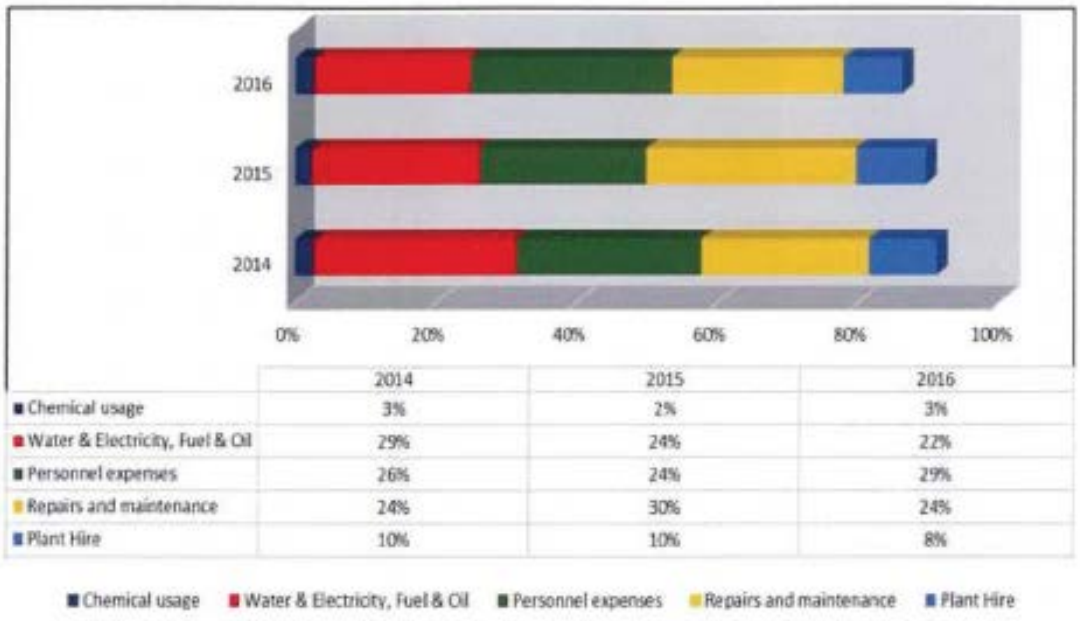


	2014	2015	2016
Government Grant	63%	63%	63%
Sewerage Charges	4%	4%	4%
Water Charges	33%	33%	33%
Other Income	0.15%	0.15%	0.07%

Source: WAF Strategic Plan 2017-2019

Figure 5.3.1 Rete of Revenue

Regarding expenditure, about FJD 85 million is required as operation and maintenance expenses every year. Electricity bills, labor costs, repair, and maintenance expenditure account for about 30% each.



	2014	2015	2016
Chemical usage	3%	2%	3%
Water & Electricity, Fuel & Oil	29%	24%	22%
Personnel expenses	26%	24%	29%
Repairs and maintenance	24%	30%	24%
Plant Hire	10%	10%	8%

Source: WAF Strategic Plan 2017-2019

Figure 5.3.2 Rete of Expenditure

5.3.4 Prospect for Financial Balance

WAF Strategic Plan 2017-2019 projected the financial balance of WAF for the next three years as below..

Table 5.3.2 Prospect for Financial Sustainability

	PROPOSED BUDGET 2017-2018 $(000)	FORECAST 2018-2019 $(000)	FORECAST 2019-2020 $(000)
Government Grant			
Expenses			
Electricity	20,150	20,553	20,964
Chemicals	3,076	3,138	3,200
Fuel & Oil Machinery & Equipment	992	1,002	1,012
R&M Water & Waste Water	7,916	7,797	7,680
Road Reinstatement (FRA)	4,064	1,500	1,500
Plant Hire	6,000	6,000	6,000
Water Carting	1,100	1,100	1,100
Fleet	2,685	2,739	2,793
Salaries	26,689	26,956	27,495
Staff Related Costs	3,223	3,256	3,321
Communication	1,162	1,162	1,162
Computer	2,501	2,501	2,501
General Admin	6,922	6,922	6,922
Total Expenses (VEP)	**86,480**	**84,624**	**85,650**
Revenue			
Revenue Water	40,708.00	41,929	43,187
Revenue Waste Water	5,760.00	5,933	6,111
Liquid Trade Waste	900.00	1,000	1,100
Tanker waste charge	500.00	600	700
Other Income	200.00	200	210
Total Revenue	**48,068**	**49,662**	**51,308**
VAT On Grant	**5,381**	**5,190**	**5,234**
Government Operating Grant Request (VIP)	**91,861**	**89,814**	**90,884**

Source: WAF Strategic Plan 2017-2019

5.4 Technical Relevance and Sustainability in Project Implementation

5.4.1 Compatibility with the Technical Level of Fiji

Technical standards related to water supply project are not prepared in Fiji, and international standards (ISO, AWWA/ASTM, AS, NZS) are used depending on the project and donor countries, while water quality standards for drinking water are defined by the Fiji National Drinking Water Quality (FNDWQ).

The basic technology in proposed water supply project is almost same with the project prepared by Fiji side and it match to the technical level of Fiji. When new technology is introduced, compatibility with technical level in Fiji shall be considered.

5.4.2 Personnel Recruitment and Assignment

Technical assistance project including preparation of development plan is to develop individual capacity of WAF counterparts. The consultant will give guidance and advice to the counterparts to carry out the activities. Through this activity, capacity for planning by WAF will be improved in addition to capacity of facility maintenance and NRW reduction. In order for this project to be implemented effectively, it is indispensable to arrange the counterparts of the Fiji side. WAF understands that the planning department staff of the headquarters and the staff in charge of maintenance in the West and the North shall be attended.

Since most of WAF officials are employed as contract base for 3 years, it is concerned that the staffs will leave WAF after they are trained. When it is pointed out WAF officers explained that most of the staff will continue to work since there is no place other than WAF for the trained staff to work in Fiji. After discussion, WAF officers basically agree to consider the system, in which "evaluation points will be given on the knowledge and technology acquired through technical assistant project, and the points will be considered for evaluated at the next interview for hiring by WAF." This system will help to reduce moving from jobs and to improve the willingness to the capacity building.

5.4.3 Operation and Maintenance of Facilities/Equipment

While operation & maintenance of facilities and equipment are not necessarily performed sufficiently, technical assistance will help improvement of the capacity and performance. In formulating the future plan, careful consideration should be given to feasibility such as introduction of appropriate and suitable technology.

5.5 Environmental Considerations

5.5.1 Expected Environmental Impact

Technical Cooperation for Development Planning has no impact on the environment.

5.5.2 Environmental Impact Assessment

Technical Cooperation for Development Planning has no environmental/social impact.

6. Conclusion

6.1 Particulars

Water supply system in the North (Labasa Town) has not been developed or improved in a proper manner for long since no donner was found. The facilities become obsolete and adequate management of water supply system is very difficult.

Remarkable development of tourism industry is expected in Nadi and direct flight with Japan is scheduled to restart since political situation becomes stable. Construction of casino is also permitted. Considering the importance of water supply improvement in Nadi and Lautoka, other donors may be interested in the assistance. It is desirable for the project to be accepted by JICA as expected by WAF in order to keep Japan's influence in the area. In addition to that, technical support to improve water supply facilities and O&M capability in the North is very important. The impact on the activities in the North will also very big to Fiji since the importance of area is re-confirmed and improvement is expected seriously. .

6.2 Precautions for Implementation of Cooperation Project

When technical assistance is executed both in the West and the North, it is necessary to consider the balance. Considering only the direct benefit effect, the impact in the West will be significant, but it is also necessary to focus on improving the present situation in the North, which is facing serious difficulties. It is also necessary to formulate projects with a long-term and overall perspective in water supply services.

6.3 Conclusion

The basic policy of Japanese ODA for Fiji is summarized below aiming support for sustainable economic growth with environmental consideration and improvement of living standards of the people.

(1) Environment/Climate Change: To support the improvement of ambient environment and public health by strengthening ability to respond to natural disasters and treating waste in a proper manner.

(2) Overcoming vulnerability: To improve infrastructure, control infectious diseases to improve health standards, improve basic academic ability, support relating to development of rural areas and remote island departments.

The plan of the water supply facilities development project in Nadi/Lautoka and the North clearly meets (2) Overcoming vulnerability, i.e. "To improve infrastructure, control infectious diseases to improve health standards, improve basic academic ability, support relating to development of rural areas and remote island departments".

In addition WAF executives explained that high turbidity at the time of floods which exceed water facilities capacity in both areas and water shortages due to prolonged drought period are occurring as the effects of climate change. Therefore, it will be consistent with (1) Environment/Climate Change,

i.e. "To support the improvement of ambient environment and public health by strengthening our ability to respond to natural disasters and treating waste in a proper manner."

Considering the current situation in Nadi/Lautoka and the North together with the necessity of developing capacity and water supply facilities, it can be concluded that urgency and relevance to the policy are high in supporting formulation of water supply project and technical assistance on operation and maintenance. Continuation and dissemination of NRW reduction activities are also important. The proposed project will match to the basic policy of Japanese ODA to Fiji countries. Capacity development on management and upgrading of water supply service will contribute to improvement of living environment of local residents and to reduction of climate change impact.

The proposal content is as follows.

【Development plan study type technical cooperation project in Western division (Nadi and Lautoka) and Northern division (Labasa)】

- Review of master plans of Western division (Nadi and Lautoka) and Northern division (Labasa)
- F/S of priority project and extraction of emergency project (grant aid)
- Support operation management for WTP.
- Improving capacity and promoting dissemination of measures to reduce NRW

6.4 Comments

In this case, the necessity and urgency are clear, especially in Nadi and Lautoka, since the beneficial effect after completion is great and can contribute to the development of the entire Northern region, it is judged that the validity as a project is high.

In order to meet the water demand of Nadi and Lautoka, it is necessary to develop a new water source and construct a new WTP. Planning based on fundamental investigations, taking into consideration its relevance and effect, is necessary for formulating projects. It is also important to consider drought countermeasures in the northern division such as Labasa Town and consider how to get rid of the troubles by measures against high turbidity during rainfall. Therefore, in order to improve the deterioration of facilities due to aging of facilities, measures such as repair and repair, emergency measures, improvement of maintenance and management capacity, reduction of NRW are required.

It is expected that the technical assistance project will improve these issues, the effect of Japan's technical cooperation will be sustained and the water supply projects in Nadi and Lautoka and the northern area will be implemented steadily. It is also expected that WAF's planning ability will be improved and a more feasible plan will be developed to contribute to the development of the water supply business.

Appendices

1. Site Survey Schedule

			The Ministry of Health, Labour and Welfare of Japan (MHLW) Mr. Toru KAJIWARA		The Ministry of Health, Labour and Welfare of Japan (MHLW) Mr. Ryota Ushio		Nihon Suido Consultants Co., Ltd. Mr. Shinkichi KOBAYASHI Mr. Takahiro NAKATA		Ryusei Consultant Co., Ltd Mr. Keita SHINJYO Mr. Wataru HASEGAWA		Omae Co., Ltd Mr. Kenta IMAI		Fukuoka City Waterworks Bureau Mr. Keizo WATANABE Mr. Yuji NISHIYAMA	
			Activity	Destination	Activity	Destination	Activity	Destination	Activity	Destination	Activity	Destination	Activity	Destination
2/6	Tue	AM												
		PM									MOVING HANEDA→SYDNEY →NADI→SUVA	–		
2/7	Wed	AM												
		PM										SUVA		
2/8	Thu	AM									Arangement with related institution Data Collecton	SUVA		
		PM												
2/9	Fri	AM									Arangement with related institution Data Collecton	SUVA		
		PM												
2/10	Sat	AM									Arangement with related institution Data Collecton	SUVA		
		PM												
2/11	Sun	AM					MOVING HARITA→HONG KONG→NADI→ LABASA	–	MOVING NAHA→HONG KONG→NADI→ LABASA	–	Data Collecton	SUVA		
		PM												
2/12	Mon	AM						LABASA		LABASA	Meeting with WAF	SUVA		
		PM					Meeting with WAF (LABASA)		Meeting with WAF (LABASA)					
2/13	Tue	AM					Site Survey	LABASA	Site Survey	LABASA	Meeting with WAF	SUVA		
		PM												
2/14	Wed	AM					Site Survey	LABASA	Site Survey	LABASA	SUVA→LABASA	LABASA		
		PM									Site Survey			
2/15	Thu	AM					Site Survey	LABASA	Site Survey	LABASA	Site Survey	LABASA		
		PM												
2/16	Fri	AM					Meeting with WAF (LABASA)	LABASA	Meeting with WAF (LABASA)	LABASA	Meeting with WAF (LABASA)	LABASA		
		PM												
2/17	Sat	AM		-		-	Site Survey	LABASA	Site Survey	LABASA	Site Survey	LABASA		
		PM	MOVING HANEDA→SYDNEY →NADI→SUVA		MOVING NARITA→PORT MORESBY→NADI									
2/18	Sun	AM		NADI		NADI	Data Collecton	LABASA	LABASA→SUVA	SUVA	Data Collecton	SUVA	MOVING FKUOKA→INCHEON →NADI→LABASA	-
		PM							Data Collecton		LABASA→SUVA			
2/19	Mon	AM	NADI→LABASA	LABASA	NADI→LABASA	LABASA	Meeting with WAF (LABASA)	LABASA	Meeting with WAF	SUVA	Meeting with WAF	LABASA		LABASA
		PM	Meeting with WAF (LABASA)		Meeting with WAF (LABASA)								Meeting with WAF (LABASA)	
2/20	Tue	AM	Site Survey	SUVA	Site Survey	SUVA	Site Survey	SUVA	MOVING SUVA→NADI→ SYDNEY→TOKYO→ NAHA	-	Data Collecton	SUVA	Site Survey	SUVA
		PM	LABASA→SUVA		LABASA→SUVA		LABASA→SUVA						LABASA→SUVA	
2/21	Wed	AM	Meeting with WAF	SUVA	Meeting with WAF	SUVA	Meeting with WAF	SUVA			Meeting with WAF	SUVA	Meeting with WAF	SUVA
		PM												
2/22	Thu	AM	MOVING HANEDA→SYDNEY →NADI	-	Embassy of Japan、 JICAFiji Office	SUVA	Embassy of Japan、 JICAFiji Office	SUVA			Embassy of Japan、 JICAFiji Office	SUVA	Embassy of Japan、 JICAFiji Office	SUVA
		PM												
2/23	Fri	AM			Meeting with WAF	NADI	Meeting with WAF	SUVA			Meeting with WAF	SUVA	MOVING SUVA→NADI→ INCHEON→ FUKUOKA	-
		PM			SUVA→NADI									
2/24	Sat	AM			MOVING NADI→PORT MORESBY→NARITA	-	MOVING SUVA→NADI→ HONG KONG→ HANEDA	–			MOVING SUVA→NADI→ SYDNEY→HANEDA	–		
		PM												
2/25	Sun	AM												
		PM												

2. Visited Institution

所属 Institution	名前 Name	役職 (和名)	(西名) Position
在フィジー日本国大使館 Embassy of Japan	大村　昌弘 Mr. OMURA Masahiro	特命全権大使	Ambassador Extraordinary and Plenipotentiary
	羽田　貢由 Mr. HADA Tsuguyoshi	参事官	Counsellor and Deputy Chief of Mission
	山田　源太 Mr. YAMADA Genta	経済協力班　一等書記官	First Secretary
国際協力機構　フィジー事務所 Japan International Cooperation Agency Fiji Office	堺水尾　真也 Mr. TAMIO Shinya	JICAフィジー事務所次長	Depty Resident Representtive
	可児　渥美 Ms. KANI Atsumi	JICAフィジー事務所企画調査員	Project Formulation Adviser
国際協力機構　本部 Japan International Cooperation Agency Tokyo	田村　えり子 Ms. TAMURA Eriko	JICA 地球環境部水資源グループ水資源第一チーム課長	Director Water Resources Team1 Water Resources Group Global Environment Department
	大村　真由 Ms. OMURA Mayu	JICA 地球環境部水資源第一チーム専門嘱託	Technical Advisor Water Resources Team1 Water Resources Group Global Environment Department
フィジー水道公社(WAF) 本部	Mr. Nemani Waqanivalu	計画設計建設部部長	General Manager Planning Design & Construction
	Mr.Seru Soderberg	計画設計建設部マネージャー	Manager planning & design
	Mr. Taitusi Vakadravuyaca	特別プロジェクト部長	General Manager Special Projects
	Mr. Sharvint Chand	下水道解析チームリーダー	Team Leader Wastewater modeling
	Mr. Saman Ekanayake	運転管理チーフ	Chief Operating Officer (Water Operations)
	Mr. Josua Wainiqolo	無収水対策マネージャー	Manager NRW
	Mr.Sher Singh	水質スーパーバイザー	Supervisor-Water Quality
	Ms. Anjalune Prasad	カスタマーサービスチームリーダー	Team Leader Costomer Acount
フィジー水道公社(WAF) 給水局北部事務所	Mr.ApeteRadrodrolagi	北部地区マネージャー	ManagerNorthern
	Mr.Samuela Ratoci	北部地区技術者	Regional Engineer
	Mr.Tikiko Rawalai	サブサブ地区スーパーバイザー	Superviser Savusavu
フィジー水道公社(WAF) 給水局西部事務所	Mr.Ponipate Naigulevn	ナンディ地区チームリーダー	Team leader Nadi
北部開発計画・政策担当 (Ministry of rural&maritime depevelopment and national disaster management)	Mr.Jovesa Voce	北部地区コミッショナー	Divisional Commissioner Northern
	Mr.Nicholas Ting	北部地区シニア計画担当者	Senior Economic Planning officer Northern Division
北部開発計画・政策担当 (Department of town & country planning)	Mr.Manasa Tuilau	都市計画	Senior Town Planning Northern

3. Collected Data list

Nadi/Lautoka Regional Water Supply Scheme Master Plan 2013-2033

Master Plan for Labasa Regional Water Supply

Strategic Plan 2017-2019

4. Letter of Notice on Dispatch of the Study Team Survey Schedule

Ministry of Health, Labour and Welfare
Japanese Government
1-2-2, Kasumigaseki,
Chiyoda-ku, Tokyo 100-8916
Tel ＋ 81-3-5253-1111

日本国厚生労働省
〒100-8916
東京都千代田区
霞が関１－２－２
電話 03-5253-1111

January 22, 2018

Dear Sir/ Madamn

Water Authority Fiji

Subject: Request for acceptance of a survey team of the "Water Supply Project Formation Program." by the Ministry of Health, Labour and Welfare of Japan

Dear Sir/ Madamn;

I am writing to you to seek a possibility of your arrangements for an on-site survey.

The Ministry of Health, Labour and Welfare of Japan (MHLW) has a program the "Water Supply Project Formation Program" to encourage international cooperation in the field of water supply. This program aims to support formulation of a water supply improvement plan through discussions and on-site surveys together with water supply authorities in a country which has challenges to be addressed on their water supply.
This year, the MHLW commissioned the program to Nihon Suido Consultants Co., Ltd.
The Company proposed an idea for water supply improvement in Labasa in Fiji, and would like to dispatch the survey team in February, 2018. Resume is given in the enclosed document and Detail schedule will be informed by the survey team later.

It is highly appreciated if you could kindly accept the survey team and coordinate visits and consultations with institutions concerned.
I thank you for your consideration and I look forward to hearing from you soon.

Sincerely yours,

Mr. Toru KAJIWARA
Director, Office of Global Health Cooperation, International Affairs Division
Minister's secretariat, Ministry of Health, Labour and Welfare

Enclosure: Resume

RESUME

1. SUMMANRY OF PROGRAM

Japanese ODA is implemented by Ministry of Foreign Affair (MOFA) and Japanese International Cooperation Agency (JICA). Ministry of Health, Labour and Welfare (MHLW) is ordinary indirectly associated with ODA on water supply sector through consultations with MOFA and JICA as the ministry holding jurisdiction over water supply in Japan. The Water Supply Project Formation Program is provided by MHLW to stimulate improvement projects in countries having big challenges on water supply sector.

This time, Nihon Suido Consultants Co., Ltd., proposed the study plan for Labasa, to the MHLW and the MHLW decided to entrust the study.

2. PURPOSE OF THE STUDY

The study team conducts a fact-finding investigation from technical and professional points of view, aiming to support formulating a water supply improvement project in Labasa in Fiji.

3. SURVEY ITEM

Major Survey items are following;

(1) Survey on the current situation of water supply in Labasa (Water resources, water supply facilities, current drinking water and etc.)

(2) Interview of the current situation (facility, organization, O&M, water quality and finance, etc.)

(3) Confirmation of 2014 Water Supply Master Plan

(4) Investigation on project priority

(5) Study on the business planning

4. EXPECTED INTERVIEWEE

(1) Water Authority Fiji (WAF)

(2) Labasa Water Works

5. MEMBERS OF THE SURVEY TEAM

The Survey Team consists of the following members:

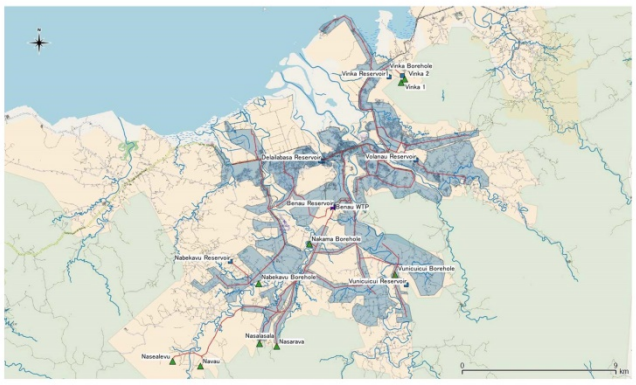
Table1 Survey Team members

Name	Job title	Occupation
Mr. Toru KAJIWARA	Project Planning	The Ministry of Health, Labour and Welfare of Japan (MHLW)
Mr. Ryota Ushio	Project Planning	The Ministry of Health, Labour and Welfare of Japan (MHLW)
Mr. Shinkichi KOBAYASHI	Chief Consultant	Nihon Suido Consultants Co., Ltd.
Mr. Takahiro NAKATA	Deputy Chief Consultant/ Water Supply Engineer	Nihon Suido Consultants Co., Ltd.
Mr. Keita SHINJYO	Water Supply Engineer	Ryusei Consultant Co., Ltd
Mr. Wataru HASEGAWA	Water Supply Engineer	Ryusei Consultant Co., Ltd
Mr. Kenta IMAI	Coordination and local logistics	Omae Co., Ltd
Mr. Keizo WATANABE	Water supply management operation and maintenance	Fukuoka City Waterworks Bureau
Mr. Yuji NISHIYAMA	Water supply management operation and maintenance	Fukuoka City Waterworks Bureau

Source: Survey Team

6. Survey Area

The survey area is the Labasa water supply area.



Source: Survey Team

Figure1 Survey Area

7. Survey Schedule

The overall survey schedule is shown in **Table2**Table. The total duration of the survey is about 5 months, and reports will be submitted in end of March, as shown in the same Table. Key meetings will be held at appropriate intervals. The Survey activities are summarized in **Table3**.

Table2 Survey Schedule

Item	2017			2018		
	Oct	Nov	Dec	Jan	Feb	Mar
Preparation in Japan	■					
Survey in Fiji					■	
Interview Survey		■	■	■		
Reporting in Japan		■	■	■	■	
Briefing to Fiji Side					■	
Submission of Final Report						△
Key Meeting with Fiji Side		●			●	

Source: Survey Team

Table3 Survey Activities

Stages	Period	Activities
First Assignment in Japan	End Oct to End Jan	· Review of Master plan for Labasa · Preparation of Study Contents and Schedule · Preparation of Draft Final Report · Interview for the current situation, etc.
First Assignment in Fiji	Mid. Feb	· Explanation and discussion with the Fiji side · Data collection and analysis
Third Assignment in Japan	End Feb to End Mar	· Preparation and submission of Final Report

Source: Survey Team

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