Chapter 11 Non-Structural Measures

The flood disaster control measures include the "Structural measures", such as river bank, dam, diversion channel and so on and the "Non-structural measures", such as human activities and awareness, development of disaster information distributing system at the time of emergency, legal regulations and so on. Generally, the construction of structural measures takes long time to complete and they cannot produce the full effects on the disasters which exceed the target scale of disaster. Therefore, it is important to minimize the flood damage by implementing the non-structural measures which are feasible before the completion of structure measures, and by the non-structural measures, which can complement and create a synergistic effect, in combination with appropriate structural measures.

Moreover, following four priority areas, 1) Understanding disaster risk; 2) Strengthening disaster risk governance to manage disaster risk; 3) Investing in disaster risk reduction for resilience; 4) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction, are mentioned in "Sendai Framework for Disaster Risk Reduction (SFDRR)" as priorities for actions, and they are considered as one of the guidelines to examine the disaster prevention measures in regard to disaster prevention and risk reduction.

Implementation flowchart of non-structural measures is as shown in Figure 11-1. Current situation and issues of each classified non-structural measure in the Nadi River Basin are organized. Then, the non-structural measures, which are feasible in the Nadi River Basin, are examined and the detailed plan of non-structural measure is proposed in this project.

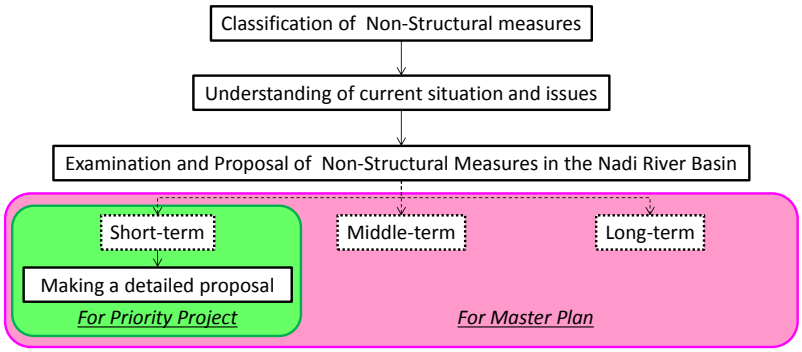


Figure 11-1 Implementation flowchart of non-structural measures

11.1 Classification of Non-Structural Measures

Disaster management can be expressed as a cycle shown in Figure 11-2. There are Structural measures (written in black in Figure 11-2) and Non-Structural measures (written in white in Figure 11-2), which can contribute to the disaster mitigation in each phase, such as "Pre-Disaster", "Disaster Response" and "Post Disaster".

As for Non-Structural Measures in Fiji, National Disaster Management Plan was developed in 1995 and NDMC, NDMO were established. Even though disaster risk management and reduction are mentioned in the plan, disaster response and rehabilitation are one of the main components, and only public awareness and training of disaster risk management are described as the actions in the pre-disaster phase. Actually, these two components are put emphasis on and disaster response is implemented in a systematic and an organized way. Measures in pre-disaster phase are mainly based on the commitment of other donors. On the basis of this situation, conceivable Non-Structural Measures in Fiji are classified as in Figure11-3.

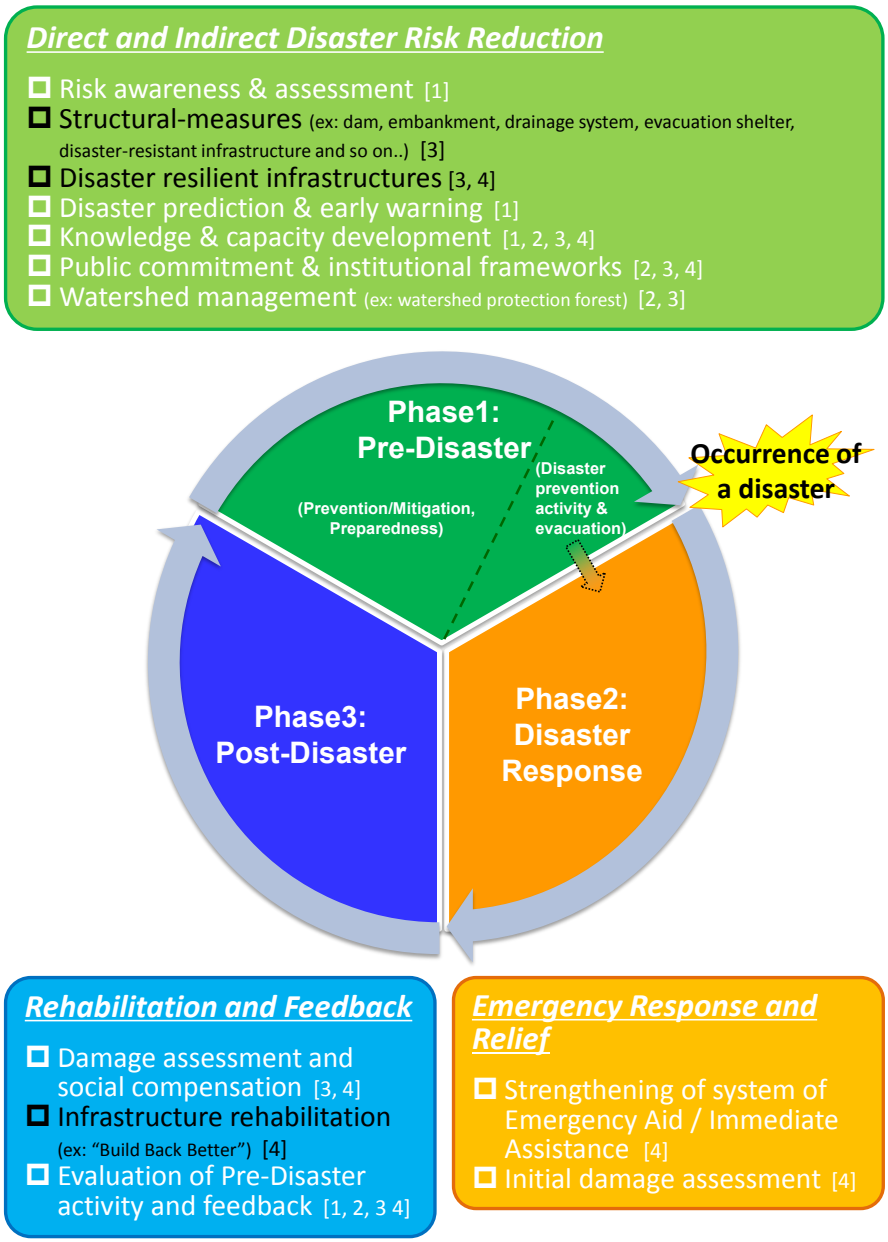


Figure 11-2 Disaster Management Cycle and fields of Non-structural measures in each phase

* The numbers in the figure, such as [1], indicates the number of "Priorities for action on Sendai Framework for DRR"
The measure written in black indicates the Structural Measures and written in white indicates the Non-Structural Measures
Source: JICA Project Team made based on Sendai Framework for Disaster Risk Reduction 2015-2030, 2015

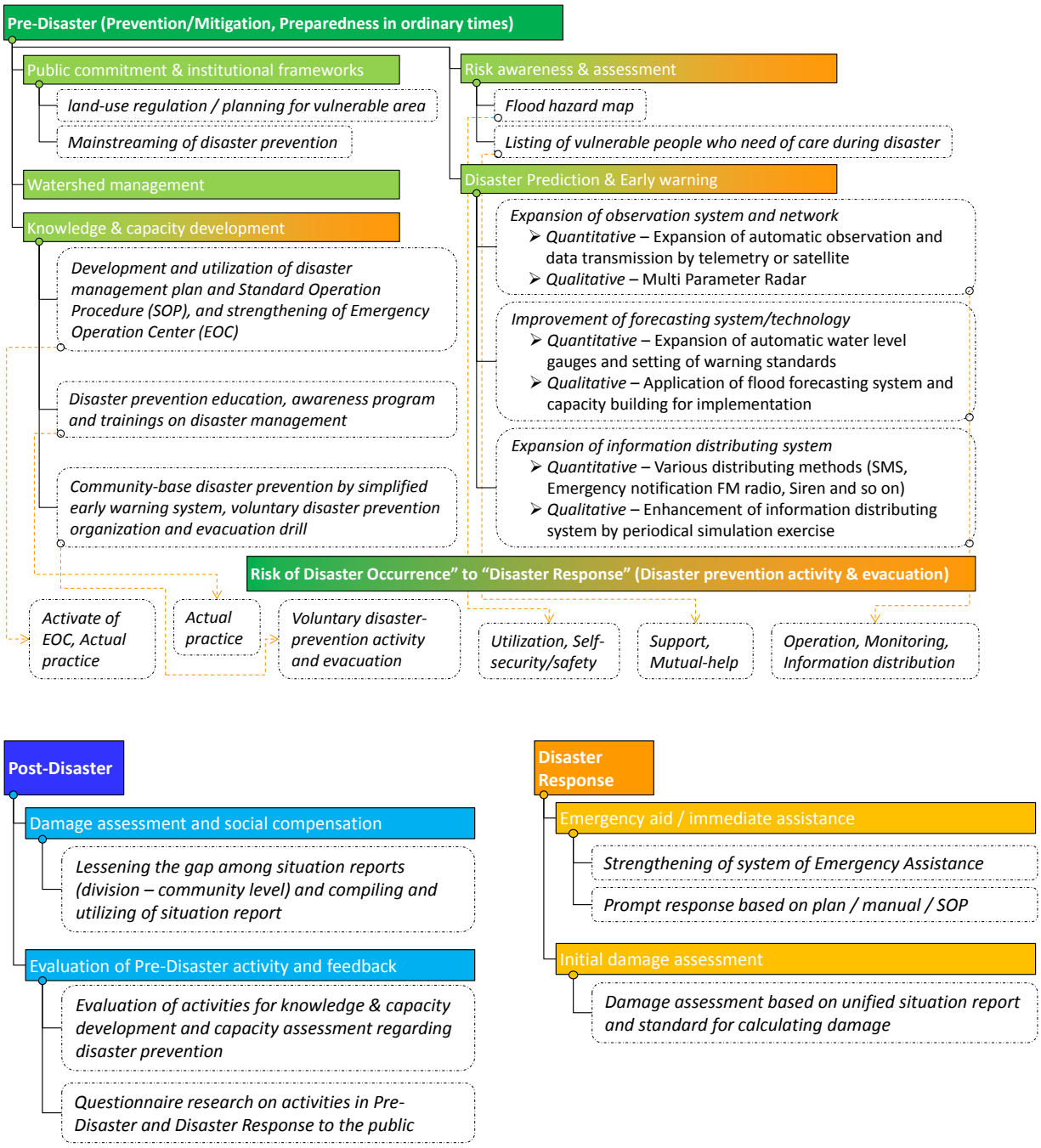


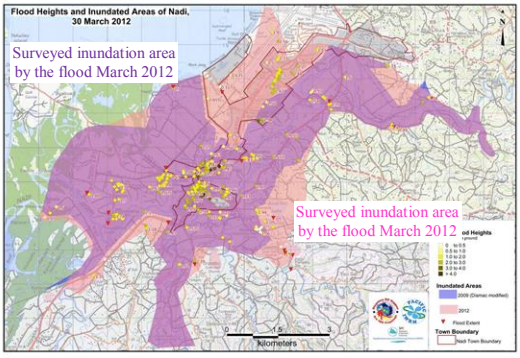
Figure 11-3 Main field of Non-Structural Measures in each phase and Main Measures

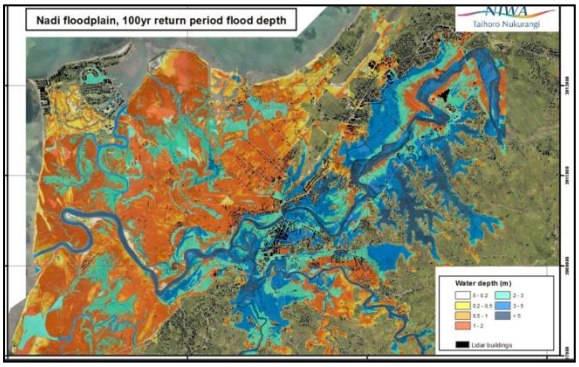
11.2 Current situation and issues of Non-Structural Measures (Pre-Disaster Phase)

11.2.1 Risk awareness & Assessment

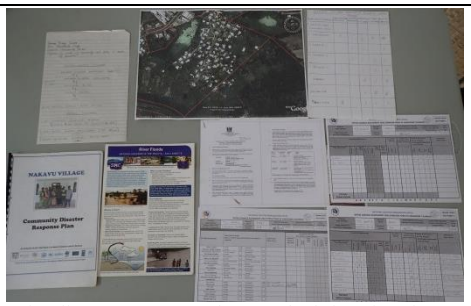
"Flood hazard map" and "Listing of vulnerable people who need of care during disaster" are considered as the main measures in the field of Risk awareness & assessment. Current situation and issues of both measures are shown in Table 11-1.

Table 11-1 Current situation and issues of Risk awareness & Assessment

<table>
<tr><td colspan="3">Flood hazard map</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>Drainage & Irrigation Section (DIS), MOA: DIS is the responsible organization according to the Natural Disaster Management Act (1998). Even though, a detailed activity has not been implemented.
NTC: Surveyed and simulated inundation areas drawn in the IWRM project are shared with NTC.</td></tr>
<tr><td>Donors</td><td>GEF et al: Surveyed (2009 and 2012) and simulated inundation areas were developed in the IWRM project. Even though the flood hazard map is not developed, the community risk maps have been developed for the several communities along the Nadi River through the project.</td></tr>
<tr><td>Issues</td><td colspan="2">➢ Since there is no flood hazard map other than several communities, the residents cannot recognize the flood-hazard area, the risk and the evacuation center and so on properly. Therefore, flood damage cannot be reduced.
➢ Implementation and completion of the priority project might invite the misunderstanding among the public, such as no flood damage after the project. Even though, the priority project cannot prevent inundation for any floods over the target flood, which is the historical maximum flood, in March 2012 (occurrence probability of approximately 1 / 50) and inland flood outside the flood structures. Therefore, awareness of flood risk and the way to respond after the project is required.
➢ Since simulated inundation area by other donor is based on the limited rainfall data (using the observed data at Nadi Airport) and it cannot represent the basin rainfall appropriately, the simulation conditions and the simulation result might not be able to reflect the basin characteristics properly.</td></tr>
<tr><td colspan="3"> 

Surveyed inundation area and depth of Nadi (Floods in 2009 and March 2012)
[Source: Nadi Integrated Flood Management Project, SPC/SOPAC]


Simulated inundation area of Nadi (using 1/100 probable rainfall)
[Source: Nadi Flood Risk Assessment, NIWA]</td></tr>
<tr><td colspan="3">Listing of vulnerable people who need of care during disaster</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td rowspan="2">NTC: NTC just knows that each Community Disaster-prevention Committee (CDC) prepared the list or information of vulnerable people in the community through the PCIDRR project.
Community: The CDC, which has been developed through the PCIDRR project by AusAID, prepared the list / information of vulnerable people in the community, and respond to the disaster utilizing the list / information.</td></tr>
<tr><td>Donors</td></tr>
<tr><td>Issues</td><td colspan="2">➢ Mutual-help is implemented utilizing the list / information in the community. There is no serious issue other than the regular update of the information.
➢ Even though there is no serious issue in the current situation, District office should know the information of care facility and develop a list of vulnerable people in line with developing of disaster management plan to reduce the risk of disaster damage.</td></tr>
<tr><td colspan="3"> 

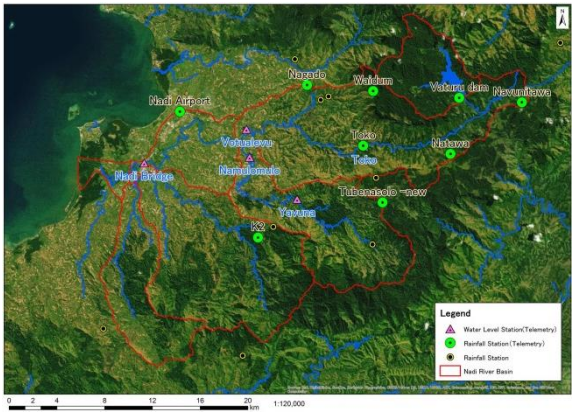
Community Risk Map [Nakavu Village]


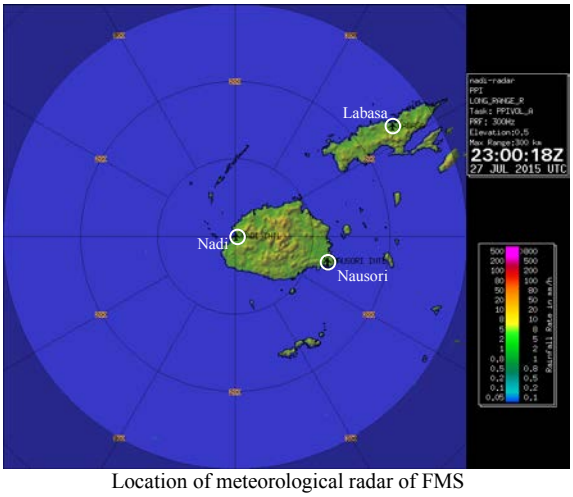
Community disaster response plan (on the left), List of evacuee (on the upper right), Form of IDA (on the bottom right) [Nakavu Village]</td></tr>
</table>

11.2.2 Disaster Prediction & Early Warning

"Expansion of observation system and network", "Improvement of forecasting system/technology" and "Expansion of information distributing system" are considered as the main measures in the field of Disaster Prediction & Early warning. Current situation and issues of both measures are shown in Table 11-2.

Table 11-2 Current situation and issues of Disaster Prediction & Early Warning

<table>
<tr><td colspan="3">Quantitative expansion of observation system and network
(Expansion of automatic observation and data transmission by telemetry or satellite)</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>FMS, WAF et al: <u>There are nine operating telemetry rainfall gauges, which can be monitored by FMS during the disaster, in / near the Nadi River Basin</u>. FMS, WAF, MOA and forestry department are managing these gauges. <u>There is no expansion plan of rainfall and water level gauges in the Nadi River basin in FMS</u> as of July 2015. Observed data is transferred to the server of FMS by GPRS and utilized for issuing the flood warnings.</td></tr>
<tr><td>Donors</td><td>GEF et al: Six telemetry rainfall gauges out of nine were installed in 2010 through the IWRM project. These rainfall gauges, water level gauges and the siren described below are maintained by MOA of Western division office in cooperation with Hydrology section of FMS based on MOA's budget and vehicle as of 2015. Maintenance fee is approximately 10,000 FJD/year. MOA looks after the equipment from 2013 to 2016 after the completion of the project. Hydrological equipment, such as rainfall gauge and water level gauge will be handed over to FMS after 2016.</td></tr>
<tr><td>Issues</td><td colspan="2">➢ Since there is no rainfall gauge in southwest part of the Nadi River Basin (especially in the Malakua River basin), the basin characteristics cannot be reflected on the flood forecasting system appropriately when the system is installed in the future. Moreover, there is no expansion plan of rainfall and water level gauges in the Nadi River basin.</td></tr>
<tr><td colspan="3">Qualitative expansion of observation system and network (Multi Parameter Radar, MP Radar)</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>FMS: S-band radar has been installed and operated since 2005 as meteorological radar by FMS. Three radars including the radars provided by the donor are operating. <u>MP radar is not used at the moment.</u></td></tr>
<tr><td>Donors</td><td>Australian Bureau of Meteorology: Two meteorological radars are installed by Australian Bureau of Meteorology in 1993.</td></tr>
<tr><td>Issues</td><td colspan="2">➢ <u>Since flood forecasting system and highly accurate measurement</u> by MP radar and so on <u>are not used</u> at the moment, <u>there is no serious issue</u>.
➢ Introducing of MP radar and establishment of radar network are considered as the one of the measures to implement the highly accurate measurement and the flood forecasting based on the measured data in the future. Even though, improvement of forecasting system/technology in order to utilize the measured data is required prior to introduction of MP radar.</td></tr>
<tr><td colspan="3"> 

Location of telemetry rainfall and water level gauges in the Nadi River Basin (Rainfall: 9, Water level: 5)</td><td colspan="3"> 

Location of meteorological radar of FMS
(3 S-band radar in Nadi, Nausori, Labasa,)
[Source: http://www.met.gov.fj/radar.php]</td></tr>
<tr><td colspan="3">Quantitative improvement of forecasting system/technology (Expansion of water level gauge)</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>WAF: Since the management office of Vaturu Dam does <u>not implement the measurement of outflow discharge from the spillway</u>, information distribution of outflow discharge for the downstream of the dam is not conducted.</td></tr>
<tr><td>Donors</td><td>FMS: Six telemetry water level gauges were installed in 2010 through the IWRM project. One of the gauges installed in the Nawaka River has not been operating due to vandalism (<u>a total of five water level gauges can be monitored by FMS during the disaster</u>).</td></tr>
</table>

Issues

- Even though there is a risk of flood caused by the Nawaka River and the Malakua River, water levels of both rivers are not monitored at the moment. Therefore, **flood forecasting and issuing the warning for both tributaries cannot be implemented**. Moreover, there is no expansion plan of water level gauges including the vandalized gauge in the Nadi River basin.
- **Since water level at downstream of the dam will increase rapidly during the discharge from the dam, there is a risk caused by discharge from the dam without any prior announcement for the residents along the river and the user of the river.**
- Permanent measurement at the control points in regard to river planning and maintenance; measurement of water level at the river mouth in order to understand the sediment transport caused by flood, and fluctuation of water level caused by tide; measurement at the Vaturu dam in order to implement the information distribution in regard to the discharge from the dam are important.

Qualitative improvement of forecasting system/technology
(Application of flood forecasting system and capacity building for implementation)

Current Situation

Fiji side

FMS: 4 engineers of the Hydrology section of WAF got transferred to FMS, Nadi in 2013. Current flood forecasting and **early waring are based on the past experience and knowledge of flood**. FMS issues the flood warning by **monitoring the water level at major stations based on the observed water level in real-time**. **Flood warning consists of three types: Alert, Warning and Sever Warning. The flood warning is set so that it will provide at least 2 to 4 hours lead-time before the flood occurs**. Warning standards of flood based on precipitation is not set.

Donors

JICA: Capacity building of the hydrology section of FMS in regard to runoff analysis and setting of flood warning standards was implemented as part of the project activity in "The Strengthening Community-Based Disaster Risk Management Project, SCBDRM Project", targeting of other river basin. Even though, the learned technology is not reflected on an actual practice or the flood forecasting does not become established as an actual practice at the moment.

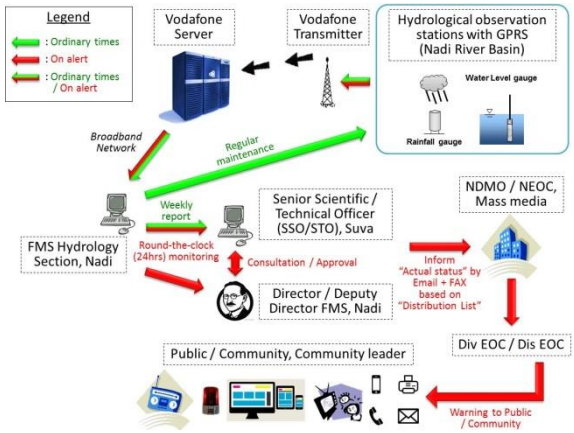
Issues

- Since there is no long-term compiled data of observed flood water level and flood discharge, **it is difficult to set the warning standards based on the scientific basis, such as water level correlation between stations or flood forecasting calculation at the moment**. Therefore, it is difficult to issue proper flood alert and warnings.
- Since the weather forecast section has accumulated the experience and know-how for many years and it has relatively more personnel (approximately 30 people), technical capability has been well-developed. On the other hand, the hydrology section has just been unified under FMS in 2013 (number of staff of hydrology section is 3 in Nadi and 12 in total, whole number of staff of FMS is 124 as of 2013). Since the task of hydrology section of WAF before unification was associated with water resources, **task and technical capability regarding flood forecast does not become established as an actual practice at the moment**.

Warning Type	Descriptions	Warning Water Level at Stations	
		Votual evu	Nadi Bridge
Flood Alert	Residents are advised to continue checking the water level and prepare for flooding (suggesting the gathering of information through media)	3.5 m	3.5 m
Flood Warning	Flooding is expected and residents are advised to start preparing for evacuation	4.5 m	4.5 m
Severe Flood Warning	Serious flooding is expected and there is imminent danger to life and property	6.0 m	7.0 m

List of Flood Warnings in Nadi River Basin

[Source: Structure and Organization of Flood Warnings: Flood Mitigation 2014, FMS]



Disaster information / warnings distributing system

Quantitative expansion of information distributing system
(Various distributing methods, such as SMS, Disaster information board, Siren and so on)

Current Situation

Fiji side

Role of each organization in regard to disaster information distributing system is clear as shown in the figure above and explanation below.

FMS: **FMS distributes the alert or warning for 1) Cyclone, 2) Heavy Rain, Flood, Swell, to the registered organization (such as NDMO, mass media and so on) on the distribution list by E-mail and facsimile**, in case of bad weather condition compared to the warning standards. Contents of distributed information are about the **actual observed value of rainfall or water level and the risk of occurrence of disaster in the future, and FMS does not distribute the information related to evacuation**. Weather information is also distributed by the website and Facebook.

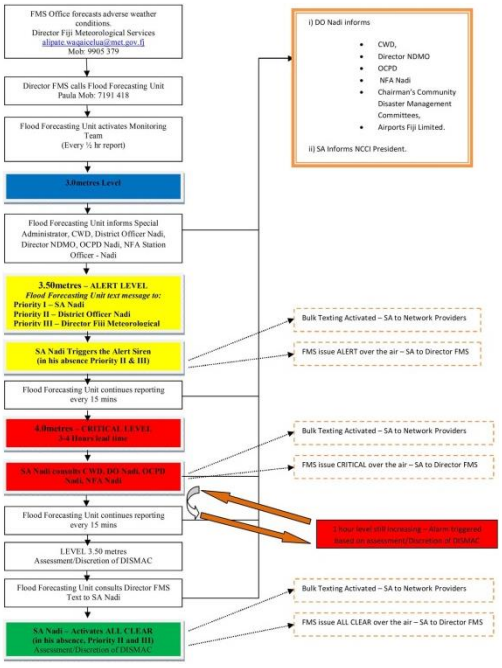
NDMO: **NDMO distributes the information related to evacuation to lower organizations, such as a division office or a district office mainly by phone**, based on the information from FMS. **Wireless station for disaster prevention is not established**.

District Office: **District office distributes the disaster information, such as "Beware of disaster. Cyclone is approaching and hit in a few days" to each community leader by phone** based on the information from FMS and NDMO. Especially for the communities located at the downstream of the Nadi River, a lot of residents start to prepare for the disaster, evacuate and start refuge life just after they receive the information above. Therefore, **district office does not distribute the some more information form FMS, such as the water level of river reaches to the certain levels / warning standards, to each community leader after the distribution of the first information**.

Community, Public: Residents in Fijian community and Indian community receive the disaster information from community leader or the CDC after they received the information from districts office. Other information sources are **TV and radio**. Especially the communities located at the downstream of the Nadi River, the residents start to prepare

		for the disaster (carry a property to an evacuation center), evacuate and start refuge life just after they receive the information from district office a few days prior to hit by cyclone. According to the interview survey to the community, **there are no problem awareness and needs for improvement of disaster / evacuation information distribution**. Some of the residents stay in their own houses even after receiving of information and even there is a risk of inundation. Therefore, it causes difficulties especially in rapid water level rising and flood during night time. **Denarau (resort area)**: Even though a few hotels / travel agencies on the remote islands are registered on the list of information distribution of FMS, resort areas basically collect the disaster information via TV and radio. **There is a need for various ways to collect information and reciprocal connection with district-level EOC considering the information distribution for tourist**.
	Donors	**GEF et al.**: **The sirens, which operate simultaneously with the water level gauge at the Nadi Town Bridge, are installed in Nadi town and in the downstream community** through IWRM project. Information is announced in three languages, English, Fijian, and Hindi. Moreover, **SMS about flood warning is manually distributed by NTC via mobile-service providers** (Vodafone, Digicel, Inkk Mobile) **to the registered users on the distribution list**. MOU is exchanged between the project manager of the IWRM project and the providers. These system and equipment are looked after by MOA for three years as previously mentioned (Table 11-2, Quantitative expansion of observation system and network). The sirens will be handed over to NDMO. Updating of MOU is not yet determined. **Introduction of CCTV camera (monitoring camera) in order to grasp the situation in real-time was considered, however, it was abandoned due to expensive initial cost**. **JICA, Japan Embassy**: Simplified early warning system, which is described in more detail in "11.2.3 Knowledge & Capacity Development", is introduced.
Issues		➢ Since communication tools among governmental organizations are mainly by phone, facsimile and Email, **there is a risk that officers cannot secure emergency contact system if the telephone line was disconnected**. Establishment of wireless station for disaster prevention is considered as the one of the measures. ➢ Various distribution methods are already utilized in cooperation with the information distribution by district office in the Nadi River Basin. Therefore, it is considered there are no serious issue and need regarding information distribution to the public. Even though, updating and continuous utilization of the system and equipment, which are installed through the IWRM project, after 2016 is the one of the concern. ➢ **Limited methods to collect disaster information by the tourists and disaster risk awareness to the tourists are one of the concerns.** ➢ As mentioned in Table 11 3, there is the issue regarding continuous operation and maintenance of the simplified EWS.

Installed siren through the IWRM project
[Sikituru Village located downstream of the Nadi River]



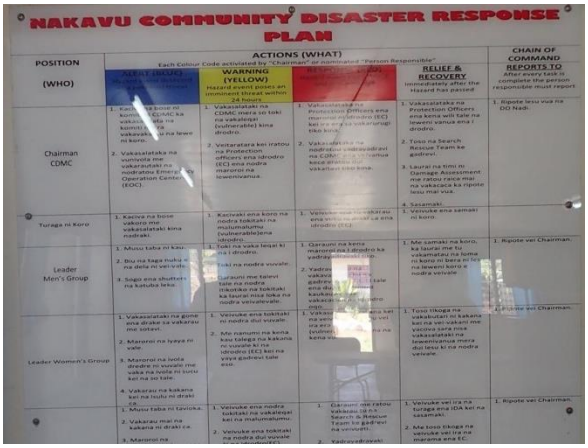
SOP of flood warning including the usage of siren and SMS
[Source: Integrated Water Resource Management Demonstration Project, GEF & etc.]

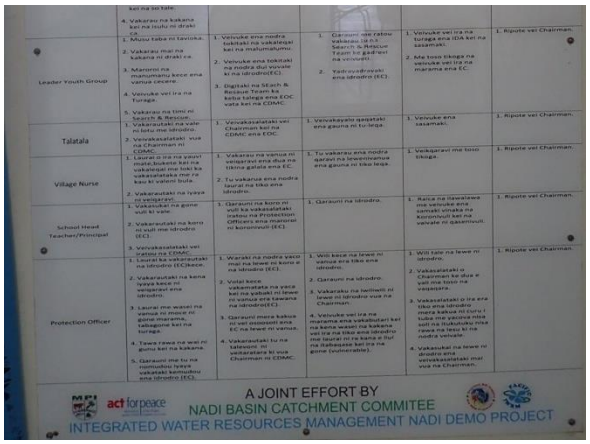
Qualitative expansion of information distributing system (Periodical simulation exercise)		
Current Situation	Fiji side	**NDMO, District Office**: NDMO and the district office play a leading role in the periodical simulation exercise, which is jointly held with the stakeholders since 2013. Developing a deep understanding of divisions of roles, shortening of response time and so on are the one of the results of the exercise
	Donors	**ADRA, SOPAC, Red Cross et al.**: Simulation exercise for Informal Settlers is conducted by ADRA, practical simulation exercise on the field is conducted by SOPAC, and the Table Top Simulation is conducted by Red Cross. All the exercises are similar.
Issues		➢ **Since governmental organizations of Fiji implement the joint simulation exercise periodically and play a leading role, there is no serious issue**. Following the SOP of National EOC, which is undergoing revision and described below, is preferable.

11.2.3 Knowledge & Capacity Development

"Development and utilization of Disaster Management Plan (DMP) and SOP, and strengthening of EOC", "Disaster prevention education, awareness program and trainings on disaster management" and "Community-based disaster prevention by simplified early warning system, voluntary disaster prevention organization and evacuation drill" are considered as the main measures in the field of Knowledge & Capacity Development. Current situation and issues of each measure are shown in Table 11-3.

Table 11-3 Current situation and issues of Knowledge & Capacity Development

<table>
<tr><td colspan="3">Development and utilization of Disaster Management Plan (DMP) and Standard Operation Procedure (SOP), and strengthening of Emergency Operation Center (EOC)</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>NDMO: NDMO was established according to the Natural Disaster Management Act, which was developed in 1998. NDMO implements several disaster management trainings at many levels, such as governmental level and community level in ordinary times. Enhancing of operation capability of NDMO is implemented with support of the European Development Fund (EDF, EDF10 [from 2008 to 2013] and EDF11 [from 2014 to 2020]). The SOP of National EOC, which is developed in 2010 with reference to "The National Disaster Management Plan, 1995" and "The Natural Disaster Management Act", is undergoing revision. Methods of disaster operation and information management, roles of each member and so on are prescribed in this SOP.
Division Office: Divisional EOC is organized for disaster response according to the SOP of National EOC. Moreover, Sectional SOP was developed through the SCBDRM Project and utilized during disaster. DMP is not developed yet.
District Office, related organizations: Even though detail procedure of disaster response for district office is not clearly described on the SOP of National EOC, it is used as a guideline. Since related organizations in Nadi have own emergency response plans and follow the plan during disaster, there is difficulty in coordination among other organizations at the moment. Therefore, district office took a leading role and held the 1st stakeholders meeting in regard to developing of DMP / SOP in November 2104 in order to specify each organization's role and strengthening of cooperation among organizations.</td></tr>
<tr><td>Donors</td><td>NTC: Disaster Management Plan, which includes the evacuation centers in Nadi and the disaster response plan, was developed through the IWRM project. Even though, it is not utilized very well by NTC.
Community: Disaster management system in community is described in more detail in "Community-based disaster prevention by simplified early warning system, voluntary disaster prevention organization and evacuation drill". Especially in the communities located at the downstream of the Nadi River, CDC is established. Moreover, the Community Disaster Response Plan (DMP / SOP) was developed through the PCIDRR project, and it is utilized by CDC during disaster.</td></tr>
<tr><td>Issues</td><td colspan="2">➢ As for EOC and the procedure of disaster response, the SOP and the forms, such as situation report were developed and a framework for disaster response is clearly defined. On the other hand, since personnel rotation is made very often (within 1 to 2 years) especially for the governmental offices in Fiji, past expediencies, issues, challenges and good practices are not shared / inherited to the successors. Also the developed DMP and SOP is not utilized due to the similar reason.
➢ As mentioned above, since related organizations in Nadi have own emergency response plans and follow the plan during disaster, there is a lack of coherence in emergency response. Each organization is aware of this issue and started to develop a unified SOP.</td></tr>
<tr><td colspan="3"> 



Community Disaster Response Plan [Nakavu Village]</td></tr>
<tr><td colspan="3">Disaster prevention education, awareness program and trainings on disaster management</td></tr>
<tr><td>Current Situation</td><td>Fiji side</td><td>NDMO: Training / Education / Awareness department of NDMO is responsible for conducting various trainings, and organizes the nationwide trainings targeting government staff and community with the support of international donor organizations. Fiji government does not allocate funds from the national budget for this activity. NDMO implemented IDM (Introduction of Disaster Management) and IDA (Initial Damage Assessment) trainings, which target is the governmental organizations, in cooperation with each division office in 2015. Existing</td></tr>
</table>

		textbook, which was developed by donor through the past project, is utilized in the training. Moreover, NDMO set certain week in October or November as the National Disaster Awareness Week and takes a leading role in public awareness, especially for education institution and community. It is conducted from 17 Nov. to 21 Nov in 2014. **MOE**: MOE compiles with the "Education in Emergencies [EiE] and School Safety Policy" and implements various activities, such as **developing the school disaster management and emergency response plan at schools in the Nadi River Basin, conducting prevention drills at the beginning of each semester starting from the school year 2015, and implementing educational programs on risk reduction** as part of the current curriculum. Manual of disaster prevention education for teacher was developed in cooperation with NDMO and other organizations by 2012. **Community**: **Since the communities located in flood-prone area** (at the downstream of the Nadi River), **the residents are high flood-conscious**, and CDC-centered disaster preparedness and response are conducted voluntary at the early stage of disaster. Moreover, disaster management training was conducted through the PCIDRR and the IWRM projects. These trainings are conducted only with the external support even though **there is a need for ToT (Training of Trainers) and periodical training**. Since no budget for the disaster management training is allocated by Fiji government, there is a difficulty in self-reliant and continuous implementation of the trainings at the moment.
	Donors	**AusAID**: The PCIDRR project has been implemented since 2011 in cooperation with NDMO. Project activity has been finished and there is no activity in the Nadi River Basin. **GEF et al.**: Not only public awareness in the community, but also lecture at the university, sharing of outcomes with other project implemented by other donor, decollation of project vehicle for advertisement were conducted through the IWRM project. **Pacific Humanitarian Team (Save the Children Fiji, UNICEF)**: EiE is implemented by Save the Children Fiji and UNICEF as a part of PHT activity. They are the members of The Pacific Humanitarian Team (PHT), which is established by OCHA in 2008. Above mentioned "EiE and School Safety Policy" has been implemented since 2014.
Issues		➢ Same as above mentioned, establishing, sharing and inheritance of learned knowledge and experience to the successors is one of the concern due to frequent personnel rotation and no budget allocation for trainings on disaster management by Fiji government. ➢ Since there is a need for periodical training especially in the communities located at the downstream of the Nadi River and the CDC has already established, strengthening of knowledge and experience sharing and inheritance by ToT is preferable. ➢ On the other hand, **it seems that community has a strong "recipient-conscious" and it is difficult to have a sustainable program regarding disaster management in ordinary times without external support** and except for an emergency case. ➢ Especially, if the frequency of disaster is reduced because of the completion of Structural Measures, losing substance of the CDC and losing past good practices, knowledge and experiences learned regarding disaster prevention will be a concern. Moreover, it will cause the extent of damage if the case of any floods over the target flood, which is the historical maximum flood.
Community-based disaster prevention by simplified Early Warning System (EWS), voluntary disaster prevention organization and evacuation drill		
Current Situation	Fiji side	**Community**: The CDC, which is established through PCIDRR project, distributes the disaster information to the individual residents in the community after the community leader received the information from the district office, and supports the vulnerable people who need of care. **Evacuation drill is not conducted voluntary by the community at the moment, and it is sporadically conducted only when there is donor's or NGO's support or project.** The siren, which was installed through IWRM project, and the simplified EWS, which was installed through Grant Assistance for Grassroots Human Security Projects (GGP), are utilized as a community EWS in some communities. Moreover some **communities have a drainage system** and it **contributes to drain rainwater and flood water** outside of the community during rainy season. Even though, maintenance of the drainage system is not conducted voluntary by the community and some parts remain malfunction. There is a need for a stock of equipment for disaster response (such as boat), since one of the communities and its community hall, which is used as an evacuation center, will be isolated during flood.
	Donors	**AusAID**: As mentioned above, Community Disaster-prevention Committee (CDC) was established through the PCIDRR project. **JICA, Japan Embassy**: Simplified Early Warning System, which is introduced in other river basin through the SCBDRM project, is installed in six communities in the Nadi River Basin through the GGP in 2015. It will help the community to respond to rapid water level rising and flood during night time, and **help them to make independent judgments and evacuation**. Evacuation drill at the community is a part of the project activities. **International / Religious NGO, NPO (Red Cross, ADRA)**: As mentioned in "Table 11-2, Qualitative expansion of information distributing system", International / Religious NGO and NPO, such as ADRA conduct simulation exercise and evacuation drill.
Issues		➢ Maintenance work in ordinary times for simplified EWS is required. Especially, since simplified rainfall gauge and water level gauge are installed outside, it will get damaged by weather for a short period without maintenance work. Therefore, **establishing of periodical maintenance system by the community** is considered as an issue. ➢ As mentioned above, since community has a strong "recipient-conscious", **it is difficult to establish, maintain and repair a drainage system and stock the equipment for disaster prevention in a self-sustaining way**. Even though, because these resources belong to the community's common benefit, it is preferable to manage by the community with a common service charge. Enhancement of community's self-reliance is a concern.

Simplified early warning system (upper: simplified water level gauge, bottom: simplified rainfall gauge) [in the Ba River Basin]

Community drainage [Nakavu Village]

11.2.4 Public Commitment & Institutional Frameworks

"Land-use regulation / planning for vulnerable area" and "Mainstreaming of disaster prevention" are considered as the main measures in the field of Public Commitment & Institutional Frameworks. Current situation and issues of each measure are shown in Table 11-4.

Table 11-4 Current situation and issues of Public Commitment & Institutional Frameworks

Land-use regulation / planning for vulnerable area		
Current Situation	Fiji side	**Land adjacent river**: River and Streams Act stipulates the land easement on both sides of river bank as "the banks of the side rivers to the breadth of 20 feet from the ordinary water-line in the wet season and the highest spring tide shall be subject to an easement in favor of the public for all purposes necessarily incident to the free use of the rivers." (Reference: Chapter 136 Rivers and Streams). **General land**: There are National Land Act and Land Use Regulation (2010). Even though, **these laws and regulations do not limit the land use in the flood-prone area**. **Others**: Even though it is not an actual Non-Structural Measures, there is a need for improvement of rainwater drainage system in Nadi. Especially, **there is no recognition / regulations for impact on drainage caused by a large-scale development** and it seems that it negatively affects to the surrounding areas. As for the construction of the bypass road from the Nadi International Airport to Denarau, even though FRA, Drainage and Irrigation department of MOA and Town and Country Planning discussed demarcation of drainage system, demarcation is not clear yet. **Airports Fiji limited worries about the load growth of rainwater caused by the town development at the surrounding area of the airport as well.**
	Donors	**ADB (SPC/SOPAC, NIWA)**: Developing of a process to consider a result of risk assessment in the town development and developing of a tool for how to provide guidance to the public are examined in the "Strengthening disaster and climate resilience in urban development project" in cooperation with Ministry of town and country planning and Nadi Town Council. The 2nd phase of this project is planned to be implemented from 2016. If a flood hazard map is developed through other project, sharing outcomes and information with this project is important.
Issues		➢ Since there is no regulation / institutional framework for land-use, **development in flood-prone areas**, such as the past inundation area and assumed inundation area by flood along the river **is not restricted**. Therefore, countermeasures, such as heightening of ground, high-floored building and so on, will not be considered and **flood risk in such areas cannot be avoided**. ➢ **Recognition / regulation for impact on drainage caused by a large-scale development shall be considered in order not to provide a negative effect to the surrounding area.** Institutional framework is required for it.
Mainstreaming of disaster prevention		
Current Situation	Fiji side	**NDMO, governmental office**: Even though the "Pacific Platform for Disaster Risk Management" was held and it contributed to enhance mainstreaming of disaster prevention every year in the pacific countries, **disaster response and rehabilitation were put emphasis on and implementation of measures in Pre-disaster phase as described above is relatively less advanced in Fiji**. **Private sector (Denarau, Bank)**: **Denarau Co. Ltd. established own committee for disaster prevention**, and

		discusses about dispatch of staff to the district EOC, cooperation and reciprocally-associated with the district EOC and so on. Moreover, **major banks in Nadi developed own Business Continuity Plan (BCP)**, they respond to disaster following the plan when they receive the warning.
	Donors	**SPC/SOPAC, UNISDR, OCHA, UNDP, USAID, The Asia Foundation, EU**: Above mentioned Pacific Platform for Disaster Risk Management was established in 2008 by SPC/SOPAC, UNISDR and so on, and it was held in round-robin fashion every year. A purpose of this platform was sharing the knowledge, experience and good practice among pacific countries and contributing to develop a regional policy and strategy for disaster risk management considering the Hyogo Framework for Action (HFA). New platform based on the Sendai Framework for Disaster Risk Reduction 2015-2030 will be established. **JICA**: BCP was developed for Ba HART, which is a business located in other river basin and managed by only female, through the SCBDRM project considering gender and mainstreaming of disaster prevention.
Issues	➢ However mainstreaming of disaster prevention has been directed in pacific countries centering on international organizations, it might require more time to permeate Fiji government, judging from the fact that very limited budget is allocated for the measures in the Pre-disaster phase. ➢ Some business in the private sector developed the BCP considering disaster risk management in Fiji. Since there a lot of self-employments and private business in the Nadi Town and the Nadi Town is a touristic center in Fiji, **it is important to minimize the damage to the private sector and accelerate early economic recovery for not only private sector, but also whole Nadi**.	

Operation Category		Recovery time, day	Response	ResponseDetail	To where, To Whom	Person in charge
Whole duration		7 days	Management	• Decesion Making, Direction, Management	Shady Cool Enterprises	Ms. Sainiana Tinai
Disaster happened	Initial Response	Immediately	Evacuation	• Evacuation acoording to Disaster Management Plan	HART home Community Hall or Namosau Methodist School	Ms. Setaita Wati
		~1 hour	Rescue Secondary Disaster Prevention Safety confirmation	• Rescue by using rescue stock stuffs. • Response for secondary disaster • Safety confirmation (staffs and their family.)	Within HART Ba	Ms. Alesi Siga Ms. Gyan Wati
		~1.5 hour	Mutual Help	• Safety confirmation within HART Ba.	Within HART Ba	Ms. Setaita Wati
		~2 hours	Damage Assesment Request for assistance	• Damage Assesment of Shop, equipments,life lines • Request for assistance, manpower	Ba Correction Center, Red cross, Ba DISMAC, Co-operative Dep.	Ms. Setaita Wat Ms. Sainiana Tlanaii
		~24 hours	Releasing and Shariing Information	• Collecting Damage Assesment Data • Damage Asssesment around community • Report Damage Assesment	HART headquater, Ba DISMAC, Co-operative Dep.	Ms. Setaita Wati Ms. Sainiana Tianai
	Recovery Response	~3 day	Mutual Help	• Cleaning up • Serving foods	HART Ba・HART Ba residents	Ms. Alesi Siga
Ordinary Operation		~7 days	Releasing and Shariing Information	• Reopen • Communication to all stakeholders	HART headquater, Ba DISMAC, Co-operative Dep.	Ms. Sainiana Tinai

BCP [Ba HART, Ba River Basin]

[Source: The Strengthening community-Based Disaster Risk Management Project in The Pacific Region, JICA]

11.2.5 Watershed Management

Current situation and issues in the field of Watershed Management is shown in Table 11-5.

Table 11-5 Current situation and issues of Watershed Management

Watershed management		
Current Situation	Fiji side	**MOA**: Construction of 15 **retention dams** in the Nadi River Basin was planned as a part of watershed management **aiming the peak cut of flood and small scale retention**. 15 retention dams are planned to be constructed and 3 dams out of 15 had been constructed and one of them are under construction as of December 2014.
	Donors	**GEF et al.**: Bank erosion is the one of the issues at the upstream of the Nadi River. Therefore, planting of fruit trees, which produce revenue, on bank slope and other areas, was implemented as a part of the project activities in order to reduce logging and bank erosion. Water tank was provided as a trade-off of planting of trees.
Issues	➢ MOA and the donor are implementing / already implemented some of the activities regarding watershed management, such as establishing of the Nadi Basin Catchment Committee (NBCC). Even though, it is difficult to continue the activity after the project, especially for the project conducted by donors. Empowerment of communities to take ownership of project initiatives and mainstreaming into national policy and so on were considered as the challenges in IWRM project.	

Diagram of planting program by IWRM
[Source: IWRM Nadi Basin Demo Project, Dec. 2011 presentation slide of Project seminar]

11.2.6 Major Non-Structural Measures Implemented by Donor (Pre-Disaster Phase)

Ongoing or completed major Non-Structural Measures for Pre-Disaster phase, which is implemented by donor, are shown in Table 11-6.

Table 11-6 Major Non-Structural Measures Implemented by Donor (Pre-Disaster Phase)

<table>
<tr><th>Project</th><th>Donor</th><th>Year</th><th>Summary</th></tr>
<tr><td>PDRMP, PDRMP-2
(Pacific Disaster Risk Management (Training) Programme)</td><td>SPC/SOPAC, The Asia Foundation, USAID</td><td>2004 – 2008
2010 – 2013
Ongoing (by SPC/SOPA without fund)</td><td>This project was implemented in thirteen pacific countries, targeting officers of disaster-related organizations and community leaders. Following trainings were conducted in this project.
<table>
<tr><th></th><th>Course Name</th><th>Duration</th><th>Description</th></tr>
<tr><td>1</td><td>Introduction to Disaster Management</td><td>3 days</td><td>Basics of disaster management, community-based disaster management programs and activities, etc.</td></tr>
<tr><td>2</td><td>Disaster Risk Reduction</td><td>3 days</td><td>Identification and assessment of potential hazards, identification of opportunities for risk reduction, preparation of risk reduction action plan and implementation methods, et.</td></tr>
<tr><td>3</td><td>Initial Damage Assessment Course</td><td>2 days</td><td>Purpose of damage assessment in disaster management, collection and recording of information and data related damage resulting from disaster, etc.</td></tr>
<tr><td>4</td><td>Exercise Management Course</td><td>5 days</td><td>Needs analysis for EOCs at various levels, design and development of exercises</td></tr>
<tr><td>5</td><td>Emergency Operations Centers Course</td><td>5 days</td><td>Determination of requirements for facilities and resources in the establishment of EOCs, determination of administrative needs of an EOC, etc.</td></tr>
<tr><td>6</td><td>Training for Instructors Course</td><td>5 days</td><td>Training for Instructors in order to conduct the above-noted trainings</td></tr>
</table></td></tr>
<tr><td>Pacific Disaster Net</td><td>SPC/SOPAC, UNDP, OCHA, Red Cross and Red Crescent Societies, UNISDR</td><td>2006 – ongoing</td><td>It is designed to become the largest and most comprehensive information resource in relation to disaster risk management in the Pacific. It was developed as an initiative of the Pacific Disaster Risk Management Partnership Network (PDRMPN).
[Source: http://gsd.spc.int/pacific-disaster-net]</td></tr>
</table>

PCIDRR (Pacific Community-Focused Integrated Disaster Risk Reduction)	National Council of Churches, AusAID	2008 – 2011, and ongoing	Fiji, Solomon Islands, Tonga and Vanuatu are the target countries for this project. Since some of the project activities are not finished yet in certain community, project activity is still implemented in cooperation with NDMO. Main project activities are establishing of the CDC, understanding of risks in the community, developing of disaster response plan, table top and field simulation and so on. Governmental offices regarding disaster prevention and the community leaders are set as a target and there are ten target communities in Nadi.
EiE (Education in Emergencies)	Save the Children Fiji, UNICEF (PHT - OCHA)	2008 – ongoing	Develop the Education in Emergencies and School Safety Policy in order to implement disaster management measures at schools. Mainly, improvement of safety on school facilities, establishment of disaster management structures within school, implementation of risk reduction education in school curriculum.
EDF 10, 11 (European Development Fund 10th, 11th)	EU	2008 – 2013, 2014 – 2020	EDF is the main instrument for European Union (EU) aid for development cooperation in Africa, the Caribbean, and Pacific countries and it supports strengthening operation and function of NDMO. A need for resilience-building to natural disasters was emphasized especially for Small Island Developing States at the ACP-EU Joint Parliamentary Assembly held in June 2015, considering the case of Vanuatu devastated by Cyclone Pam in 2015. [Source: ACP-EU Joint Parliamentary Assembly Newsletter June 2015 Edition]
IWRM (Integrated Water Resource Management Demonstration Project)	GEF, SPC/SOPAC, EU, UNDP, UNEP	2009 – 2013	Project Purpose: Improved catchment resilience to flood impacts and better flood preparedness and management within the Nadi Basin. Components: 1) Rainfall; 2) Run-off; 3) River Network and Floodplain; 4) River Water Health; 5) Coastal Health; 6) Nadi Basin Flood Management Plan Rainfall gauges and water level gauges were installed regarding 1) and 2). Public awareness for stakeholders was implemented regarding 3). Monitoring was conducted for 4) and 5), and the Nadi Basin Catchment Committee was established regarding 6).
Strengthening disaster and climate resilience in urban development project	ADB	2010 – 2014	Project outcome is "Climate and disaster risk information is integrated into urban development and infrastructure planning in Pacific developing member countries". A learning-by-doing approach will be develop a methodology for integrating disaster and climate risk assessment tools in to development planning, and SPC will organize training activities in each of the six participating countries. [Source: Technical Assistance Report December 2012, ADB]
The Strengthening community-Based Disaster Risk Management Project in The Pacific Region	JICA	2010 – 2013	Three communities along the river were selected as the target communities in the Ba River basin, Northwestern part of Viti Levu Island in this technology transfer project. The main counterparts were NDMO, WAF, FMS and district office. Project purpose was "A system in which the residents of the selected community area are able to evacuate appropriately is established". Installation of hydrological equipment, development of disaster management plan, introduction and operation of simplified EWS and strengthening community-based disaster risk management were implemented as the project activities.
Grant Assistance for Grassroots Human Security Projects	Ministry of Foreign Affairs of Japan	2014 – ongoing	Simplified EWS is installed in four areas in Nadi out of thirty-two areas in entire Fiji in this project. This project consists of three components, including the (1) installation of a simplified EWS; (2) the conduct of workshops; and (3) the conduct of evacuation drills, at the targeting six communities in the Nadi River Basin.

11.3 Current situation and issues of Non-Structural Measures (Disaster Response Phase)

11.3.1 Emergency Aid / Immediate Assistance

Current situation and issues of the Emergency Aid / Immediate Assistance is shown in Table 11-7. "Strengthening of system of Emergency Assistance" is considered as the main measure.

Table 11-7 Current situation and issues of Emergency aid / immediate assistance

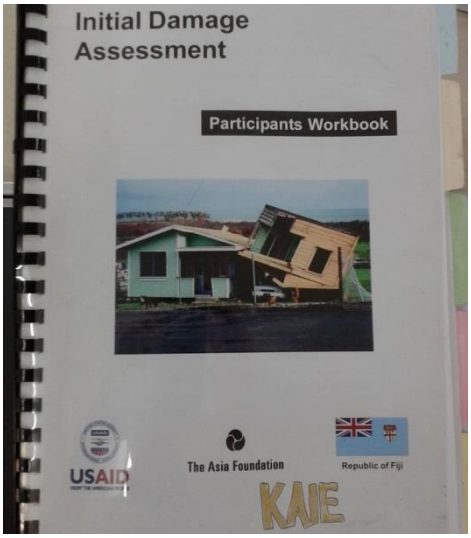
Strengthening of system of Emergency Assistance		
Current Situation	Fiji side	**National EOC et al.**: National, divisional, district EOCs are immediately activated based on the weather forecast in 24 to 48 hours and disaster related information of FMS except for the case of sudden disaster, such as earthquake and tsunami. Information of disaster and evacuation to the public, collection of information and communication before and during disaster by phone and interview at evacuation centers, preparation of disaster response, monitoring of disaster situation and immediate assistance after the disaster are conducted. Resources for disaster prevention, response and rescue, such as vehicle, boat, fuel, and stockpile are totally very insufficient. Even the equipment for emergency rescue is also insufficient at district level and rescue during the disaster is difficult in the current situation. In case of shortage of vehicle and manpower, the army might request assistance from not-affected areas.
	Donors	**Red Cross**: Donation, contribution of facilities such as water supply, and distribution of daily necessities are conducted as a main assistance. Distribution of daily necessities is conducted in their ways without the mutual consultation with EOC.
Issues	➢ Even though the EOCs are immediately activated and information distribution and preparation are conducted from pre-disaster phase, immediate assistance requires a lot of time and emergency rescue is difficult due to lack of budget and insufficient resources for disaster prevention, response and rescue. ➢ Since daily necessities, such as food, water is often delivered to the communities directly without the mutual consultation with EOC, some assistance will duplicate and it affects to the fair immediate assistance.	

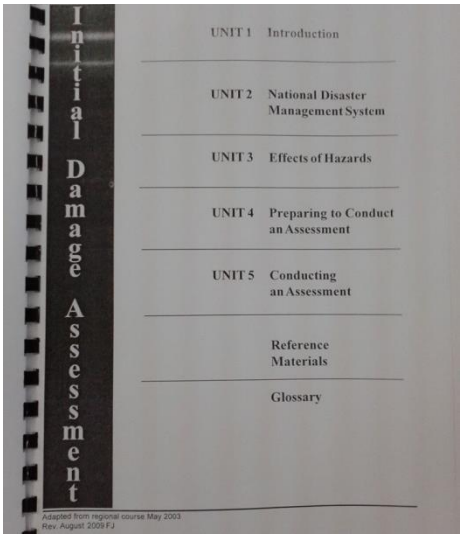
11.3.2 Initial Damage Assessment

"Damage assessment based on unified situation report and standard for calculating damage" is considered as the main measure in the field of Initial Damage Assessment. Current situation and issues of the measure is shown in Table 11-8.

Table 11-8 Current situation and issues of Initial Damage Assessment

Damage assessment based on unified situation report and standard for calculating damage		
Current Situation	Fiji side	**NDMO, CWD et al.**: Initial Damage Assessment (IDA) is implemented within 48 hours after the occurrence of disaster aimed at humanitarian support, such as securing of food, water, fuel, medical service and evacuation center. Moreover, training of IDA is conducted with the support of donor below, and NDMO took a leading role in the training in March 2015. The textbook, which was developed through the project below, is utilized in the training.
	Donors	**SPC/SOPAC, USAID et al.**: As mentioned in Table 11-6, trainings of IDA were implemented in PDRMP projects.
Issues	➢ Same as "Disaster prevention education, awareness program and trainings on disaster management (refer to Table 11-3)", since Fiji government does not allocate funds from the national budget for the training, establishing, sharing and inheritance of learned knowledge and experience to the successors is one of the concern.	





Textbook developed in PDRMP project

11.3.3 Major Non-Structural Measures Implemented by Donor (Disaster Response Phase)

Ongoing or completed major Non-Structural Measures for Disaster Response phase, which is implemented by donor, are shown in Table 11-9.

Table 11-9 Major Non-Structural Measures Implemented by Donor (Disaster Response Phase)

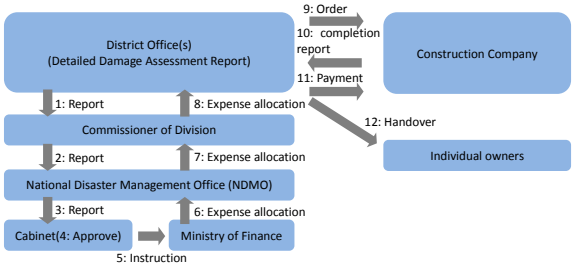
Project	Donor	Year	Summary
PDRMP, PDRMP-2 (Pacific Disaster Risk Management (Training) Programme)	SPC/SOPAC, The Asia Foundation, USAID	2004 – 2008 2010 – 2013 Ongoing (by SPC/SOPA without fund)	Project summary is described in Table 11-6. Activity regarding initial disaster assessment was conducted in the project.
Emergency relief during disaster	International NGOs, such as Red Cross, and religious NGOs such as, ADRA and Muslim League	During disaster	Donation, contribution of facilities such as water supply, and distribution of daily necessities are conducted as a main assistance. Distribution of daily necessities is conducted in their ways without the mutual consultation with EOC. NGOs are skilled in the field of disaster-relief and be able to conduct the field work. Besides, they are skilled on the arrangement of logistics, distribution of aid supplies and so on

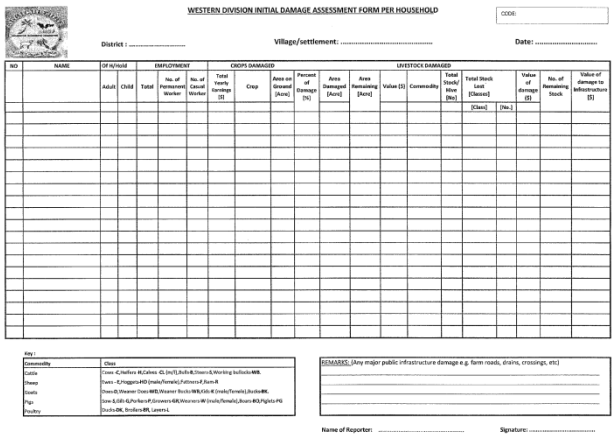
11.4 Current situation and issues of Non-Structural Measures (Post-Disaster Phase)

11.4.1 Damage Assessment and Social Compensation

"Lessening the gap among situation reports (division - community level) and compiling and utilizing of situation report" is considered as the main measure in the field of Damage Assessment and Social Compensation. Current situation and issues of the measure is shown in Table 11-10.

Table 11-10 Current situation and issues of Damage Assessment and Social Compensation

<table>
<tr><td colspan="3">Lessening the gap among situation reports (division - community level) and compiling and utilizing of situation report</td></tr>
<tr><td rowspan="2">Current Situation</td><td>Fiji side</td><td>Government office: As for the damage assessment of residential building (legal), district office organizes a housing unit in order to conduct damage assessment within approximately two weeks after the occurrence of disaster and after receiving a damage report from the community. Damage is assessed depending on whether the building is complete collapse or half collapse, and physical compensation, such as repair of damaged part; and rebuilding and handover of building is conducted. Financial compensation for damaged building and properties are not conducted. As for the compensation for damaged crop, MOA conducts damage assessment using the certain form and provide the seeds and seedlings of damaged crops as physical compensation. Financial compensation is not conducted. Some organizations are not conducting damage assessment for their own facilities.
There is a gap between the damage report from the community and assessment result by governmental office. The damage report and assessment result are not compiled.</td></tr>
<tr><td>Donors</td><td>NGO: Since compensation for illegal residents is not applied by Fiji government, NGO supports those people.</td></tr>
<tr><td>Issues</td><td colspan="2">➢ Since <u>damage report from the community is often over-claimed comparing to the assessment result by governmental office, it causes more time for assessment and confirmation activity</u>.
➢ Even though there is a gap between the damage report from the community and the assessment result, lessons are not recognized and it is not utilized for improvement due to no accumulation nor evaluation of the damage report and the assessment result.
➢ Infrastructure, which is managed by each organization, should be assessed its damage using the unified assessment form of each organization after the disaster.
➢ Physical compensation is already conducted as social compensation based on the prescribed assessment standard and form and there is no serious issue.</td></tr>
<tr><td colspan="3"> 

Flowchart of compensation for residential building
[Source: JICA Project Team made based on the interview with NDMO]


Detail damage assessment form for crops
[Source: MOA, Commissioner Western Office]</td></tr>
</table>

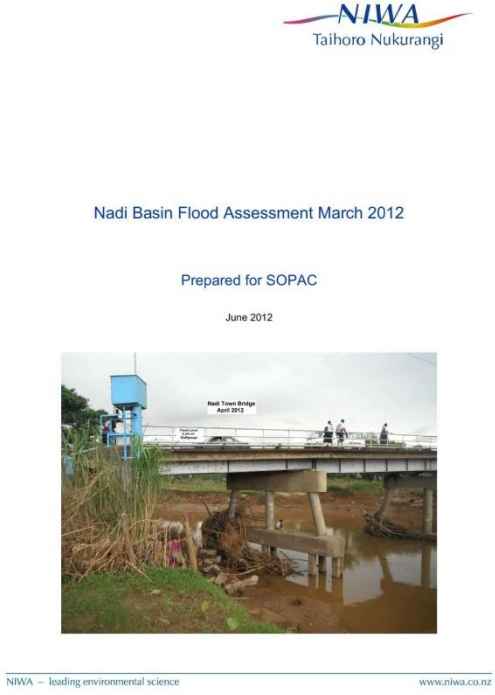
11.4.2 Evaluation of Pre-Disaster Activity and Feedback

"Evaluation of activities for knowledge & capacity development and capacity assessment regarding disaster prevention (internal evaluation), and questionnaire research on activities in Pre-Disaster and Disaster Response to the public (external evaluation)" is considered as the main measure in the field of Evaluation of Pre-Disaster Activity and Feedback. Current situation and issues of the measure is shown in Table 11-11.

Table 11-11 Current situation and issues of Evaluation of Pre-Disaster Activity and Feedback

<table>
<tr><td colspan="3">Internal and external evaluation for Non-Structural Measures (Questionnaire research and so on)</td></tr>
<tr><td>rent Situ ation</td><td>Fiji side</td><td>Government office: Even though assessment for damaged hydrological equipment, building and some infrastructure is conducted and rehabilitation plan is developed, evaluation of measures for disaster risk reduction is not conducted.</td></tr>
</table>

	Donors	NIWA: Assessment for damaged hydrological equipment by Cyclone Evan in 2012, which was installed in IWRM project, was implemented and its report was developed. **This assessment is mainly focus on whether the equipment worked or not during the disaster and whether the equipment got damaged or not**. **Evaluation and feedback of implemented pre-disaster activity, such as the impact and effectiveness of the siren during the disaster, are not conducted**.
Issues	➢ Even though utilization of some of the measures for disaster risk reduction and damage situation of introduced equipment are implemented at the moment, **impact, effectiveness and contribution of the implemented measures are not evaluated. Therefore, problems and lessons of implemented measures are not recognized and they are not utilized for improvement and feedback**.	


NIWA
Taihoro Nukurangi

Nadi Basin Flood Assessment March 2012

Prepared for SOPAC

June 2012

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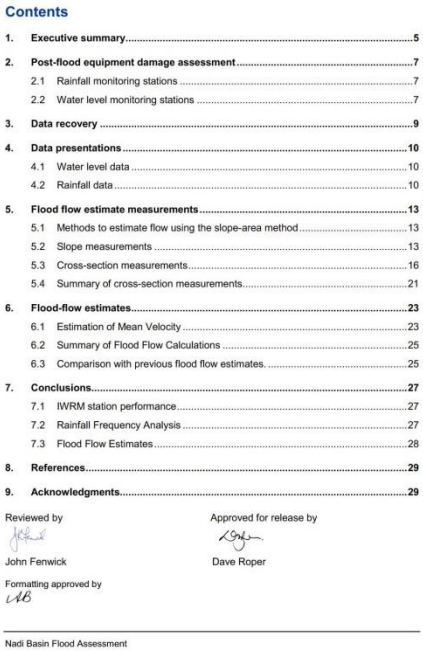

Contents

Reviewed by
John Fenwick

Approved for release by
Dave Roper

Formatting approved by

Nadi Basin Flood Assessment

Nadi Basin Flood Assessment report, March 2012
[Source: Nadi Basin Flood Assessment March 2012, NIWA]

11.4.3 Major Non-Structural Measures Implemented by Donor (Post-Disaster Phase)

Ongoing or completed major Non-Structural Measures for Post-Disaster phase, which is implemented by donor, are shown in Table 11-12.

Table 11-12 Major Non-Structural Measures Implemented by Donor (Post-Disaster Phase)

Project	Donor	Year	Summary
IWRM (Integrated Water Resource Management Demonstration Project)	GEF, SPC/SOPAC, EU, UNDP, UNEP	2009 – 2013	Project summary is described in Table 11-6. Damage assessment of the equipment installed in the project was conducted after the disaster as a part of project activities.

11.5 Examination of Non-Structural Measures for the Master Plan

11.5.1 Programs of Non-Structural Measures for the Master Plan

Seven Non-Structural Measures for M/P are categorized and suggested considering the current situation and issues of each Non-Structural Measure and existing / passed projects described above. Expected major components of each measure are described below.

A) Strengthening of understanding flood risk with flood hazard map

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Risk awareness & Assessment (Refer to p.11-4, Table 11-1)	➢ The flood-hazard area, the risk and the evacuation center and so on are not recognized properly.	➢ Implementation and completion of the priority project might invite the misunderstanding among the public, such as no flood damage after the project. ➢ There is a risk of inundation even after the river improvement. ➢ If the frequency of disaster is reduced because of the completion of Structural Measures, losing past good practices, knowledge and experiences learned regarding disaster prevention will be a concern. Moreover, it will cause the extent of damage if the cases of any floods over the target flood.	**Development of flood hazard map and holding workshops**
	Disaster Prediction & Early Warning (Refer to p.11-5, Table 11-2)	➢ Lopsided distribution (Especially in Malakua and Nawaka Rivers Catchments)	➢ Flood forecasting and issuing the warning for both tributaries cannot be implemented	**Installing of rainfall gauge, water level gauge and real-time monitoring camera**
		➢ Limited methods to distributing especially for tourists	➢ Limited methods to collect disaster information by the tourists and disaster risk awareness to the tourists are one of the concerns	**Disaster information board and distribution of the hazard map**

Purpose	➢ Understanding of flood risk for the public including tourists with a flood hazard map, which indicates estimated inundation area caused by any floods over the target flood, and disaster information board. ➢ Establishing the system, which can enhance monitoring capability during flood and enables appropriate evacuation, by expansion of rainfall gauges and water level gauges and introducing a monitoring camera.
Programs	1. Installation of hydrological equipment, camera and disaster information board 2. Collection of information regarding disaster prevention resources and development of flood hazard map (Output sharing with D) Technology support for land-use regulations) 3. Distribution of the hazard map and holding workshops for utilization it 4. Simulation exercise using installed equipment in 1. And the hazard map
Assumed implementing agency	NDMO, FMS, DO, Nadi Town Council, Community
Assumed implementing time scale	➢ Risk awareness & Assessment: **[Short-term]** -> Since some of the activities are implemented in this project, it is possible to start in short-term ➢ Disaster Prediction & Early Warning: **[Short-term]** -> Since some of the activities are implemented by FMS and donor, it is possible to start in short-term
Estimated rough cost	➢ Development of flood hazard map and holding workshops: Technology transfer project : More than 1.0 million FJD / year ➢ Installing of rainfall gauge, water level gauge and real-time monitoring camera: Rainfall & Water level gauges : More than 50,000 FJD / gauge Introduction of monitoring camera : More than 60,000 million FJD / camera ➢ Disaster information board and distribution of the hazard map: Disaster information board : More than 0.8 million FJD / board

B) Strengthening flood forecasting technology

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Qualitative improvement of forecasting system/technology (Refer to p.11-5, Table 11-2)	➢ Current flood forecasting and early waring are based on the past experience and knowledge of flood. ➢ Hydrology section has just been unified under FMS in 2013 and task regarding flood forecast does not become established.	➢ Since there is no long-term compiled data of observed flood water level and flood discharge, it is difficult to set the warning standards based on the scientific basis ➢ Since task and technical capability regarding flood forecast does not become established as an actual practice at the moment, it is difficult to conduct operation of the system and flood forecast	**Strengthening organization (hydrology section of FMS) and personnel regarding flood forecast**
	Qualitative expansion of observation system and network (Refer to p.11-5, Table 11-2)	➢ Flood forecasting system and highly accurate measurement are not introduced.	➢ Technical assistance regarding improvement of forecasting system/technology is required in order to utilize the new technology.	**Introduction of flood forecast system and MP Radar and strengthening operation and management the system**

Purpose	Establishing appropriate flood forecasting system and issuing flood warnings by strengthening the technology regarding flood forecast and introducing high accurate observation system in order to enable appropriate evacuation activity during flood.
Programs	1. Unification of hydrological observation system 2. Strengthening of setting /update of warning standards (flood discharge survey, periodical cross-section survey) 3. Establishment of flood forecasting system 4. Development of operation manual of the system and O&M plan of the system 5. Introduction of MP Radar 6. Strengthening data collection, compiling, and utilization of MP Radar
Assumed implementing agency	FMS Hydrology section
Assumed implementing time scale	➢ Qualitative improvement of forecasting system/technology: **[Short-term to Long-term]** -> Substantial time is required for capacity building ➢ Qualitative expansion of observation system and network: **[Middle-term to Long-term]** -> Technical assistance regarding improvement of forecasting system/technology is required in order to utilize the new technology in conjunction with introduction of new technology
Estimated rough cost	➢ Strengthening organization and personnel regarding flood forecast: Technology transfer project : More than 1.0 million FJD / year ➢ Introduction of flood forecast system and MP Radar: Introduction of MP Radar : More than 1.7 million FJD (technology transfer regarding MP Radar is included above project)

C) Strengthening disaster management system

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Knowledge & Capacity Development (Refer to p.11-8, Table 11-3)	➢ SOP of the National EOC, SOP of CWD, DMP of NTC and DMP of certain communities are developed.	➢ Due to frequent personnel rotation, past expediencies, issues, challenges and good practices are not shared / inherited to the successors	**Development / Update of DMP, SOP and establishment of system for feedback**
	Public Commitment & Institutional Frameworks (Refer to p.11-10, Table 11-4)	➢ Pacific platform had been implemented and there is a donor support such as EDF10 & 11. ➢ Disaster response and rehabilitation were put emphasis on	➢ It requires substantial times for understanding of importance of investment in disaster prevention	**Economic estimation of investment in disaster prevention**
Disaster Response Phase	Emergency Aid / Immediate Assistance (Refer to p.11-14, Table 11-7)	➢ EOC is activated based on SOP and in each governmental level and disaster response is conducted. ➢ NGOs directly distribute the daily necessities to the community aside from EOC's immediate assistance	➢ Even though the EOCs are immediately activated and information distribution and preparation are conducted from pre-disaster phase, immediate assistance requires a lot of time and emergency rescue is difficult due to lack of budget and insufficient resources for disaster prevention, response and rescue ➢ Since daily necessities, such as food, water is often delivered to the communities directly without the mutual consultation with EOC, some assistance will duplicate and it affects to the fair immediate assistance.	**Strengthening of system of Emergency Assistance**

Purpose	Developing and Updating of DMP, SOP and establishment of system for feedback; understanding importance of investment in disaster prevention by economic estimation of investment; and expanding of resources for disaster prevention in order to encourage immediate disaster response.
Programs	1. Establishment and revision of DMP and SOP in each governmental level (based on revised SOP of the National EOC) 2. Periodical simulation exercise involving private sector and community 3. Establishing of data base for the situation report of disaster response 4. Development of feedback system and reflecting lessons learnt from the simulation exercise and actual disaster response on DMP and SOP 5. Model development and implementation of economic estimation of investment in disaster prevention
Assumed implementing agency	NDMO, CWD, DO, Private sector, Community
Assumed implementing time scale	➢ Knowledge & Capacity Development: **[Middle-term]** -> DMP and SOP are partially developed, but substantial time is required for continuous utilization ➢ Public Commitment & Institutional Frameworks: **[Short-term to Long-term]** -> It requires substantial times for understanding of importance of investment in disaster prevention and securing and expansion of resources for disaster prevention. ➢ Emergency Aid / Immediate Assistance: **[Short-term to Long-term]** -> Lack of personal, physical, budgetary resource for emergency aid / immediate assistance. It requires substantial times for securing and expansion of resources for disaster prevention.
Estimated rough cost	➢ Development / Update of DMP, SOP and establishment of system for feedback: Technology transfer project : More than 0.3 million FJD / year ➢ Economic estimation of investment in disaster prevention: Technology transfer project : More than 1.0 million FJD / year ➢ Strengthening of system of Emergency Assistance: Technology transfer project : More than 0.3 million FJD / year

D) Technical assistant for land-use regulation

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Risk awareness & Assessment (Refer to p.11-4, Table 11-1)	➢ The flood-hazard area, the risk and the evacuation center and so on are not recognized properly.	➢ Implementation and completion of the priority project might invite the misunderstanding among the public, such as no flood damage after the project. ➢ There is a risk of inundation even after the river improvement ➢ If the frequency of disaster is reduced because of the completion of Structural Measures, losing past good practices, knowledge and experiences learned regarding disaster prevention will be a concern. Moreover, it will cause the extent of damage if the cases of any floods over the target flood.	**Development of flood hazard map and holding workshops** **"Output sharing of A) Strengthening of understanding flood risk with flood hazard map**
	Public Commitment & Institutional Frameworks (Refer to p.11-10, Table 11-4)	➢ There is no land-use regulation regarding flood. ➢ Developing of a process to consider a result of risk assessment in the town development is conducting.	➢ There is a risk of expanding of damage due to no land-use regulation in flood-prone area.	**Development of law (Revision of the National Land Act and Land Use Regulation)** **Setting of drainage standard regarding development**
		➢ There is no recognition / regulations for impact on drainage caused by a large-scale development	➢ Recognition / regulation for impact on drainage caused by a large-scale development shall be considered in order not to provide a negative effect to the surrounding area.	

Purpose	Developing / revising the law for land-use regulation especially for flood-prone area and retarding basins; setting of drainage standard regarding development; and Organizing of information of town / development plans with GIS in order to publish to the public in an understandable way.
Programs	1. Development of a flood hazard map (Output sharing of A)) 2. Organizing of information of town / development plans with GIS 3. Zoning based on inundation risk level and setting of regulation for each zone 4. Development of guideline for land-use regulation 5. Setting of drainage standard regarding development 6. Seminar for the regulation and the standard
Assumed implementing agency	Strengthening of understanding flood risk with flood hazard map: NDMO, FMS, Nadi Town Council, Community Land-use regulation: Ministry of Town and Country Planning (MTCP), Nadi Town Council, (Donor, which is implementing the current project)
Assumed implementing time scale	➢ Risk awareness & Assessment: **[Short-term]** -> Since some of the activities are implemented in this project, it is possible to start in short-term ➢ Public Commitment & Institutional Frameworks: **[Short-term to Long-term]** -> Even though it is in place by Org with support of donors, development of law requires substantial time
Estimated rough cost	➢ Technical assistant for land-use regulation: Technology transfer project : More than 1.0 million FJD / year

E) Strengthening river basin management

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Risk awareness & Assessment (Refer to p.11-4, Table 11-1)	➢ Details are described in A) Strengthening of understanding flood risk with flood hazard map and D) Technical assistant for land-use regulation		**Development of flood hazard map [A)]** **Development of law (Revision of the National Land Act and Land Use Regulation) [D)]**
		➢ The flood-hazard area, the risk and the evacuation center and so on are not recognized properly. [A)] ➢ There is no land-use regulation regarding flood [D)]	➢ Lack of understanding of risk will delay disaster preparedness and response. [A)] ➢ There is a risk of expanding of damage due to no land-use regulation in flood-prone area. [D)]	
	Watershed Management (Refer to p.11-11, Table 11-5)	➢ Even though the Nadi Basin Catchment Committee (NBCC) was established and watershed management is conducted, not continued after the project completion.	➢ It is difficult to continue the activity after the project, especially for the project conducted by donors. Flood risk reduction by watershed management cannot be continuously implemented.	**Reactivation of NBCC, development of regulation of local government and cooperation with other projects**

Purpose	Reactivating the Nadi Basin Catchment Committee (NBCC), developing a regulation of local government for river basin management and cooperating with other project (Structural and Non-Structural Measures) in order to enable integrated flood management in entire basin and manage flood risk.
Programs	1. Implementation of activity regarding reactivation and continuity of the NBCC, such as development of regulation on river basin management by local government 2. Output sharing / cooperation with other projects (especially with other Structural Measures, EWS, hazard map and land-use regulation and so on) 3. Implementation of measures regarding rainwater storage and infiltration, such as examination and planning of water conservation forest, introducing and strengthening of facilities for rainwater storage and infiltration at agricultural land and playground (Structural Measure) 4. Implementation of sediment runoff control measure by tree plantation or utilization of flood control tree 5. Seminar for river basin management
Assumed implementing agency	CWD, DO, NTC, NBCC
Assumed implementing time scale	➢ Risk awareness & Assessment: **[Short-term]** -> Since some of the activities are implemented in this project, it is possible to start in short-term. ➢ Public Commitment & Institutional Frameworks: **[Short-term to Long-term]** -> Even though it is in place by Org with support of donors, development of law requires substantial time ➢ Watershed Management : **[Short-term to Long-term]** -> Even though IWRM project was conducted with donor support and the NBCC was established, substantial time is required for continuous implementation of activity by Fiji government
Estimated rough cost	➢ Strengthening river basin management: Technology transfer project : More than 1.0 million FJD / year

F) Strengthening economic disaster risk management by regional BCP

	Field	Current Situation	Issues	Expected Measures
Pre-Disaster Phase	Public Commitment & Institutional Frameworks	➢ Mainstreaming of disaster prevention for government has been done. ➢ Mainstreaming of disaster prevention for private sector, such as development of BCP, is limited.	➢ Because there is no BCP, it might delay recovery of private sector after the disaster. It is important to minimize the damage to the private sector and accelerate early economic recovery for not only private sector, but also whole Nadi	**Development of BCP / regional BCP and holding workshops**

Purpose	Developing BCP / regional BCP in order to encourage early recovery of Nadi Town and whole Nadi and to mitigate the economic damage especially for inundation caused by any floods over the target flood.
Programs	1. Workshops of developing of BCP (Private sector and local government) (Including review of existing BCP and lecture by the sector which has already introduced the BCP and so on) 2. Simulation exercise based on the developed BCP
Assumed implementing agency	NDMO, CWD, DO, Nadi Town Council, Private sector
Assumed implementing time scale	➢ Public Commitment & Institutional Framework: **[Short-term to Long-term]** -> Since some activities are in place by certain private sector and other basin, it is possible to implement in short-term. Regional BCP involving local government requires substantial time
Estimated rough cost	➢ Development of BCP and holding workshops: Technology transfer project : More than 1.0 million FJD / year

G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

	Field	Current Situation	Issues	Expected Measures
Post-Disaster Phase	Evaluation of Pre-Disaster Activity and Feedback	➢ Current assessment is mainly focus on whether the equipment worked or not during the disaster and whether the equipment got damaged or not. Evaluation and feedback of implemented pre-disaster activity are not conducted.	➢ Impact, effectiveness and contribution of the implemented measures are not evaluated. Therefore, problems and lessons of implemented measures are not recognized and they are not utilized for improvement and feedback.	**Evaluation of Pre-disaster activity / existing measures and feedback**

Purpose	Establishing the feedback system, which enables Better Disaster Prevention by evaluation of Pre-disaster activity and existing measures, in order to examine improvements and encourage better risk understanding and avoidance.
Programs	1. Listing up of conducted / conducting measures 2. Evaluation of impacts / effectiveness of the measures and development of feedback system 3. Examination of improvements 4. Feedback of improvements abstracted in 3
Assumed implementing agency	NDMO, CWD, DO, Nadi Town Council, FMS
Assumed implementing time scale	➢ Evaluation of Pre-disaster activity / existing measures and feedback: **[Short-term]** -> Since similar activity was conducted by donor, it is possible to start in short-term
Estimated rough cost	➢ Evaluation of Pre-disaster activity / existing measures and feedback: Technology transfer project : More than 0.3 million FJD / year

Table 11-13 Current Condition, Challenges and Future Prospective of Non-Structural Measures in the Nadi River Basin (Pre-Disaster Phase)

Pre-Disaster	Current Status			Future Perspective			Feasibility	
	Current situation		Challenges / Issues	Preferable level for implementation	Effect of activity	Sustainability of activity	Time scale for implementation	Required Condition for implementation
Activity		Existing program (Project, Donor, Year)	Remain unutilized, Lack of continuity : Especially after the project / program completion and so on	"Div: Division-level", "Pro: Province-level", "Dis: District-level", "Org: Organization-level", "Com: Community-level", "Private: Private sector-level"		Method to secure sustainability / continuity	Short-term: in 1 ~ 5 years Middle-term: in 5 ~ 10 years Long-term: in 10 and more years ***Especially for Short-term, detailed plan will be proposed***	
Risk awareness & assessment								
Flood hazard map	- Surveyed and simulated inundation areas were developed, but flood hazard map is not developed	IWRM, GEF & UNDP & etc., 2009-2013	- Only specific communities have the risk map - There is a risk of inundation even after the river improvement	Dis Org(Nadi Town Council)	Understanding of flood-prone area after the priority project and by any floods over the target flood	1. Map should be distributed to each household 2. Annual workshop for utilization of hazard map	***Short-term*** -> Some of the activities are implemented in this project	Awareness program for utilization and continuity
Listing of vulnerable people who need of care during disaster	Only community (Disaster management committee) has the list of vulnerable people	PCIDRR, AusAID, 2008 - 2011	- District-level should have a list of vulnerable people and facility, such as care facility	Dis Org(Nadi Town Council) Com	Understanding of location and procedure to support vulnerable people	1. Annual update by Org and Com	***Short-term*** -> Activity is implemented by community with donor support	Periodic update Disaster management plan or SOP
Disaster Prediction & Early warning								
Expansion of observation system and network								
Quantitative – Expansion of automatic observation and data transmission by telemetry or satellite	- 9 telemetric rainfall gauges in operation in Nadi River basin - No plan for expansion in FMS	IWRM, GEF & UNDP & etc., 2009-2013	- Lopsided distribution (Especially in Malakua and Nawaka Rivers Catchments)	Org (FMS)	More accurate observation Data will be utilized for forecasting	1. Periodic maintenance	***Short-term*** -> Some of the activities are implemented by donor	Well-balanced distribution of observation station in the Nadi River basin
Qualitative – Multi Parameter Radar	- 3 S-band radars for weather forecast in Fiji - No plan for MP radar in FMS	Fiji Meteorological Service, 2005 Australian Bureau of Meteorology, 1993	-	Org (FMS, Multi Parameter X-band radar)	More accurate observation for flood forecasting (60 - 120km radius, 250m - 1km resolution)	1. Periodic maintenance	***Middle-term to Long-term*** -> Capacity development is required for utilization it	Capacity building for implementation for Hydrology section of FMS
Improvement of forecasting system/technology								
Quantitative – Expansion of automatic water level gauges and setting of warning standards	- 5 telemetric water level gauges in operation in Nadi River basin - No plan for expansion in FMS	IWRM, GEF & UNDP & etc., 2009-2013	- Lopsided distribution (Especially in Malakua and Nawaka Rivers Catchments)	Org (FMS)	More accurate observation Data will be utilized for forecasting and issuing the warnings	1. Periodic maintenance 2. Cross-section survey 3. Update of warning standards	***Short-term*** -> Some of the activities are implemented by donor	Observation Station in downstream, middle-stream and upstream of the Nadi River, the Nawaka River and the Malakua River
Qualitative – Application of flood forecasting system and capacity building for implementation	- Early waring are based on the past experience and knowledge of flood - No. of staff of hydrology section is 12 as of 2013	The Strengthening community-Based Disaster Risk Management Project (JICA Project), JICA, 2010 - 2013	- Issuing warnings are based on an empirical basis - Resource of hydrological section is not enough	Org (FMS)	More accurate flood forecasting	Refer to "Required Condition"	***Short-term to Long-term*** -> Substantial time is required for capacity building	Long-term compiled flood data, especially for flood water level Capacity building of the hydrology section and its personnel
Expansion of information distributing system								
Quantitative – Various distributing methods (SMS, Disaster information board [big-screen], Emergency Notification FM radio[EN FM], Siren and so on)	- Defined distributing via FMS - NDMO - Public with phone, FAX and Email - The siren and SMS of Cell-phone are used in downstream of the Nadi River	IWRM, GEF & UNDP & etc., 2009-2013 (Siren) Vodafone, Digicel, Inkk (SMS)	- Continuation of usage after handover in 2016 (Siren, SMS) - No methods to distributing especially for tourists	Dis Org (FMS) Org (Nadi Town Council)	Wide and prompt distributing by various distributing methods including for tourists and tourist site	1. Disaster support agreement 2. Periodic maintenance by Org and Com	***Short-term*** -> Some of the activities are implemented by donor	SOP for Siren Disaster support agreement for SMS
Qualitative – Enhancement of information distributing system by periodical simulation exercise	- NDMO, DO, and other donors conduct the simulation exercise on a voluntary basis	Simulation exercise for Informal Settlers, ADRA Simulation exercise, SPC/SOPAC Table-top simulation, Red Cross	- No specific challenges / issues - Development of SOP is preferable	National & Div & Pro & Dis & Org (& Com, at least Community Leader)	Securing prompt information distribution	Refer to "Required Condition"	***Short-term or Middle-term*** -> In place by National & Div & Dis & Org & Many donors	SOP, ToT and cooperation work Initiative by relevant organization
Knowledge & capacity development								
Development and utilization of disaster management plan and Standard Operation Procedure (SOP), and strengthening of Emergency Operation Center (EOC)	- SOP of National EOC, SOP of CWD, DMP of Nadi Town Council, and DMP of certain communities are developed	Div - JICA Project, 2010 - 2013 Org - IWRM, GEF & UNDP & etc., 2009-2013 Com - PCIDRR, AusAID, 2008 - 2011	- Remain unutilized and Lack of continuity due to frequent personnel transfer	Div (DMP) Pro (DMP) Dis (DMP)	Securing prompt disaster response	Refer to "Required Condition"	***Middle-term*** -> In place, but substantial time is required for continuous utilization	Knowledge development for utilization and continuity
Disaster prevention education, awareness program and trainings on disaster management	- Trainings by NDMO and CWD, disaster prevention education by Min. of Education and awareness programs by other donors are conducted	EDF10, 11 (National-level) EiE, Save the Children & UNICEF PCIDRR, AusAID, 2008 - 2011 PDRMP, SPC/SOPAC, 2004 - 2013	- Lack of continuity due to no-secured budget by Fiji - Implementation only if there is a support from donors	National & Div & Pro & Dis & Com	Understanding of disaster risk and way of coping with disaster Securing prompt disaster response	ditto	***Short-term or Middle-term*** -> In place by all sectors with support of donors	Securing of budget by Fiji Regular visit and ToT Activity for securing continuity
Community-base disaster prevention by simplified early warning system, voluntary disaster prevention organization and evacuation drill	- EWS by Japan Embassy, disaster management committee and evacuation drill by other donors are conducted	GGP, Japan Embassy, 2014 - (EWS) PCIDRR, AusAID, 2008 - 2011 (voluntary organization)	- Implementation only if there is a support from donors (EWS and Evacuation drill, Common service such as disaster resources)	Dis Org (Nadi Town Council) Com	Prompt and safe evacuation	ditto	***Short-term*** -> In place by Org and Com with support of donors	Regular visit and ToT Maintenance work for utilization and continuity of the system Fund-raising
Public commitment & institutional frameworks								
land-use regulation / planning for vulnerable area	- There is no land-use regulation, but developing of a process to consider a result of risk assessment in the town development is conducting	ADB, Resilience in urban development, 2010 - 2014	- There is a risk of expanding of damage due to no land-use regulation in flood-prone area	Div & Pro & Dis & Org (Nadi Town Council)	Avoidance of risk of land development/use in flood-prone area or in retarding basin	Development of law	***Short-term to Long-term*** -> In place by Org with support of donors	Development of law Resilience to disaster in development planning Public awareness activity
Mainstreaming of disaster prevention	- Disaster response was put emphasis - Certain private sector developed own Business Continuity Plan (BCP) and EOC	Pacific Platform, SPC/SOPAC, 2008 - 2014 (National-level)	- Long time will be required for National-level - BCP is required especially for tourist place and main town	All sectors Org (NTC, Chamber of Commerce) Private	Securing of long-term budget and manpower for disaster prevention Resilience to disaster and prompt recovery of business	-	***Short-term to Long-term*** -> In place by certain sector and it is possible to implement in short-term	Understanding of importance of disaster prevention measures
Watershed management								
Watershed management	- The Nadi Basin Catchment Committee (NBCC) was established and watershed management is conducted	IWRM, GEF & UNDP & etc., 2009-2013	- It is difficult to continue the activity after the project, especially for the project conducted by donors	Div & Pro & Dis & Org (the Nadi Basin Catchment Committee)	Integrated flood management considering the whole river basin and flood risk reduction will be enable	1. Empowerment of certain organization to take ownership of holding NBCC	***Short-term to Long-term*** -> In place, but substantial time is required for continuous utilization	Certain organization to take ownership of holding NBCC

Table 11-14 Current Condition, Challenges and Future Prospective of Non-Structural Measures in the Nadi River Basin (Disaster Response and Post-Disaster Phases)

Disaster Response	Current Status			Future Perspective			Feasibility	
	Current situation		Challenges / Issues	Preferable level for implementation	Effect of activity	Sustainability of activity	Time scale for implementation	Required Condition for implementation
Activity		Existing program (Project, Donor, Year)	Remain unutilized, Lack of continuity : Especially after the project / program completion and so on	"Div: Division-level", "Pro: Province-level", "Dis: District-level", "Org: Organization-level", "Com: Community-level", "Private: Private sector-level"		Method to secure sustainability / continuity	Short-term: in 1 ~ 5 years Middle-term: in 5 ~ 10 years Long-term: in 10 and more years ***Especially for Short-term, detailed plan will be proposed***	
Emergency Aid / Immediate Assistance								
Strengthening of system of Emergency Aissistance	- EOCs are immediately activated, and disaster response is conducted. - Lack of budget & insufficient resources for disaster prevention	International NGO (Red Cross et al.) Religious NGO (ADRA and Muslim League et al.)	- Appropriate assistance is difficult due to lack of budget & resources -Duplicated assistance & securing of fair immediate assistance	National & Div & Dis, Org, Private sector	Securing prompt disaster response	1. Periodic implementation of simulation exercise	***Middle-term to Long-term*** -> Expansion of resources is required first and substantial time is required for securing budget	Securing government budget
Initial damage assessment								
Damage assessment based on unified situation report and standard for calculating damage	- NDMO takes a leading role in the training including IDA	PDRMP, SPC/SOPAC, 2004 - 2013	- The training is basically conducted with donor's support	National & Div & Dis	Securing prompt and fair humanitarian support	1. Periodic implementation of training	***Short-term*** -> In place by Org with support of donors	Establishing a databese for situation report

Post-Disaster	Current Status			Future Perspective			Feasibility	
	Current situation		Challenges / Issues	Preferable level for implementation	Effect of activity	Sustainability of activity	Time scale for implementation	Required Condition for implementation
Activity		Existing program (Project, Donor, Year)	Remain unutilized, Lack of continuity : Especially after the project / program completion and so on	"Div: Division-level", "Pro: Province-level", "Dis: District-level", "Org: Organization-level", "Com: Community-level", "Private: Private sector-level"		Method to secure sustainability / continuity	Short-term: in 1 ~ 5 years Middle-term: in 5 ~ 10 years Long-term: in 10 and more years ***Especially for Short-term, detailed plan will be proposed***	
Damage assessment and social compensation								
Lessening the gap among situation reports (division – community level) and compiling and utilizing of situation report	- Gap among situaiton reports (division - community level) and no compiling of situation report - Social compensation for damaged house and crops are implemented	Support for illegal residence, NGO, -	- There is a gap among situation reports and it causes more time for confirmation activity - There is no serious issue for social compensation	National & Div & Dis Com	Prompt social compensation by reducing the gap / streamlining of damage assessment	Refer to "Required Condition"	***Short-term*** -> In place by Org (NDMO) and community	Establishing the database of situation report Regular visit and ToT
Evaluation of Pre-Disaster activity and feedback								
Internal and external evaluation (Evaluation of knowledge & capacity development,Questionnaire research to public / citizens / community)	- Even though rehabilitation plan is developed, effectiveness and contribution of the implemented measures are not evaluated	IWRM, GEF & UNDP & etc., 2009-2013	- Effectiveness and lessons of the implemented measures are not recongnized and evaluated, and they are not utilized for improvement.	National & Div & Dis Org	Disaster risk reduction by examination and implementation of better disaster prevention	Refer to "Required Condition"	***Short-term*** -> Similar activities are implemented by donor	Setting up the responsible organization / department for this activity and publication of the evaluation result

Table 11-15 Effect and Main Challenges of each measure (Summary Table)

	Non-Structural Measures (Implementing(-ed), Partially implemented, Not-implementing)	Effect of Measure (Large Classification)	Effect of Measure	Main challenges of each measure	Reference
Pre-disaster to Disaster Response	Flood hazard map	- Understanding disaster risk and risk avoidance	Understanding of flood-prone area after the priority project and by any floods over the target flood	- The flood-hazard area, the risk and the evacuation center and so on are not recognized properly. - Implementation and completion of the priority project might invite the misunderstanding among the public, such as no flood damage after the project.	p.11-3
Pre-disaster	Land-use regulation / planning for vulnerable area		Avoidance of risk of land development/use in flood-prone area or in retarding basin	- There is a risk of expanding of damage due to no land-use regulation in flood-prone area. - Recognition for impact on drainage caused by development shall be considered in order not to provide a negative effect to the surrounding area.	p.11-9
Pre-disaster to Disaster Response	Disaster forecast, issuing warnings and information distribution		More accurate observation, disaster forecast, monitoring and information distribution	- There is a risk that officers cannot secure emergency contact system if the telephone line was disconnected. - There are limited methods to distributing especially for tourists.	p.11-5
	Expansion of disaster forecast and early warning system			- There is no hydrological observation station in southwest part of the Nadi River Basin (especially in the Malakua River basin) - Since task and technical capability regarding flood forecast does not become established, it is difficult to conduct appropriate flood forecast	p.11-4, 5, 6
Pre-disaster	Listing of vulnerable people who need of care during disaster		Understanding of location and procedure to support vulnerable people	+ Mutual-help is implemented utilizing the list / information in the community and there is no serious issue. - Information of care facility and entire vulnerable people in Nadi area is not organized by local government.	p.11-3
	Preparation for disaster	- Understanding disaster risk and risk avoidance - Enhancing disaster preparedness for effective response	Understanding of disaster risk and way of coping with disaster Securing prompt disaster response	+ Since the residents in the flood-prone area start to prepare for the disaster in early stage of fear of disaster, there is no serious issue. - It is difficult to establish, maintain and repair a drainage system and stock the equipment for disaster prevention in a self-sustaining way.	p.11-5
	Voluntary disaster prevention organization			- It seems that community has a strong "recipient-conscious" and it is difficult to have a sustainable program regarding disaster management in ordinary times without external support	p.11-8
	Awareness program, evacuation drill			- It seems that community has a strong "recipient-conscious" and it is difficult to have a sustainable program regarding disaster management in ordinary times without external support	
Pre-disaster to Disaster Response	Voluntary disaster prevention, response and evacuation			+ Since mutual-help is implemented by CDC in early stage of fear of disaster, there is no serious issue.	
	Community-based disaster prevention by simplified Early Warning System			- Establishing of periodical maintenance system by the community is required.	p.11-8, 9
Pre-disaster	Watershed management	- Disaster risk management, risk avoidance	Integrated flood management considering the whole river basin and flood risk reduction will be enable	- It is difficult to continue the activity after the project, especially for the project conducted by donors. Flood risk reduction by watershed management cannot be continuously implemented.	p.11-10, 11
	Platform for Disaster Risk Management	- (Disaster risk management, risk avoidance) - Strengthening disaster risk governance to manage disaster risk - Enhancing disaster preparedness for effective response	Securing of long-term budget and manpower for disaster prevention Resilience to disaster and prompt recovery of business	- However mainstreaming of disaster prevention has been directed in pacific countries centering on international organizations, limited budget is allocated for the measures in the Pre-disaster phase.	p.11-9, 10
	Economic estimation of investment in disaster prevention				
	Investing in disaster prevention (expansion of personal, physical, budgetary resource)				
	Disaster Management Plan (DMP) and Standard Operation Procedure (SOP)	- Enhancing disaster preparedness for effective response	Understanding of disaster risk and way of coping with disaster Securing prompt disaster response	-Since personnel rotation is made very often , past expediencies, issues, challenges and good practices are not shared / inherited to the successors.	p.11-7
	Disaster prevention education			+ Since the project regarding disaster prevention education has just started since 2014, there is no serious issue. Finding of problems / issues and feedback are required in the future.	p.11-8
	Trainings on disaster management			- Limited budget is allocated for disaster management training and knowledge and experience do not become established as an actual practice. + Since governmental organizations of Fiji implement the joint simulation exercise periodically and play a leading role, there is no serious issue.	p.11-6, 8
Disaster Response	Evacuation and disaster response by EOC	- Effective response	Securing prompt disaster response	- Even though the EOCs are immediately activated and information distribution and preparation are conducted from pre-disaster phase, immediate assistance requires a lot of time and emergency rescue is difficult due to lack of budget and insufficient resources for disaster prevention, response and rescue.	p.11-13
	Initial Damage Assessment (IDA)				
	Emergency Aid / Immediate Assistance, communication				
Pre-disaster to Post-disaster	Business Continuity Plan (BCP)	- (Strengthening disaster risk governance to manage disaster risk) - Disaster risk management, "economical " risk avoidance	Early recovery of private sector	- Mitigation of disaster damage for private sector and encouraging early recovery for entire Nadi are one of the challenges.	p.11-9, 10
	Regional BCP, Business Continuity Management (BCM)		Early recovery of region / town including infrastructure and private sector		
Post-disaster	Damage assessment and social compensation	- Rehabilitation	Early recovery	- Damage report from the community is often over-claimed comparing to the assessment result by governmental office, it causes more time for assessment and confirmation activity	p.11-15
	Evaluation of Pre-disaster activity / existing measures and feedback	- Build Back Better and Better Disaster Prevention	Build Back Better and Better Disaster Prevention for next disaster	- Impact, effectiveness and contribution of the implemented measures are not evaluated. Problems and lessons of implemented measures are not recognized and they are not utilized for improvement and feedback.	p.11-15, 16

11.6 Examination of the Priority Project of Non-Structural Measures

Major Non-Structural Measures for the Master Plan described in 11.5 are catabolized as Table 11-16 and the summary of each measure is described below. Suggested priority project of Non-Structural Measures and measures for phased implementation are described in 11.6.1 to11.6.2.

Table 11-16 Major Non-Structural Measures for Master Plan

	Effect of Measure (Large Classification)	Non-Structural Measures for M/P
Non-Structural Measures	(1) Understanding disaster risk and risk avoidance	A) Strengthening of understanding flood risk with flood hazard map B)-1 Strengthening flood forecasting technology, such as expansion of rainfall gauge, water level gauge and introduction of real-time monitoring camera B)-2 Strengthening flood forecasting technology, such as accurate observation equipment and flood forecasting system
	(2) Enhancing disaster preparedness for effective response	C) Strengthening disaster management system (Disaster prevention planning, Development and update of SOP, Economic evaluation of disaster prevention investment, Strengthening of emergency assistance system, etc.)
	(3) Disaster risk management, risk avoidance	D) Technical assistant for land-use regulation E) Strengthening river basin management
	(4) Economic disaster risk management	F) Strengthening disaster risk management for economic damage by development of regional BCP
	(5) Evaluation and feedback	G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

A) Strengthening of understanding flood risk with flood hazard map

Understand flood risk with the flood hazard map and encourage early voluntary evacuation to the safer place, and avoid the flood risk. Moreover, expand the hydrological observation system, which contributes to appropriate flood forecast and early evacuation.

B) Strengthening flood forecasting technology

Strengthen flood forecasting technology in order to understand flood risk by appropriate flood forecast, to encourage early evacuation, and to avoid the flood risk Moreover, aiming accuracy improvement of flood forecasting and enhance of early evacuation in future, expand the hydrological observation system.

C) Strengthening disaster management system

Strengthen disaster risk governance to manage disaster risk and to encourage effective disaster response before the disaster and during disaster. Moreover, encourage early and appropriate evacuation and disaster risk avoidance by effective disaster management and response.

D) Technical assistant for land-use regulation

Understand the flood risk based on the flood hazard map and avoid the risk caused by land development/use in flood-prone area or in retarding basin by land-use regulation. Moreover, mitigate the negative effects of development regarding drainage, and manage and avoid the new disaster risk.

E) Strengthening river basin management

Plantation in the upstream aiming the prevention of the land from sliding has been conducted by MOA as a part of the river basin management. Flood risk reduction will be enabled by continuous integrated flood management considering the whole river basin and the measures against sediment disaster.

F) Strengthening economic disaster risk management by regional BCP

Minimize the flagging economy in the region due to disaster by sharing the measures of disaster prevention and recovery plan among municipality and each sector, and reduce economic damage by economic disaster risk management utilizing BCP and encourage early recovery after the disaster.

G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

Enable "Build Back Better" and "Better Disaster Prevention (understanding of disaster risk and management)" by evaluation of Pre-disaster activity / existing measures and feedback, and encourage disaster risk reduction and risk avoidance for the disasters in the future.

11.6.1 Priority Project (Short-term Measures)

As a priority project of Non-Structural Measures to avoid risks and to mitigate damages will be carried out with regard to protection of human lives for the top priority as well as to understand disaster risks and evacuation, under condition that the progress of structural measures project will be at initial phase.

Even though understanding disaster risk is important / the first step in disaster risk avoidance and reduction, it has room for improvement considering the current situation and issues previously mentioned.

Therefore, activities accompanied with development and disclosure of hazard maps and development of hydrological devices for awareness of flood risks will be implemented. Since the results of the project can be utilized for these components as parts, these components can be implemented from the initial phase. In addition, in order to evaluate the effect of non-structural measures in the past or priority projects, and in order to connect to "Better disaster prevention (improvement of existing non-structural measures)", evaluation and feedback system on the past projects will be designed and built up.

11.6.2 Middle-term Measures

As the major components for non-structural measures in middle-term, applying same measures as short term, measures to avoid risks and to mitigate damages will be carried out with regard to understanding disaster risks and evacuation.

Specifically, strengthening of flood forecasting system and technical assistance on land-use regulation as well as watershed management will be planned to be implemented.

Moreover, strengthening of disaster management system and urgent relief system will be designed and implemented as the major components of non-structural measures for the purpose of rapid assistance due to effective emergency response and relief in the event of disasters as well as damage mitigation.

In addition, as measures that will contribute to reduce economic damage, economic disaster risk management by adopting a wide BCP (Business Continuity Plan) will be also implemented for the purpose of early recovery on economic activities after disaster as well as achievement on reduction of economic damage due to disasters.

Table 11-17 Phased Implementation of the Measures for the Mater Plan

	Phase	Measures
Non-structural Measures	i) Priority Project (Short-term Measures)	(1) Understanding disaster risk and risk avoidance A) Strengthening of understanding flood risk with flood hazard map B) Strengthening flood forecasting technology, such as expansion of rainfall gauge, water level gauge and introduction of real-time monitoring camera (5) Evaluation and feedback G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback
	ii) Middle-term Measures	(1) Understanding disaster risk and risk avoidance B) Strengthening flood forecasting technology, such as accurate observation equipment and flood forecasting system (2) Enhancing disaster preparedness for effective response C) Strengthening disaster management system (Disaster prevention planning, Development and update of SOP, Economic evaluation of disaster prevention investment, Strengthening of emergency assistance system, etc.) (3) Disaster risk management, risk avoidance D) Technical assistant for land-use regulation E) Strengthening river basin management (4) Economic disaster risk management F) Strengthening disaster risk management for economic damage by development of regional BCP

Chapter 12 Environmental and Social Considerations

12.1 Environmental Policy, Legal and Administrative Framework in Fiji

The current Fiji national environmental policies are based on the principles of sustainable use and development of natural resources through effective environmental management and controls. To identify matters of national importance and to promote development that "meets the needs of the present generation without compromising the ability of the future generations to meet their own needs and implies using resources to improve the quality of human life within their carrying capacity."

The Government of Fiji through the Department of Environment is the regulatory and implementing body of the Environmental legislation. The Department of Environment falls under the Ministry of Local Government, Housing and Environment and is primarily responsible for Environment and National Resource Management.

In addition, Section 3(4) of the Environment Management Act requires that any person performing any function under the Act must have due regard to the traditional owners and guardians of resources. Therefore, to a certain extent, these provisions also support indigenous people and community's governance and management rights.

12.1.1 Environmental Legislation, Regulations and Guidelines

The following legislations having direct or indirect bearing on the project are therefore as follows:

(1) Environmental Management Act 2005

1) EIA Process

The Fiji Government has provided a legal framework for the EIA process through the passing of the Environment Management Act in 2005. The main purpose of the Environment Management Act (EMA) is to achieve sustainable use and development of natural resources. Part 4 of the EMA 2005 stipulates the requirements of the EIA which basically involves the following:

(1) Screening Process - To determine which Part of Schedule 2 of the Act the development proposal falls under and ultimately whether an Environmental Impact Assessment (EIA) and/or Environmental Management Plan (EMP) is required or not.

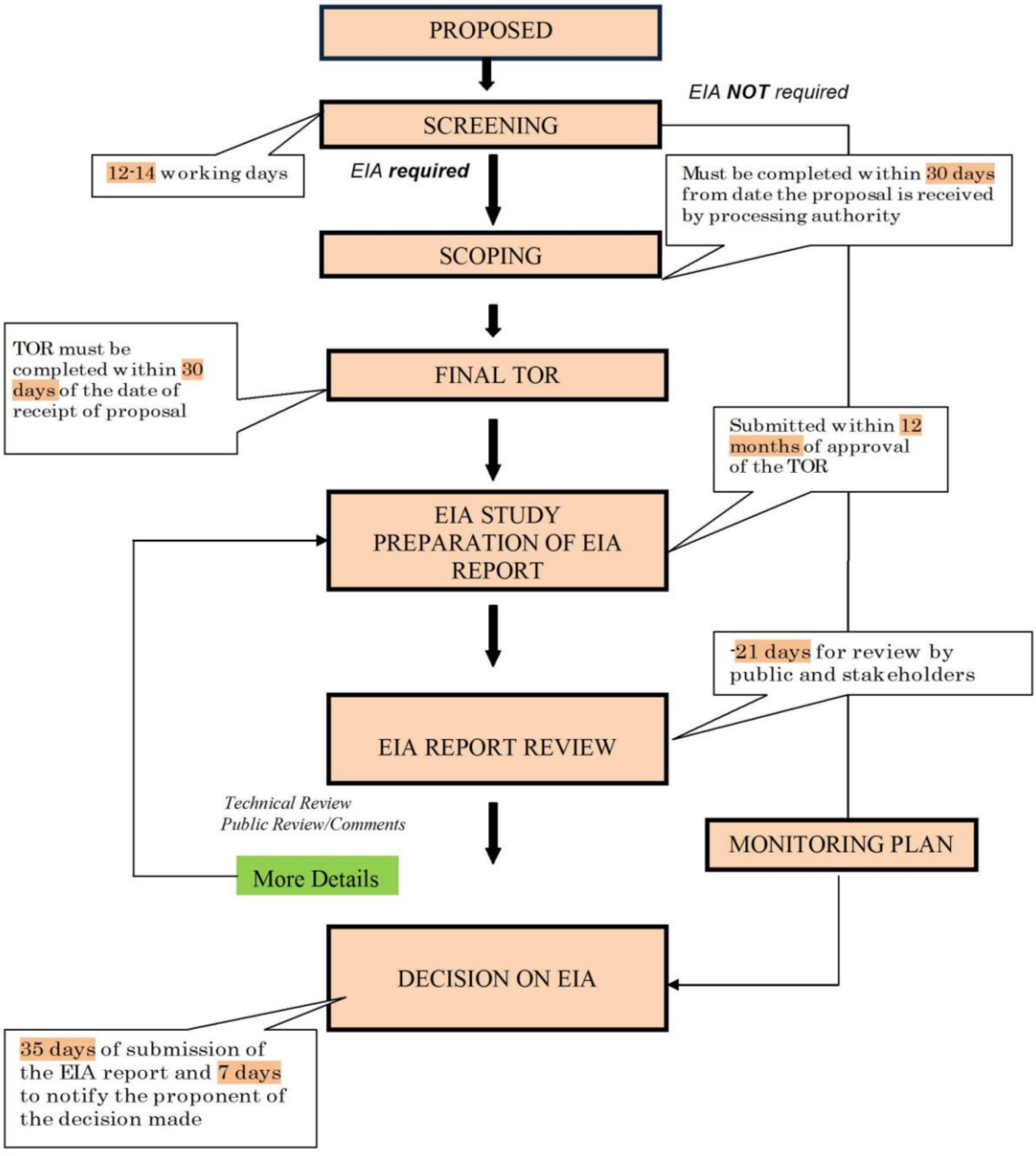
(2) Scoping Process - Once it has been determined that an EIA is required, a scoping exercise and site inspection is required to be undertaken to develop the Terms of Reference (ToR) with the Department of Environment (DoE).

(3) EIA Study - Carry out investigations and reporting including:
   a) Establishing natural and community baseline environments
   b) Identifying and assessing potential impacts
   c) Recommending mitigation and management measures
   d) Recommending the implementation of monitoring programmes

(4) Review of the EIA Report - Once the final EIA report is submitted to DoE with the EIA Processing Application forms and fees, the DoE reviews the EIA report with the assistance of relevant approving authorities and/or established environmental units. The EIA Administrator may also call upon the assistance of specialist/technical experts to review the EIA Report as part of a Review Committee.

(5) Issue EIA Review Decision - EIA approved with conditions, or EIA not approved and subject to further studies will be issued.

EIA process are also described in Environment Management (EIA Process) Regulations 2007 and Environmental Impact Assessment (EIA) Guidelines2012 which shown in later. Figure 12-1 shows flow diagram of EIA process in Fiji.



Source: Environmental Impact Assessment Guidelines (Ed 2), Department of Environment, 2012

Figure 12-1 EIA Process in Fiji.

As per Part 4 Section 31(4) states that any person who disagrees with the decision of the EIA Administrator or approving authority may, within 21 days from the date of the decision, appeal to the Environmental Tribunal.

Environmental Management Act 2005 Part 4 Section 31

31.-(1) After reviewing an EIA report, the EIA Administrator or the approving authority may-

(a) approve the report with or without conditions;

(b) recommend any additional study on the report; or

(c) not approve the report.

(2) If an EIA report is approved under subsection (1), the approval may be subject to the requirement of an environmental cash bond to be deposited into the Fund as a security to cover the probable cost of preventing or mitigating any environmental damage to the area and its surroundings.

(3) If the EIA Administrator or the approving authority reviews an EIA report, the EIA Administrator or the approving authority must within 7 days from the date of the decision on the report notify the proponent of the decision.

(4) A person who disagrees with a decision of the EIA Administrator or approving authority under subsection (1) may, within 21 days from the date of the decision, appeal to the Environmental Tribunal.

(5) An approved EIA is only valid for the specific activity or undertaking in the development proposal for which it was approved, and the approved EIA must not be transferred or used for any other purpose other than the purpose for which it was approved.

2) Target Propsed Development for EIA

Schedule 2 of the EMA 2005 as mentioned above, identifies which of the three (3) Parts the proposed development falls into.

All of development proposals fall into Part 1 and Part 2 requires EIA process. A development proposals which listed in Part 1 require EIA reports that can be reviewed and approved by the EIA Administrator under the EMA, which is the Director of the Department of Environment.

Part 2 are a list of development proposals that require EIA reports that can be reviewed and approved by recognized Approving Authorities.

Part 3 of Schedule 2 of EMA are a list of proposed developments that do not require an EIA Report at all but this part is limited for small development such as individual level house construction, or emergency works.

Development proposals which carry out as a structural countermeasures for flood control such as dams, dam upgrades, retention ponds, embankments, river improvements, diversion channels, ring dykes etc. listed in Table 12-1 are recognized as Part 1 development proposals which required the approvals of EIA Administrator. The listed development proposals in EMA mention the type of development but most of the developments don't mention the size or scale of the development.

A person who carries out any development activity or undertaking which is subject to the EIA process without an approved EIA report, commits an offence under Section 43 of the Act, is liaise upon conviction to a fine not exceeding $750,000 or to a term of imprisonment not exceeding 10 years or both. Also, a person carry out development work without an EIA, can be issued with an order to stop work by the Director who has to apply to the courts for this, and anyone who contravenes any requirement under Part 4 of the Act (EIA Process) or condition of the EIA approval commits an offence and is liable upon conviction to a fine not exceeding $250,000 or to a term of imprisonment not exceeding 3 years or both. It is important to note under section 31(5) of the Act states that EIAs may not be transferred or used for any other purpose other than the purpose for which it was approved.

In addition, under Part 7 Section 61, the EMA allows for the Minister to make regulations to give effect to the provisions of the Act, and thus, the Environment Management (EIA Process) Regulations and the Environment Management (Waste Disposal and Recycling) Regulations was promulgated in 2007.

Table 12-1 Approvers of Development Proposals of Flood Control Measures

Type of Development Proposals	Potential Development proposals in the Project							Remarks
	Dam	Upgrading of Dam	Retarding Basin	Dike	River Improvement	Diversion Channel	Ring Dike	
Part1. A Development Proposals that to be approved by the EIA Administrator (Director of DOE) EIA Administrator の承認が必要な開発提案								
(a) a proposal that could result in erosion of any coast, coastline, beach or foreshore;				●	●	●		
(b) a proposal that could result in the pollution of any marine waters, ground water, freshwater body or other water resource;	●					●		An effect of intake of sea water to ground
(c) a proposal that could result in the contamination or degradation of any agricultural area or land important for agriculture;			●					An effect of inundation of farmland after an activation of retarding basin
(d) a proposal for construction of an airport;								Non
(e) a proposal for construction of a hotel or tourist resort;								Non
(f) a proposal for mining, reclaiming of minerals or reprocessing of tailings;								Non
(g) a proposal for construction of a dam, artificial lake, hydro-electric scheme or irrigation project;	●		●			(●)		
(h) a proposal for heavy industrial development or noxious industrial development;								Non
(i) a proposal for commercial logging or for a saw milling operation;								Non
(j) a proposal that could alter tidal action, wave action, currents or other natural processes of the sea, including but not limited to reclamation of the sea, mangrove areas, foreshore, rivers or creeks, or construction of a jetty, dock, wharf, pier or bridge;					●	●		
(k) a proposal that would introduce pollutants or properties to the air that are disagreeable or potentially harmful to people and wildlife;								Non
(l) a proposal that could jeopardize the continued existence of any protected, rare, threatened or endangered species or its critical habitat or nesting grounds;	●	●	●	●	●	●	●	There are any possibility of habitat jeopardizing.
(m) a proposal that could deplete populations of migratory species including, but not limited to, birds, sea turtles, fish, marine mammals;	●	●				●		There are any possibility of discontinuity in rivers

(n) a proposal that could harm or destroy designated or proposed protected areas including, but not limited to, conservation areas, national parks, wildlife refuges, wildlife preserves, wildlife sanctuaries, mangrove conservation areas, forest reserves, fishing grounds (including reef fisheries), fish aggregation and spawning sites, fishing or gleaning areas, fish nursery areas, urban parks, recreational areas and any other category or area designated by a written law;	●	●	●	●	●	●	●	In case of there are any designated areas in the Nadi River basin.
(o) a proposal that could destroy or damage an ecosystem of national importance, including, but not limited to, a beach, coral reef, rock and gravel deposit, sand deposit, island, native forest, agricultural area, lagoon, sea-grass bed, mangrove swamp, natural pass or channel, natural lake or pond, a pelagic (open ocean) ecosystem or an estuary;	●	●	●	●	●	●	●	In case of there are any designated areas in the Nadi River basin.
(p) a proposal that would result in the introduction of genetically modified organisms or of non-native species that could compete with or destroy any native species;	●	●	●	●	●	●	●	In case of introducing of plants, transport a soil or including any organisms.
(q) a proposal for the construction of a landfill facility, composting plant, marine outfall or waste water treatment plant;								non
(r) a proposal that involves dredging or excavating a river bed;	●	●	●	●	●	●	●	
(s) a proposal that is controversial from an environmental standpoint, or is not supported for environmental or resource management reasons by a significant number of representatives from the local community, local government, churches, villages and other groups;	●	●	●	●	●	●	●	
(t) a proposal that could lead to the depletion of non-renewable resources;								Non
(u) a proposal that could challenge or contravene established customary controls over the use of natural resources;			●		●	●		
(v) a proposal that could result in any trans-boundary movement of wastes that could have an impact on human health, the environment or natural resources in any neighboring country;								Non
(w) a proposal financed by an international or local development finance institution and which requires an EIA as a condition of the finance;	●	●	●	●	●	●	●	JICA requires the study for EIA
(x) a proposal for farming or agricultural method or system that could result in the contamination or degradation of any agricultural area or land important for agriculture;								Non
(y) a proposal for a residential subdivision for more than 10 lots.								Non

Part2. A Development Proposals that to be approved by the Approving Authority								
(a) a proposal that requires processing only because it could endanger or degrade public health or sanitation;								Non
(b) a proposal that requires processing only because it could harm or destroy important cultural resources including, but not limited to, archaeological sites, cemeteries, historic sites and landmarks;								Non
(c) a proposal for a residential subdivision of not more than 10 lots;								Non
(d) a proposal for civic or community development;								Non
(e) a proposal for general commercial development;								Non
(f) a proposal for general industrial development.								Non
Part3. A Development Proposals that not to be required the EIA process or an EIA								
(a) a proposal for the construction of a single family residential building in an approved residential development area, if the construction is at least 30 meters from any river, stream or the high water mark;								Non
(b) a proposal for an addition to an existing residential dwelling if the addition is to be used only for residential purposes and is at least 30 meters from any river, stream or the high watermark;								Non
(c) a proposal for the construction of a traditional or customary structure (including the Fijian villages within native reserves under the Fijian Affairs Act or villages on the islands of Rotuma and Rabi made from traditional materials, or from natural rock, sand, coral, rubble, or gravel, if the construction or the customary structure is at least 30 meters from any river, stream or the high water mark;								Non
(d) subject to paragraph 2 and 3, a proposal for emergency action.								Non

Regarding 2.(d), "Civic and Community development" means, (a) a market, (b) a car park, taxi park or any other similar development; (c) a bus station; (d) a town park, swimming pool, library or any other similar development; (e) a fire station; (f) a police station, court house, prison or any other similar development; (g) an animal pound; (h) government offices; (i) recreational facilities provided by a local authority; (j) a parade ground or barracks for the Republic of the Fiji Military Forces or for the Fiji Police Force; (k) a radio or telecommunication installation; (l) a library or reading room; (m) a church, cemetery or crematorium; (n) a school or other educational establishment and associated living accommodation; (o) an assembly room; (p) a kindergarten or crèche; (q) a hospital or health care center; (r) a social, private or sporting club registered under a written law.

(2) Environment Management (EIA Process) Regulations 2007

The Environment Management (EIA Process) Regulations 2007 outlines the principles of the main components of the EIA process in slightly more detail to that which is in the EMA 2005. For example, in Part 2 of the EIA Regulations 2007, outlines:

1) EMR part 2 - Screening -

Part 2 Section 4(1) states in detail the Screening process whereby "every proponent of a development proposal must apply for screening of the proposal in accordance with the Regulations and Section 27 of the EMA". It goes on, in further sections, to identify, what form is needed to be filled out, where the form should be lodged, information that must accompany the application i.e. contact details etc., fees payable for the screening process and number of copies of the application and accompanying documents and in what format ie. Electronic or hard copies reports to be submitted.

> Environment Management (EIA Process) Regulations 2007 Part 2 Section 4
>
> 4.-(1) Every proponent of a development proposal must apply for screening of the proposal in accordance with these Regulations and section 27 of the Act.

Relevant thing to the Project, Part 2 Section 5 states that where a Ministry is the proponent proposing the development activity where it would otherwise be the approving authority, the Ministry must apply to the EIA Administrator in accordance with regulations Part 4 (EIA Study & Report) as the EIA Administrator will perform the role of the approving authority in making a determination under regulation 6 (Procedure of a screening application) and a decision under regulation 7 (Screening decision) and for other purposes of these Regulations.

Furthermore, regulations 8 clarifies further the classifications of proposals and regulations 9 specifies the role of the EIA Administrator.

2) EMR part 3 – EIA Processing -

Part 3 of the Regulations covers in detail the EIA process includes the requirements of the scoping exercise, the need and importance of a site inspection and how it is to be conducted including factors to be taken into account in a site inspection, records of site visit, sampling taking, consultation, public participation leading to the preparation of Terms of Reference (ToR) and contents of the ToR.

Hearing survey conducted by the Team, the Department of Environment in the scoping exercises merely carry out site inspections and consultation with the relevant government stakeholders. In practice, the approving authorities and the EIA Administrator does not carry out any public participation meetings as part of the ToR nor do they take any soil, plant, or water sampling during the scoping stage.

However, for a major development proposal such as a mining project, the processing authority (EIA Administrator) may invite participation of other line ministries, private sectors, non-governmental organizations, public authorities and other interested persons to assist in the preparation of the ToRs. Section 20(1) states that in the case of a major development proposal, if the ToRs are prepared by the proponents own EIA consultant, the proponent must convene at least one meeting at which the draft ToR is presented for discussion and participants can propose additions or deletions from them. More meetings may be considered necessary by the processing authority.

Environment Management (EIA Process) Regulations 2007 Part 3 Section 20 "TOR meetings"

20. (1) In the case of a major development proposal, if the TORs are prepared by the proponent's own EIA consultant, the proponent must convene at least one meeting at which draft TORs are presented for discussion and participants can propose additions to or deletions from them.

(2) Whether or not –

(a) a meeting is convened under subregulation (1);

(b) the draft TORs are prepared by the proponent;

(c) the proposal is for a major development, the processing authority may if it considers it necessary require the proponent to convene one or more meetings to discuss the draft TORs on the proposal.

(3) Regulation 18(3) to (6) apply to TOR meetings as they apply to scoping meetings.

3) EMR part 4 – EIA Study and Report -

Part 4 of the EMR 2007 prescribes what should be covered and considered in the EIA Study and Report, how the EIA study should be conducted in terms of conducting public consultation(s), field work and sampling taking to obtain accurate measurements of social and environmental values for use in making impact predictions and recommending appropriate protections measures in respect of the proposal.

Part 4 Section 26 also includes the provision for an environmental management plan if required as part of the ToR which will include social and environmental protection measures and monitoring of the actions during with the setting up of an environmental monitoring committee to be appointed by the proponent to verify that the environmental protection plan is being fulfilled and adverse impacts of the proposed is being documented.

Environment Management (EIA Process) Regulations 2007 Part 4 Section 26 "Environmental management plan"

26. (1) If an environmental management plan for a proposal is required as part of an EIA report by the TOR, it must -

(a) describe in respect of the proposal the environmental protection measures that will be put in place by the proponent if approval is given for the proposal;

(b) include an environmental monitoring and surveillance program of action;

(c) provide for an environmental monitoring committee to be appointed by the proponent to verify that the environmental protection plan is being fulfilled and adverse impacts of the proposal documented.

(2) An environmental management plan is in addition to the statement of mitigating action required by paragraph (g) of regulation 25(2).

Key items in Part 4 of the Regulations are as follows:

- The EIA study is the responsibility of the proponent but a registered EIA consultant must be employed for technical aspects of the study. Therefore, after taken over the result of the Study to GOF and GOF carries out the project, the GOF required the EIA study with a registered consultants under Part 5 Section 39 of the Regulations.
- Submission of the EIA report requires 4 copies and 1 electronic copy in pdf to be submitted to the processing authority
- One hard copy to the EIA Administrator.
- Further hard copies of the report must be supplied for distribution to members of the review committee.
- The EIA Report once submitted must be sent to the Director and entered in the register.
- The processing authority must:
    - Make the complete report available at appropriate locations for inspection by teh public and for purchase at a cost.
    - For major development, must give notice of the publication of the EIA report on radio or television station broadcasted to the area of the site of the proposed

development, and in every newspaper that circulates the area of the site.

- Once the EIA Report is published, the processing authority must arrange for the review of the report to be conducted, as required by section 30 of the Act.
- The review can be conducted by a registered review consultant or by a review committee as directed by the Director taking into consideration the technical capacity of the processing authority and the nature and size of the proposed development.
- The review committee:
  - Is appointed by the Director as a committee of the processing authority;
  - consists of not more than 10 people drawn from the relevant industry, NGOs, Government, local communities and academic institutions;
  - appoints its own Chairman and governs its own proceedings in accordance with normal rules of committee practice;
  - meets as, when and where convenient;
  - must complete the review and make its recommendations within 35 days of the submission of the EIA Report.
  - May require the proponent to reimburse reasonable costs incurred by the authority in reviewing an EIA report, including the employment of a consultant, the convening of a review committee and transport and out of hours pay for inspectors and other staff of the Ministry. Any dispute as to the reasonable cost of the review is to be resolved by the CEO or Permanent Secretary or the Ministry. This is an important component because if it is not included in the proponent's budget and the Ministry and review committee is not able to fund this process through their own budgets, then it could potentially delay the review process.
  - Must require the proponent to conduct public consultations on the review of an EIA report by way of one or more review meetings, at time and places determined by the processing authority and convenient for those likely to wish to take part. At least one meeting must be held in the vicinity of the area of the proposed development and every review meeting must be held within 21 days of the submission of the EIA Report.
  - Must within 35 days of submission of an EIA report on a proposal produce a written report on the review which should include:

4) EMR part 5 – Miscellaneous -

Part 5 Section 32 (1) of the Regulations, provides as part of the EIA Approval that the EIA Administrator may require an environmental bond which is a bond against the cost of the following which is necessitated by the environmental or resource management impacts of a development activity or undertaking and ordered by a court under section 47 of the Act or undertaken by the Department:

a) Restoration, improvement or remediation work on any area;

b) Compensation for loss or damage to property or income; or

c) Preventative or remedial action

The environmental bond may be in cash, as contemplated by section 31(2) of the Act or as indemnity insurance, or as a guarantee, or in any other form approved by the Director in any particular case with the consent of the Ministry of Finance. The environmental bond should be sufficient to cover the probable cost of the matters mentioned above, for the foreseeable life

of the activity or undertaking and may include up to 15% of the contingency. It is usually the responsibility of the proponent to calculate this cost and put it forth to the Director for his agreement by the Permanent Secretary of the Ministry and is dealt on a case by case basis. Money paid by cash bond must be paid to the Environmental Trust Fund as provided by section 31(2) of the Act.

Where the appeal involves a technical issue, the PS must obtain appropriate technical advice from a person other than the EIA Administrator or staff of the Department. The PS also, instead of adjudicating any matter, may refer any matter this is the subject of an appeal to the Environmental Tribunal, in accordance with the rules of the Tribunal.

5) Case in the Appeal Stage

There are only a handful of cases that have reached the appeal stage, and currently there is one going in May, 2015 for a project in Lami which proposes the removal of a large area of mangroves for the purpose of a mixed commercial and industrial development which is located close to residential areas. It is the residents with the assistance of the Fiji Environmental Law Association (FELA) who is the appellant.

(3) Environment Management (Waste Disposal and Recycling) Regulations 2007

The purpose of Waste Disposal and Recycling Regulations 2007 is to prevent the pollution of the environment by controlling the discharge of solid waste from development activities and structures, the discharge of liquid wastes, the emissions of polluting gases, smoke, steam and dust, and the handing, storage and disposal of wastes and hazardous substances generally.

The Regulations identifies that waste permits are required for the disposal of significant amounts of solid waste discharge of significant amounts of liquid waste into receiving waters, and emission of air pollution by a development site from which disposal is made.

These permit requirements is considered relevant for construction works which may result in large quantities of spoil of soil such as dredging, installation of structures. It should also consider in any debris to be collected following vegetation clearance as well as solid waste and liquid waste generated from the construction sites.

The need for these permits should be reassessed as part of the EIA process and identified as to which permits may be applicable based on the proposed development activities and works following the Master Plan and priority project to the Feasibility Study

In addition, there is also a National Solid Waste Management Strategy for Fiji (NSWMS) 2006 which details the current waste management practices and outlines the inadequacies that exist in the institutions. It also provides a platform from which future waste management activities can be developed and mechanisms for coordinating the waste management programs can be achieved. Ideally, the NSWMS should be used by this project to identify an appropriate waste management system as part of the environmental management plan which will be required under the EIA process. The key objectives for NSWMS which should be considered as part of the Environment Management Plan are:

- Make best use of the waste that is generated;
- Development and implement economic and social incentive mechanisms to charge wasteful behaviour, improve and update existing waste management and disposal systems; and

- Encourage/provide waste management practices which minimize the environmental risk and harm to human health and terrestrial, freshwater and marine ecosystem.

(4) EIA Guidelines 2008, 2012

In 2008, Department of Environment prepared the EIA Guidelines to explain the EIA procedures that must be followed once an application is received for development by the Department, the Approving Authorities and the Environmental Management Units. It is similar to that which appears in the Regulations but is more specific to the step by step process in a more simplistic format and language. The latest version of guidelines was revised and issued in 2012 as Edition 2.

(5) Other Related Laws

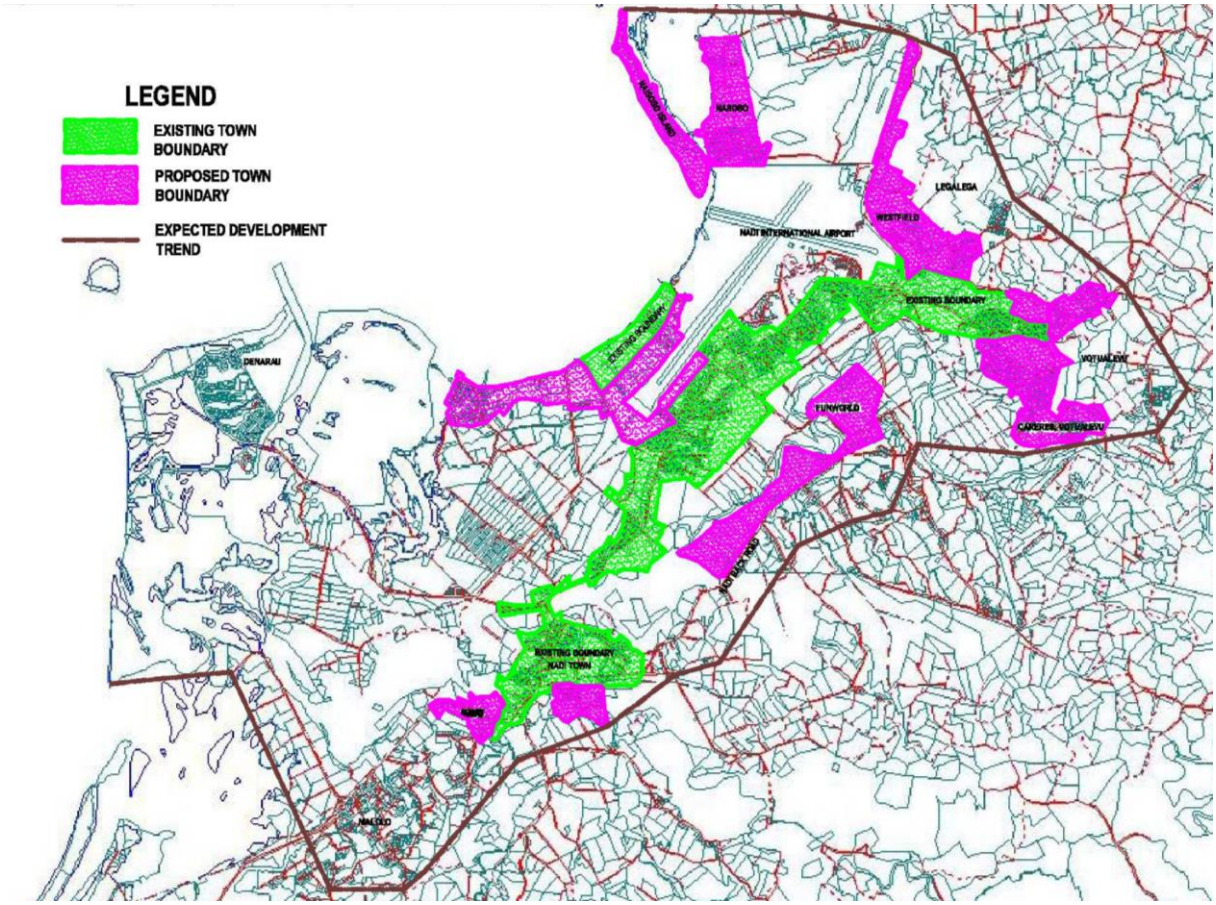
The following legislations are the principal statutes (but are not limited to) that are relevant for the EIA process in Fiji include:

- Town Planning Act (Cap 139)
- Subdivision Act (Cap 140)
- Public Health Act (Cap 111)
- State Lands Act (Cap 132)
- i'Taukei Land Trust Act (Cap 134) as amended by order of Decree No. 8, the Native Land Trust Amendment Decree 2011
- Preservation of Objects of Archaeological & Palaeontological Interest Act (Cap 264)

Other broader legislation that may be applicable for conservation by the native people and local communities that have not included in the review as it will be dependent on the development area selected and nature of development activity, are Forestry Decree, Fisheries Act, Marine Space Act, Land Conservation and Improvement Act, Water Authority of Fiji Decree, Fiji Roads Authority Decree, Quarries Act, National Trust of Fiji Act, etc.

1) Town Planning Act (Cap 139)

This Act provides the framework for land development, building and land use classifications through approved town planning schemes, zonings and development guidelines. The Nadi River Basin includes the Nadi Rural Town Planning Area and the Nadi Town Planning Area in accordance with the Town Planning Act.



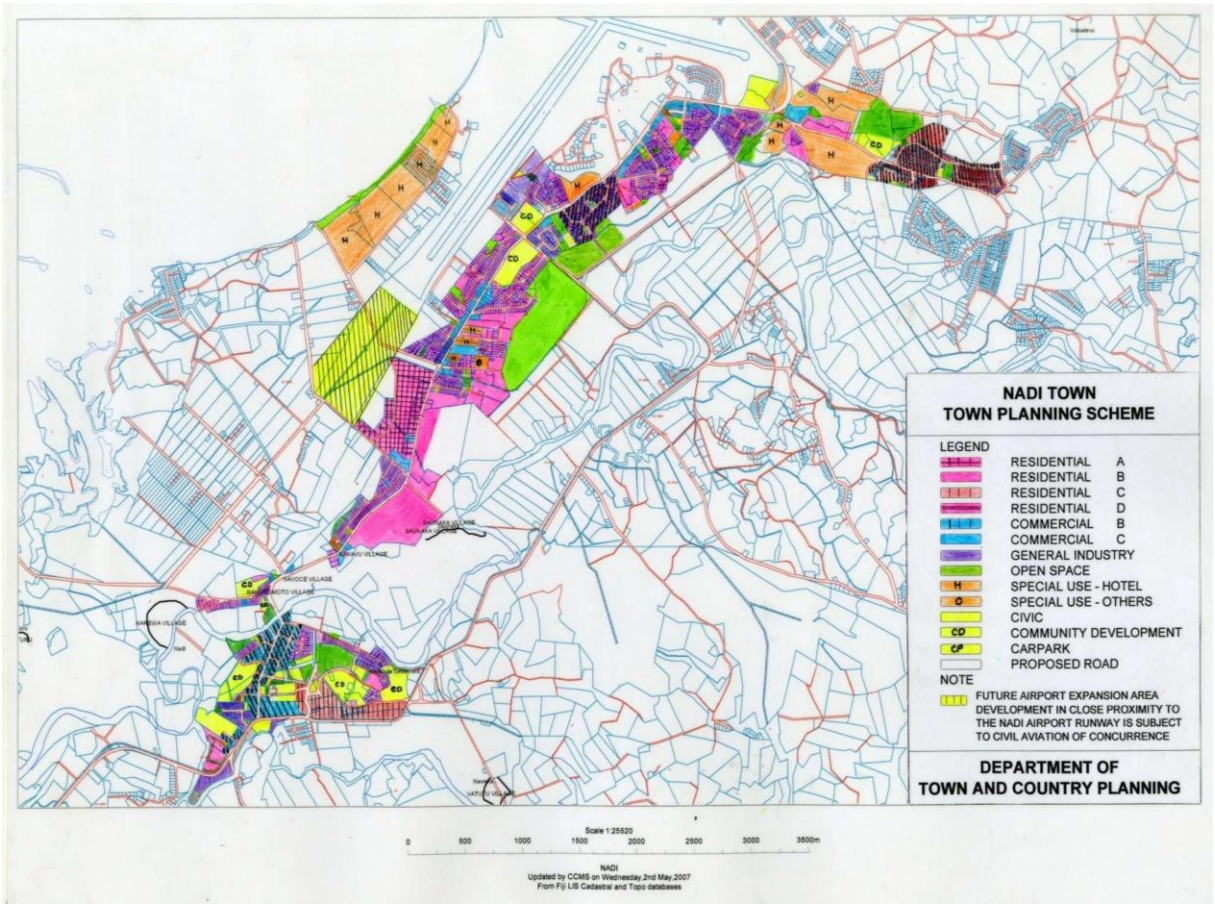
Source: Nadi Town Council

Figure 12-2 Boundary of Nadi Town (Existing and Proposed)

The major proposed development activities require the approval from the relevant Local Authority responsible for the approved Town Planning Area, i.e. either Nadi Rural and Nadi Town Council, and the consent of the Director of Town and Country Planning (DTCP).

A major development proposal will require a Master Scheme & Rezoning Plan demarcating the proposed alignment of the plan to be lodged with the DTCP's consent together with the approval of the Nadi Town Council and Nadi Rural Local Authority. The Master Scheme and Rezoning Plan will form an amendment to the Nadi Town Planning Scheme (approved in 1994 (see below) and amended in 2006) under the Town Planning Act Cap 139, which will need to be provisionally approved firstly followed by a 1 month period of public consultation.

If a project being a major development for the Nadi Region, it is likely that the public consultation period is likely to be extended to 3 months to ensure that ample time is given to the general public and land owners to consider the proposed development.



Source: Nadi Town Council

Figure 12-3 Nadi Town Planning Scheme 2007

2) Subdivision of Lands Act (Cap 140)

Subdivision of Lands Act provides the requirements for the subdivision of land for the approval of the Director of Town & Country Planning. This Act applies to all land development requiring further subdivision, including land within the boundaries of any city or town to which the Local Government Act applies (with the exception of Suva City Council & Lautoka City Council who have their own Subdivision by-laws) and land included in any native reserve constituted under the i'Taukei Land Trust Act which has been cleared for de-reservation by the i'Taukei Lands Trust Board (TLTB).

3) Public Health Act (Cap 111)

Public Health Act is administered by the Central Board of Health (CBH) under the Health Ministry. Section 10 (b) of the Act, stipulates that the local authorities in rural districts appointed by the Minister of Health and in this case, the local authority is responsible for approving town planning area which the proposed development falls under and that is the Nadi Rural Local Authority and the Nadi Town Council.

The Nadi Rural Local Authority and the Nadi Town Council are responsible for undertaking the role of the Board in ensuring that the proposed development complies with the requirements of the Act. Specific to the proposed development are building requirements as stipulated under Part three (3) of the Act and the Public Health (National Building Code) Regulations 2004. Also specific to the proposed development are the provisions in the Act for

the control of nuisances detected within their districts relating to public health, infectious diseases, venereal diseases, offensive trades, solid and liquid waste disposal, water supply and assistance with disaster control and management.

Through the undertaking of the role of the Board by the Local Authority, Nadi Town Council and Nadi Rural have the power to inspect all development works. The Act relating to compliance with the development approval conditions, building regulations, environmental, health and sanitation requirements and services requirements shall also be complied with by the proponent. The Local Authority is also responsible for ensuring compliance with all conditions of consent to developments issued by the Director of Town & Country Planning including the EIA approval conditions issued by DoE and has the powers to issue 'Stop Work' notices for any non-compliance of the relevant Acts including the Environmental Management Act in consultation with DoE.

4) Crown Lands Act (Cap 132)

The Crown Lands Act provides for the control, administration and disposal of Crown land. Consent is required from the Director of Lands for any works to be undertaken on or use of any crown land i.e. all public/state lands in Fiji, including foreshore areas under the soil and under the waters of Fiji and all lands which have been or may be hereafter acquired for any public purpose.

The areas for development by the Project may comprise both state lease land and state foreshore area that fall under the jurisdiction of the Director of Lands. Should the state land be already leased, then they will need to go through the land acquisition process with the consent of the Director. In the event, the area of development falls into state foreshore area, then the proponent will require a state development lease over the area, which will need to be surveyed once the land has been developed. Dredging of river beds will require a license from the Director of Lands and similar to the state foreshore lease process will need to go through a consultation process and the Qoliqoli fishing rights waiver process with the Qoliqoli Resource Users as registered in the i'Taukei Fisheries Commission in the Register of the iTaukei Customary Fishing Rights. This will include a fisheries assessment to determine the compensation value that shall be required to be paid (if applicable). This process is to be managed by the Department of Lands.

12.1.2 Implementation Status of Environmental and Social Considerations Study in Fiji

(1) Case Example of Environmental and Social Considerations in Nadi River Basin

The implementation status of environmental and social considerations in Nadi River Basin and surrounding areas are shown in Figure 12-4 and Table 12-2.

Based on the hearing survey to Department of Environment (DOE) in Lautoka, the list of recent developing proposals are shown in Figure 12-4. The outline of proposals are described in Table 12-2.

The development proposals shown in below have submitted the EIA report to DOE in accordance with EMA and EMR. Bigger scale of the developments are "2. Denarau Tourism & Hospitality Development", "4. Nakovacke Resort Development", "5. Nadi River Dredging, "13&14. Nadi Road Upgrade Project".

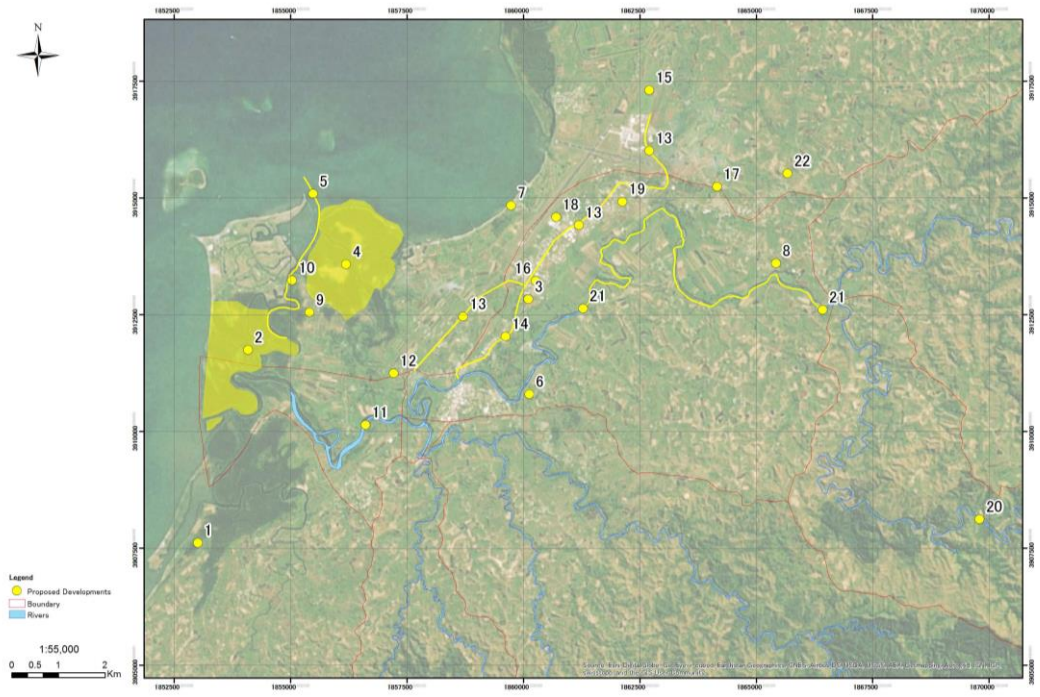


Figure 12-4 Development Proposals in the Nadi River Basin and Surrounding Areas

Table 12-2 List of Proposed Developments (2007- due data)

No.	Name of the Project	Purpose of the Project	Developer	EIA Submitted	Location
1	Sonaisali Residential, Commercial & Tourism Development	Tourism, Commercial & Residential Development	Anwar Paradise Ltd	Jan-2007	Sonaisali, Nacovi,
2	Denarau Tourism & Hospitality Development	Tourism, Commercial & Residential Development	GULF Investment Limited	Dec-2009	Denarau
3	Waqadra Subdivision Development	Residential & Commercial Development	Chandar Sen	Oct-2010	Waqadra
4	Nakovacke Resort Development	Tourism development	Nakovacke Development Trust	Dec-2010	Adjecent to Denarau Island

5	Nadi River Dredging	River Dredging	LWRM	Oct-2011	Nadi river
6	RAMSCORP Industrial Warehouse Development	Industrial development	Ramscorp Holdings Ltd	May-2012	Koronilavalava
7	Wailoaloa Beach Service Apartment & Coastal Mitigation	Commercial development	Smugglers' Cove Beach Resort	Nov-2012	Wailoaloa Beach,
8	Malawai / Votualevu Subdivision Development	Residential development	Cattrack Investment Ltd	Dec-2012	Malawai/ Votualevu
9	Maqalevu Rezoning of Lot 1 DP 8805	Residential & Commercial development	Nilan Kumar c/-Patson & Associates	Jun-2013	Maqalevu Road
10	Denarau Hotel & Tourism Development	Tourism Development	Akuilau Products	Jun-2013	State Foreshore Tiriland, Denarau
11	Navo Tourism Development (Cultural Village)	Tourism Development	Xing Wei Pan	Aug-2013	Navo
12	Vuralose Commercial development	Commercial Development	Vuralose Investment Co Ltd	Sep-2013	Vunabitu, Denarau
13	Nadi Road Upgrade Project- Section 1A, 1B and 1D	Road Upgrading	Fiji Roads Authority	Oct-2013	Queens Rd, Narewa Rd, Wailoaloa Rd
14	Nadi Road Upgrade Project- Section 1C	Road Upgrading	Fiji Roads Authority	Oct-2013	Queens Rd, Narewa Rd, Wailoaloa Rd
15	Legalega Residential & Commercial Development	Industrial development	Voivoi Land Development Co Ltd	Oct-2013	Legalega
16	Cinema Multiplex Development	Cinema Development	R B Patel Group Ltd	Dec-2013	Martintar
17	Legalega Residential Subdivision	Residential Development	Department of Land Use Unit, Govt of Fiji	Apr-2014	Legalega
18	Namaka Industrial Subdivision	Industrial Development	Namaka Land Development Co Ltd	Mar-2014	Waqavuka/Industrial Street, Namaka
19	Namaka Hotel Apartments	Tourism Development	Chariot Fiji Ltd	Apr-2014	Concave Drive, Namaka
20	Namosi Water Retention Weir No. 3	Watershed Development	Min of Agriculture (LAWRM)	Nov-2014	Namosi river
21	Nadi River Sand & Gravel Extraction	Sand & Gravel Extraction	Yavusa Ua Trust	Oct-2014	pt of Nadi River - Saunaka to Votualevu
22	Fiji Military Forces Peacekeeping Center	Military Training Camp Development	Republic of Fiji Military Forces	Jan-2015	Votualevu

Source: Department of Environment, Ministry of Agriculture

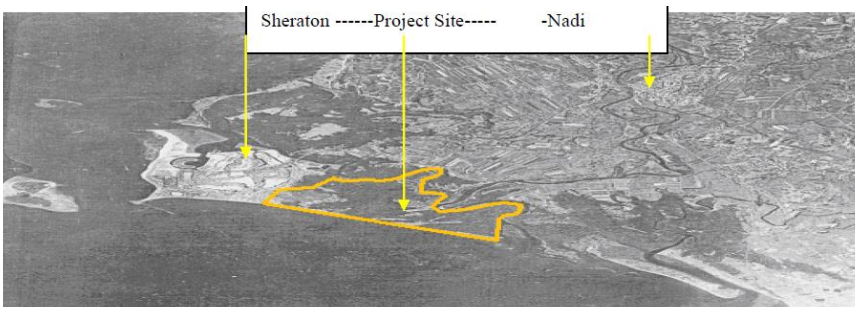
(2) Case Examples of Evaluation and Mitigation Measures on Existing EIA Reports EIA

In the EIA study of development proposals listed in Table 12-2, fundamental data collection, development of Terms of Reference(TOR) of EIA, implementation of survey and evaluation based on TOR, proposals of mitigation measures were implemented. For the example of EIA study, outline of development and major mitigation measures are shown in below:

1) Denarau Tourism & Hospitality Development (No.2)

[Outline of Development]

Integrated resort development including commercial and residential area in the mangroves area where surrounded by the area of southern side of Denarau Island and Nadi River by the private developer. The EIA report had submitted in October, 2009.



Source: Denarau Tourism & Hospitality Development, EIA Report, 2009

Figure 12-5 Location of Denarau Tourism & Hospitality Development

Source: Denarau Tourism & Hospitality Development, EIA Report, 2009

Figure 12-6 Outline of Denarau Tourism & Hospitality Development

[Major Environmental and Social Impacts]

Positive Impacts: Economic development, employment creation and increasing of population

Negative Impacts: Landscape change, Limitation of land use, loss of fishing ground and rights

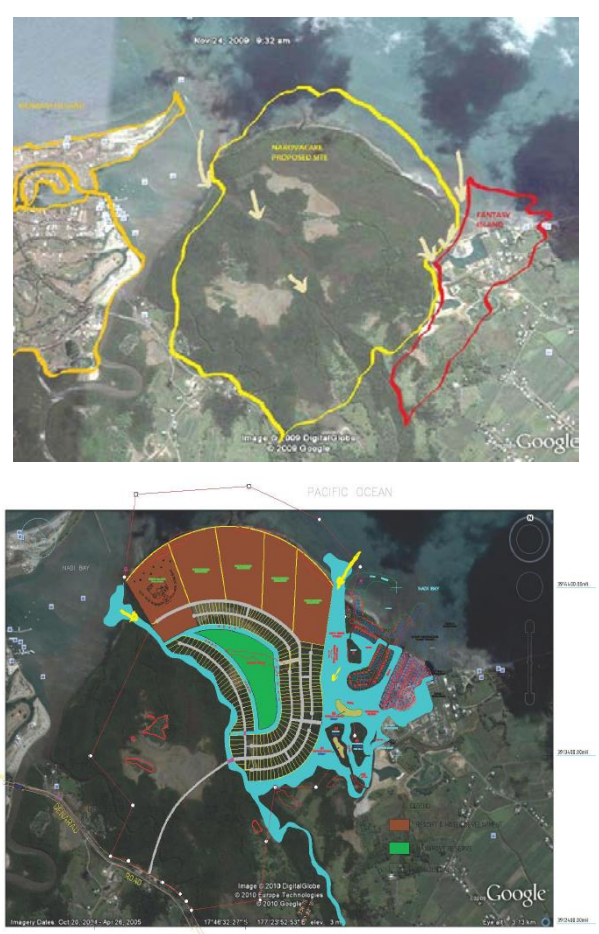
[Mitigation Measures]

For the mitigation measures to mangroves to be disappeared, replantation of the area with plants which rapidly growth are indicated. Also, the impact of wastes during construction and its adequate management is needed are pointed out.

2) Nakovacke Resort Development (No.4)

[Outline of Development]

Integrated resort development including commercial and residential area in the mangroves area where surrounded by the area of western side of Denarau Island (Orange part) and Fantasy Island developments by the private developer (Red part). The EIA report had submitted in December, 2010.



Source: Nakovacke Resort Development, EIA Report, 2010

Figure 12-7 Location & Outline of Nakovacke Resort Development

[Major Environmental and Social Impacts]

Positive Impacts: Economic development, employment creation, increasing of tourism capacity, and increasing of attractive of the area.

Negative Impacts: some impacts to the environment

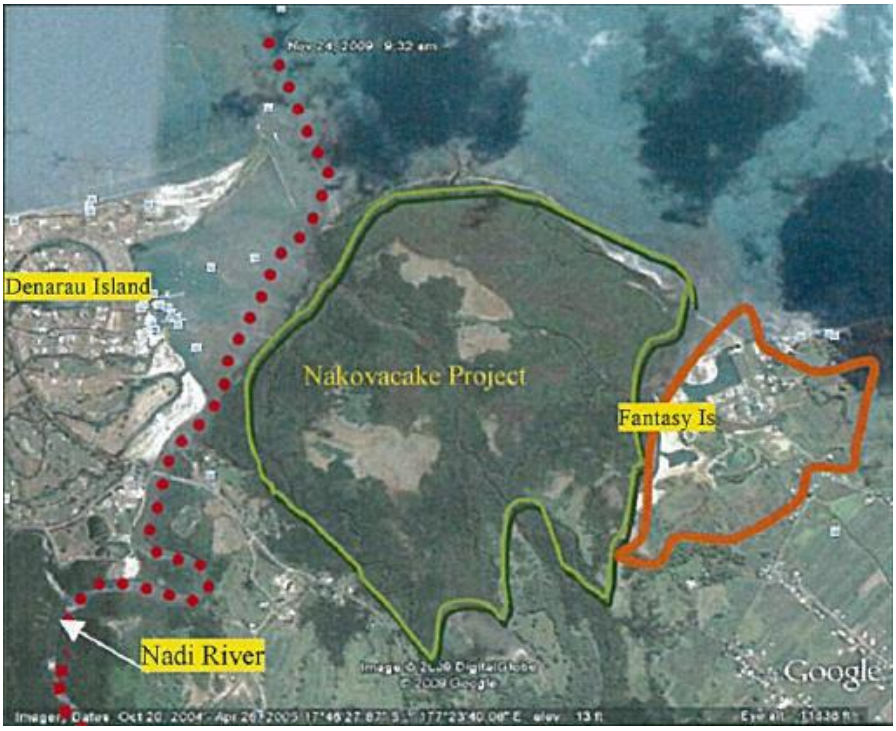
[Mitigation Measures]

To mitigate the impact to the ecosystems as the decreasing of habitats, conservation of important habitat, preservation of tall tree, replantation of the area with plants which rapidly growth are indicated. Also, regarding an erosion of coastal lines, set back from shore line, prevention measures by using plants etc. are indicated.

3) Nadi River Dredging (No.5)

[Outline of Development]

The dredging plan to ensure the drainage capacity of the area by Ministry of Agriculture in the Nadi River Mouth along with the Denarau Island. The EIA report had submitted in October, 2011.



Source: Nadi River Dredging, EIA Report, 2011

Figure 12-8 Location and Outline of Nadi River Dredging

[Major Environmental and Social Impacts]

Positive Impacts: Enhancement of capacity of drainage in the area, mitigation of flood damage in the Nadi area, employment creation by construction works, support of tourism industry, and increasing of attractive of the area.

Negative Impacts: some impacts to the environment

[Mitigation Measures]

To mitigate the impact to the ecosystems as the decreasing of habitats, conservation of important habitat, preservation of tall tree, replantation of the area with plants which rapidly growth are indicated. Also, regarding an erosion of coastal lines, set back from shore line, prevention measures by using plants etc. are indicated. (This description is same as Nakovacke Resort Development (No.4), because of the same consultant farm developed the EIA report.)

Disposal site of the soils keeps 20 – 30 m distance from the shipway and roads. The recycle of construction waste soil is recommended wherever possible.

4) Nadi Road Upgrade Project (No.13, 14)

[Outline of Development]

The road improvement plan form Nadi International Airport toward Denarau Island by Fiji Road Authority (FRA). The EIA report had submitted in October, 2013.

Source: Nadi Road Upgrade Project, EIA Report, 2013

Figure 12-9 Location and Outline of Nadi Road Upgrade Project (Section 1B)

[Major Environmental and Social Impacts]

Positive Impacts: Improvement of the traffic networks in the Nadi area.

Negative Impacts: Congestion of traffic and increasing of traffic noise and air pollutions during construction phase (12 to 15 months)

[Lands Acquisitions]

The targets of acquisition by FRA are 41 lots of individual assets. The FRA agreed with land owners/users to pay an adequate compensations.

[Mitigation Measures]

In the timing of Public Consultations, residents requested the secure of safety for an pedestrians and countermeasures against road noise during construction. Also, an impacts for the community and small business along the road are considered. In the result, the road improvement project evaluated as the project provides major benefit to the local communities.

12.2 Methods of the Environmental and Social Consideration

12.2.1 The Gaps between EIA system in Fiji and JICA Guidelines

(1) Gaps in the EIA related regal systems

The gaps between regal system of EIA such as EMA and EMR and the important items in the JICA Guidelines of Environment and Social Considerations are shown in Table 12-3. The implementation policy in the project is formulated based on the JICA Environmental and Social Considerations Guidelines, 2010.

EIA legislation in Fiji is not clearly determined Strategic Environmental Impacts Assessment, but Fiji's system requires screening process for all development proposals. Therefore, the EIA process in Fiji requires social and environmental considerations at the initial stage of the development works. In addition, the EIA system in Fiji requires a community participation, information disclosure and requirement of monitoring plan. This means that Fiji's EIA system reaches to the JICA's requirements in the environmental and social considerations.

Table 12-3 The Gaps between EIA system in Fiji and JICA Guidelines

No.	Important points of JICA Guidelines	EIA Legislation in Fiji	Gaps Between Fiji EIA System and JICA Guidelines	Implementation Policy in the Project
1	A wide range of impacts must be addressed.	EMA、MER	In the EMA, types of developing proposals which needed the approvals of EIA are shown. An environmental and social impacts to be considered are also shown.	Implement the Environmental and Social Considerations Study based on the EIA process in Fiji. The Team will develop the TOR of EIA with referring the characteristics of the Project and the items to be considered shown in JICA Guidelines.
2	Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage.	EMA、MER	In the EMA and EMP in Fiji do not use the word of Starategic Environmental Impacts Assesment, but all of development proposals need to pass the screening process in accordance with EMA and EMR. In addition, EIA report need to be included the Environment Monitoring Plan to indicate the monitoring scheme dueing construction and in –service.	EIA process in Fiji covers environmental and social considerations from initial stage of the project development to monitoring stage. In the Project, carry out the EIA study based on Fiji's legislation systems.
3	JICA is responsible for accountability when implementing cooperation projects.	—	—	To secure the accountability and transparency of the Project, based on the EMA and EMR in Fiji and JICA Guidelines, the Team will conduct a public consultations and information disclosure.
4	JICA asks stakeholders for their participation.	EMA article 17	In the EMA and EMR in Fiji requires the process to collect the opinions from stakeholders. The process to feedbakc the opinions into plan is also required.	EIA process in Fiji considers the participations of stake holders. In the Project, carry out the EIA study based on Fiji's legislation systems.
5	JICA discloses information.	—	—	The Team will disclosure an information based on the Fiji's legislation system.

(2) The Gaps between Land Acquisition and Resettlement Laws in Fiji and JICA Guidelines

The gaps between regal system of EIA such as EMA and EMR and the important items in the JICA Guidelines of Environment and Social Considerations are shown in Table 12-4

Major gaps between Fiji laws(mainly the constitution and State Acquisition of Land Act) and JICA guideline is; (1) Fiji law does not require compensation payments to affected persons who have no recognized legal right or interest in the land (2) Fiji law only requires compensation on a depreciated/book value basis for structures.

Moreover, in the State Acquisition of Land Act, does not provide relocation sites and special assistance for vulnerable groups.

The land acquisition and resettlement plan will fill these gaps in the Project.

Table 12-4 The Gaps between Land Acquisition and Resettlement Laws of Fiji and JICA Guidelines

No.	JICA Guidelines	Laws of Fiji	Gaps Between Laws Fiji and JICA Guidelines	Implementation Policy of Resettlement in the Project
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	The Constitution and the State Acquisition of Land Act set out the conditions under which land may be compulsory acquired. The property can only be acquired for the public good, and with the payment of reasonable compensation.	No explicit reference to the need for minimizing resettlement impacts by exploring alternatives.	Measures on avoiding / minimizing land acquisition and resettlement impacts will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)			
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	General principles of compensation for land and assets are set out in the Constitution and State Acquisition of Land Act.	FIJI Laws do not prescribe measures to restore/ improve standard of living.	Measures to restore / improve standard of living will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)		No specific requirement for compensation at replacement cost,	The relocation cost will be evaluated as replacement cost possible.
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	State Acquisition of Land Act sets timing for payment of compensation.	SALA states within 30 days of notification, but does not specifically state before displacement. DOL Procedure provides for 75% before construction and 25% after construction.	Measures on full payment of compensation for affected assets before start of civil works on affected land will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
6	For projects that entail	－	No requirements for a	Development of Resettlement

	large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)		resettlement action plan.	Action Plan will be required in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	In terms of information disclosure and consultation process are included in the State Acquisition of Land Act.	No specific requirements for information disclosure and discussions with communities before the preparation of Resettlement action plan.	Measures on information disclosure and discussion with communities will be included in the Land Acquisition and resettlement policy and Abbreviated Resettlement Action Plan.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)			Land Acquisition and resettlement policy and Resettlement Action Plan will be provided with the understandable language and style for displased persons, for discussions.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)			Measures on encourage of community participation will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	State Acquisition of Land Act provides for appeal against a declaration of public purpose for compulsory acquisition and amount of compensation.	No requirements for a project-specific grievance redress mechanism.	Measures on project-specific grievance redress mechanism will be proposed in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	State Acquisition of Land Act sets out the process for land investigation which includes identification of affected landowners and their assets.	No specific requirements for census, cut-off date, impact assessment and scoping of resettlement planning.	Measures on survey/census, cut-off-date, assessment of impacts and resettlement planning will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets	—	There is nothing in the FIJI Laws to address the issue of displaced persons without land title or legal land rights.	The entitlement matrix for the project provides for resettlement assistance and compensation for non-land assets to non-titled displased persons as well.

	and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)			
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	State Acquisition of Land Act sets out the process for land investigation which includes identification of affected landowners and their assets.	No specific requirements for giving preference for land-based resettlement strategies.	Measures on giving preference for land-based resettlement strategies will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	—	No specific requirements for provision of support for the transition period.	Measures on provision of support for the transition period will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	State Acquisition of Land Act sets out the process of notification of the land acquisition.	No specific provisions for preparing and implementing based on meaningful consultations with displaced person including the poor, the landless, elderly, women, and other vulnerable groups	Measures on consultations with displaced persons including vulnerable groups will be included in the Land Acquisition and Resettlement Policy and Abbreviated Resettlement Action Plan.
16	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	—	No specific requirements for preparation of Resettlement Action Plan and its scale requirements	In case of more than 200 displaced persons are concerned, measures for land acquisition and resettlement will be examined in the Land Acquisition and Resettlement Policy and Resettlement Action Plan.

12.2.2 The result of the Study and EIA Process for Project Implementation

The study of Environmental and Social Considerations in the Study is implemented in accordance with EIA related laws in Fiji. In an implementation phase of the Project, the MOA or some GOF organizations who will be proponent will submit Development Proposals and EIA report(s) based on Fiji laws and regulations to have the approvals by the EIA Administrator.

Therefore, in the Study, the Study Team collect a necessity information and conduct examination for EIA. By using these results of the Study, GOF will implement the EIA process for project implementation.

12.2.3 Project Implementation Flow and Set of Cut-Off Date

As shown in Table 12-4, there is no regulations for cut-off date in Fiji law systems. The World Bank explain the cut-off date in its Safeguard Policy (OP4.12) as below:

Operational Policy 4.12: Involuntary Resettlement, 2001 (OP 4.12)
"Normally, this cut-off date is the date the census begins. The cutoff date could also be the date the project area was delineated, prior to the census, provided that there has been an effective public dissemination of information on the area delineated, and systematic and continuous dissemination subsequent to the delineation to prevent further population influx"

In addition, in recent ADB's project, "Transport Infrastructure Investment Sector Project, 2014", the cut-off date is set as shown in below:

Transport Infrastructure Investment Sector Project
Land Acquisition and Resettlement Framework, September 2014
C. Project Principles, Entitlements and Procedures
(III) Eligibility for entitlements and types of displaced persons

30. The date of land survey will be the "cut-off-date" for eligibility of compensation and rehabilitation assistance. Landowners and/or users that have documented claims to affected land, crops, and trees as of the cut-off date will be eligible for compensation and/or rehabilitation assistance as per the project policy.

In the Study, at the 3rd JCC, the flood control measures Master Plan and Priority Project have been approved. The Public Consultation which hold just after the 3rd JCC, the outlines of Master Plan and Priority Project have been opened to the public.

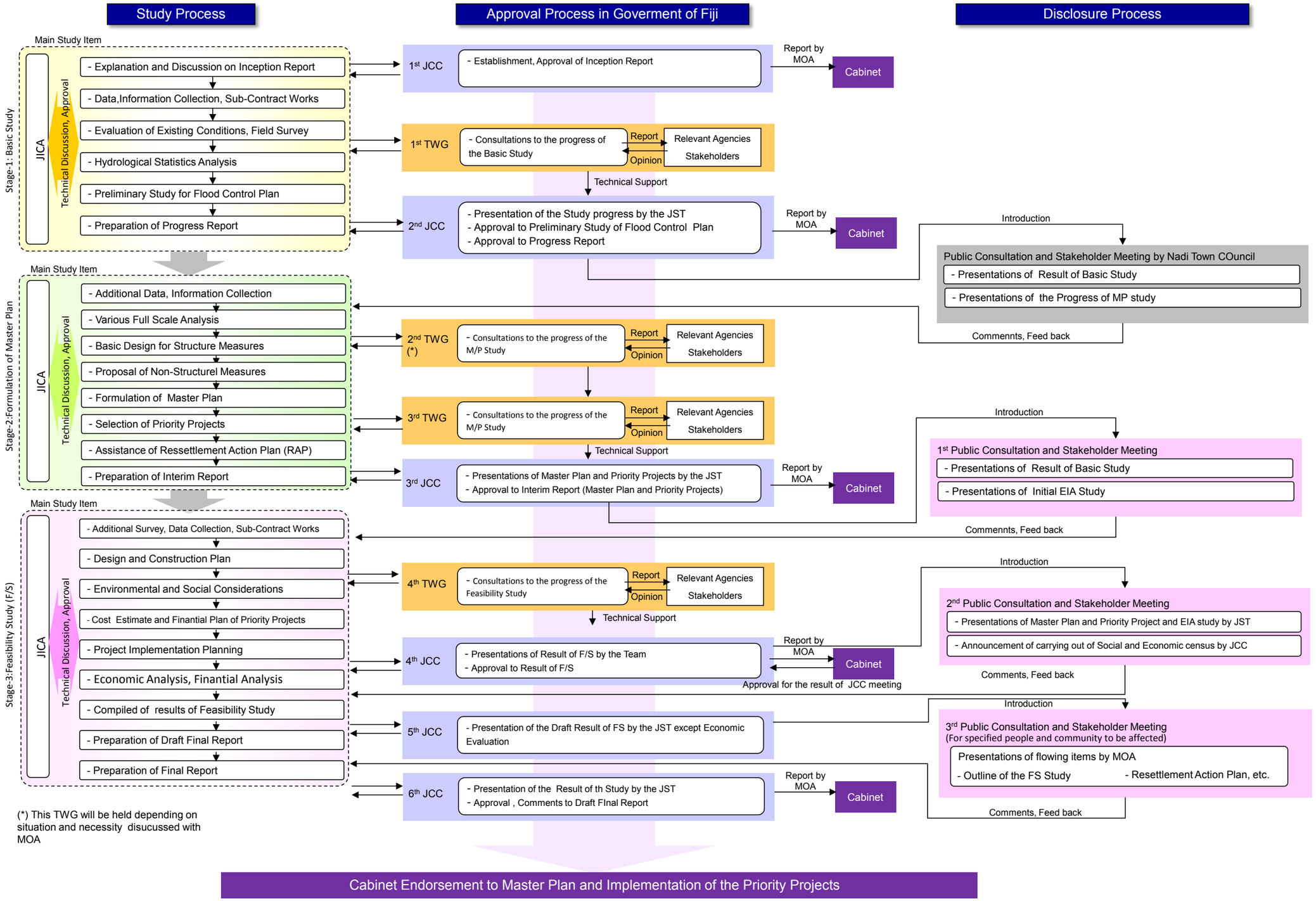


Figure 12-10 Project Implementation Flow

12.2.4 Environmental and Social Considerations Implementation Framework

(1) Confirmation of the items of Environmental and Social Considerations

The Environmental and Social Considerations study in the Master Plan Phase in the Project falls under "Full-scale Study Stage (Master Plan Study)" of JICA Guidelines for Environmental and Social Considerations. Also, the Feasibility Study Phase study falls under and "3.4.4 Full-scale Study Stage (Feasibility Study)".

JICA Guidelines for Environmental and Social Considerations (2010.04)
3.4.3 Full-scale Study Stage (Master Plan Study)
1. JICA enlists an expert(s) on environmental and social considerations to participate in study teams for Category A and B studies, ensuring the provision of an adequate study period.
2. JICA collects relevant information and conducts field surveys covering a wider area than that of the detailed plan preparatory study stage, holds consultations with project proponents etc., and prepares scoping drafts.
3. For Category A studies, after the disclosure of the scoping drafts, project proponents etc. conduct consultations with local stakeholders based on stakeholder analyses. JICA incorporates the results of such consultations into its TOR. The consultations cover the needs of projects and the analysis of alternatives. For Category B studies, project proponents etc. consult with local stakeholders after the disclosure of scoping drafts when necessary.
4. TOR includes understanding of needs, impacts to be assessed, study methods, analysis of alternatives, a schedule, and other items. JICA applies a SEA to such studies.
5. In accordance with TOR and in collaboration with project proponents etc., JICA conducts IEE-level environmental and social considerations studies, and analyzes alternatives, including "without project" situations. During studies, JICA incorporates its results into related reports prepared accordingly.
6. For Category A studies, when preparing a rough outline of environmental and social considerations, a series of stakeholder consultations are conducted after information disclosure when necessary. JICA incorporates the results of such consultations into such studies.
7. Based on the aforementioned procedure, JICA prepares draft reports incorporating the results of environmental and social considerations studies, explains them to project proponents etc., and obtains their comments. For Category A studies, draft reports are disclosed and consultations with local stakeholders are conducted. JICA incorporates the results of such consultations in its final reports. For Category B studies, consultations with local stakeholders after the disclosure of draft final reports are conducted when necessary.
8. JICA prepares final reports incorporating the study results and submits them to project proponents etc. after confirming that the reports meet the requirements of the guidelines.
9. JICA discloses final reports on its website promptly after their completion.

3.4.4 Full-scale Study Stage (Feasibility Study)
1. JICA enlists expert(s) on environmental and social considerations to participate in study teams, ensuring the provision of an adequate study period.
2. JICA collects relevant information, conducts field surveys in a wider area than that of preparatory studies, holds consultations with project proponents etc., and prepares scoping drafts.
3. For all Category A projects and for Category B projects as needed, after disclosing scoping drafts, project proponents etc. conduct consultations with local stakeholders based on stakeholder analyses. JICA incorporates the results of such consultations in the TOR of environmental and social considerations studies. The consultations cover project needs and analyses of alternatives.
4. The TOR includes understanding of development needs, impacts to be assessed, study methods, analysis of alternatives, a schedule, etc.
5. In line with the TOR and in collaboration with project proponents etc., JICA conducts (at the EIA level for Category A projects and at the IEE level for Category B projects) environmental and social considerations studies, including mitigation measures to avoid, minimize, or compensate for adverse impacts; a monitoring plan; and an institutional arrangement. JICA also analyzes alternatives, including "without project" situations. JICA incorporates the results of such studies into related reports that are prepared accordingly.
6. When considering a rough outline of environmental and social considerations, information is disclosed and consultations with local stakeholders are conducted as needed. JICA incorporates the results into its studies.
7. JICA prepares draft reports, incorporating the results of environmental and social considerations studies, and explains them to project proponents etc. in order to obtain comments. After the disclosure of draft reports, consultations with local stakeholders are conducted for all Category A projects and for Category B projects as needed. JICA incorporates the results of such consultations into final reports.
8. JICA prepares final reports and submits them to project proponents etc. after confirming that they meet the requirements of the guidelines.
9. JICA discloses final reports on its website promptly after their completion.

Regarding categorization of impacts, its sets as Category B in the project.

JICA Guidelines for Environmental and Social Considerations (2010.04)
2.2 Categorization (a part of)
1. JICA classifies projects into four categories according to the extent of environmental and social impacts, taking into account an outline of project, scale, site condition, etc.
2. Category A: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas. An illustrative list of sensitive sectors, characteristics, and areas is provided in Appendix 3.
3. Category B: Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily.

JICA Guidelines for Environmental and Social Considerations (2010.04)

Appendix 3. Illustrative List of Sensitive Sectors, Characteristics, and Areas
The project of sensitive sectors, characteristics, and areas shown in this illustrative list are those that will likely have a significant adverse impact on the environment and society. Each individual project is categorized in accordance with the standards for "Category A" indicated in the categorization section of the guidelines, depending on the impacts of the individual projects. Consequently, projects that are likely to have a significant adverse impact on the environment and society are categorized as "Category A" even if they are not included in the sectors, characteristic, or areas on the list.

1. Sensitive Sectors
Large-scale projects in the following sectors:
(1) Mining, including oil and natural gas development, (2) Oil and gas pipelines, (3) Industrial development, (4) Thermal power, including geothermal power, (5) Hydropower, dams, and reservoirs, (6) Power transmission and distribution lines involving large-scale involuntary resettlement, large-scale logging, or submarine electrical cables, (7) River/erosion control
(8) Roads, railways, and bridges, (9) Airports, (10) Ports and harbors, (11) Water supply, sewage, and wastewater treatment that have sensitive characteristics or that are located in sensitive areas or in their vicinity, (12) Waste management and disposal, (13) Agriculture involving large-scale land clearing or irrigation

2. Sensitive Characteristics
(1)Large-scale involuntary resettlement, (2)Large-scale groundwater pumping, (3)Large-scale land reclamation, land development, and land clearing, (4)Large-scale logging

3. Sensitive Areas
Projects in the following areas or their vicinity:
(1)National parks, nationally-designated protected areas (coastal areas, wetlands, areas for ethnic minorities or indigenous peoples and cultural heritage, etc. designated by national governments), (2)Areas that are thought to require careful consideration by the country or locality

Natural Environment
a) Primary forests or natural forests in tropical areas
b) Habitats with important ecological value (coral reefs, mangrove wetlands, tidal flats, etc.)
c) Habitats of rare species that require protection under domestic legislation, international treaties, etc. d) Areas in danger of large-scale salt accumulation or soil erosion e) Areas with a remarkable tendency towards desertification
Social Environment
a) Areas with unique archeological, historical, or cultural value
b) Areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social value

(2) Setting of Zero Option

The Study Team examined the setting of zero potion for alternatives.

In the Nadi River Basin, currently suffers the damages from flood, select the plan which nothing to do for flood control means causing the continuous flood disasters in area and sometime causes an increasing of damages. So, this option is inapplicable for the project. Therefore, the zero option will set the option which reach the objective without any environmental and social impact.

Non-structural measures such as education, promotion of evacuation drill etc. are considered as one of the flood damage mitigation measures without any environmental and social impacts in Nadi River basin. However, non-structural measures can't solve the current issue which low capacity of rivers causes a flood. Therefore, in the Study, zero potion is determined to the control plan without any components.

12.3 Coordination among the Relevant Organizations Regarding Environmental and Social Considerations

12.3.1 Items and Evaluation Method for Environmental and Social Considerations in the Examination for River Improvement Plan

In the examination for river improvement plan, especially concerned items for environmental and social considerations are protected area, ecosystems, resettlement (land owing, number of displaced houses) and proposed development by government and private sector.

Table 12-5 Items and Evaluation Method for Environmental and Social Considerations in the Examination for River Improvement Plan

Major Items	Items	Considerations in Initial Phase			Evaluation Method
		Items can be avoid / mitigate by ingenuity of structure, construction method and other engineering considerations (It is needed to exam in full-scale study)	Items require the impact assessment for decision making toward Initial examination		
			necessity	basis	
Pollution	Air quality	●			
	Water quality	●			
	Waste	●			
	Soil Contamination	●			
	Noise & Vibration	●			
	Subsidence	●			
	Odor	●			
	Sediment	●			
Natural Environment	Protected area		●	It's desirable to avoid projects in a protected areas.	Comparison of location of protected areas and project.
	Ecosystem		●	Impact is greatly depends on area of projects	Roughly grasp the impacts by environmental categories.
	Hydology	●			
	Topography & Geology	●			
	Management of abandoned sites	●			
Social Environment	Land Acquisition and Resettlement		●	Impact is greatly depends on scale and location of projects	Check the land owing type and count the number of houses by aerial photo.
	Poor People	●			
	Living and livelihood	●			
	Cultural heritage	●			
	Landscape	●			
	Tourism	●			
	Outdoor activities	●			
	Governmental and private development		●	To propose realistic plan with a coordination between existing proposed developments	Comparison of locations of existing proposal and project to be implemented.
	Agriculture (included Sugar Cane)	●			
	Ethnic minorities and indigenous peoples	●			
	Water usage	●			
	Existing social infrastructures and social services	●			
	local decision making organizations	●			
	Misdistribution of damages and benefits	●			
	Benefit confliction	●			
	Gender	●			

	Children rights	●			
	HIV/AIDS	●			
	Annual budget for environment management	●			
	Working conditions	●			

12.3.2 Pre Coordination with persons involved

The Study Team conducted the discussion with MOL for land acquisition. In the discussion of MOL, the Study Team confirmed the standard procedure of land acquisition, provision of land owing data, and initial cost estimation for lands to be acquired.

In addition, the Study Team had discussed with MOA about timings of approvals of the project, conducting a Public Consultations and declaration of Cut-Off date.

12.4 Collection and Analysis of Existing Data

12.4.1 Methodology

Utilize an available secondary data which stored in GOF, international organizations, etc., the Study Team had collected and analyzed a fundamental information for Environmental and Social Considerations in Nadi River Basin.

At the Basic Study Stage, it is impossible to determine the specific site for a project. Therefore, the Study Team collected the information entire the Basin.

Collected information are categorized items shown in below considering with scoping process for development a TOR for EIA.

Items of Pollutions	Air quality, Water quality, Waste ,Soil Contamination ,Noise, Vibration, Subsidence, Odor, Sediment
Items of Natural Environment	Protected area, Fauna(land), Fauna(flesh water), Fauna(sea), Flora, Mangrove, Ecosystem, Rainfall, River water level, Tide, Topography, Geology, Management of abandoned sites
Items of Social Environment	Population, land Acquisition Guidelines, Resettlement Guidelines, Land use, Land Tenure, Poor People, Living and livelihood, Cultural heritage, Landscape, Visual impacts, Tourism, Outdoor activities, Governmental and private development strategy, plan and project, Agriculture, Sugar cane industry, Ethnic minorities and indigenous peoples, Water usage, Existing social infrastructures and social services including river structure(dam, levee, water gate, water intake), bridge, road, irrigation facility, etc., Social capital and local decision making organizations, Misdistribution of damages and benefits, Benefit confliction, Gender, Children rights, HIV/AIDS, Annual budget for environment management, Working conditions (including occupational safety)

12.4.2 Current Situation of Environmental and Social condition in the Nadi River Basin

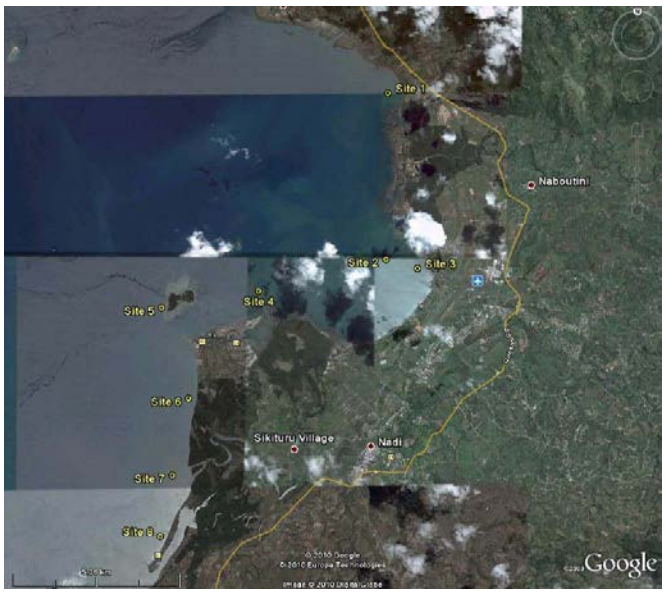
(1) Situation of Pollutions

According to the hearing survey to Department of Environment, DOE, there are no monitoring stations for pollutions. However, items of pollutions are measured as a part of existing EIA study. In this study, the Study Team use the information from EIA studies.

1) Water quality

Existing data of water quality in Nadi River and its River mouth, there is "Nadi Basin Flood Mitigation Targeted Scientific & Technical Report, Water Quality & Environmental Assessment" by SOPAC in 2010.

SOPAC measured Water Temperature, pH, Dissolved Oxygen, Conductivity, Turbidity, Total Dissolved Solid and Total Suspended Solids on the surface and depth in 2m at the sites shown in Figure 12-11



Source: Nadi Basin Flood Mitigation Targeted Scientific & Technical Report, Water Quality & Environmental Assessment

Figure 12-11 Water Quality Measurement sites by SOPAC

Table 12-6 Outline of Water Quality Measurement by SOPAC

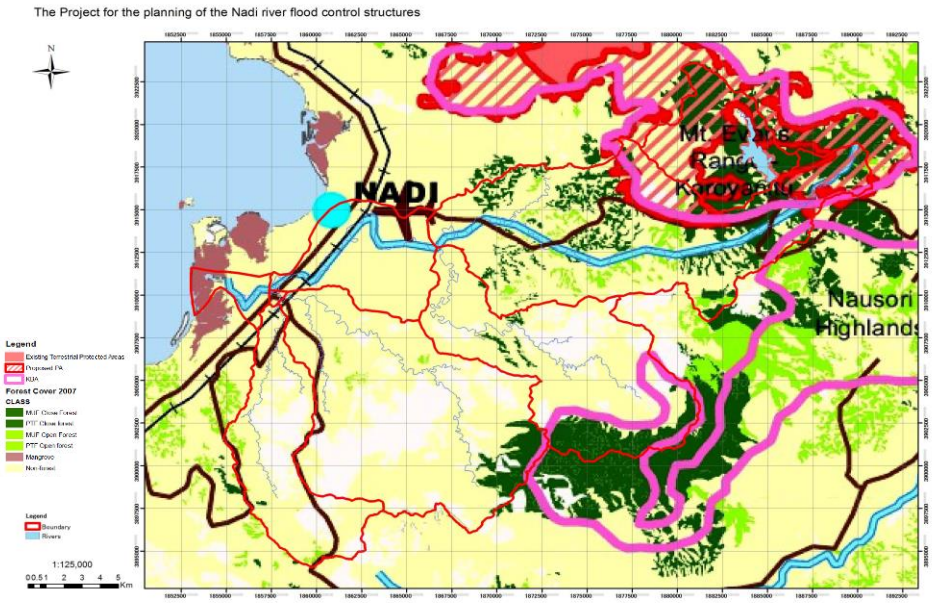
		April		May		June	
		Range	Average	Range	Average	Range	Average
Temp (℃)	Surface	27.7-29.6	28.8	27.9-28.8	28.3	27.1-27.1	27.3
	-2m	28.8-29.6	29.3	28.1-28.8	28.4	nd	nd
pH	Surface	7.9 -8.9	8.7	7.0 – 8.8	8.2	8.0 – 8.9	8.5
	-2m	8.4 – 8.8	8.7	8.1 – 8.3	8.2	nd	nd
DO (mg/L)	Surface	5.8 – 10.0	7.5	4.2 – 5.2	4.5	7.7 – 9.7	8.9
	-2m	5.7 – 8.6	6.8	4.1 – 4.8	4.4	nd	nd
Conductivity (mS/cm)	Surface	19.7 – 44.3	19.7 – 44.3	19.7 – 44.3	19.7 – 44.3	19.7 – 44.3	19.7 – 44.3
	-2m	34.8 – 44.0	34.8 – 44.0	34.8 – 44.0	34.8 – 44.0	nd	nd
TDS (g/L)	Surface	12.2 – 27.0	12.2 – 27.0	12.2 – 27.0	12.2 – 27.0	12.2 – 27.0	12.2 – 27.0
	-2m	20.7 – 26.8	20.7 – 26.8	20.7 – 26.8	20.7 – 26.8	nd	nd
Salinity (ppt)	Surface	10.5 – 27.8	24.1	33.6 – 33.8	33.7	27.9 – 28.5	28.3
	-2m	20.7 – 27.8	26.8	33.6 – 33.8	33.7	nd	nd
Turbidity	Surface	4.1-32.3	15.9	5.9 – 15.7	10.6	0.0-13.0	5
(NTU)	-2m	3.5 – 30.9	11.4	8.0 – 21.0	13.4	nd	nd

(2) Items of Natural Environment

1) Protected Area

Figure 12-12 shows the location of protected area in the Nadi River Basin. In the Basin, there are two protected areas, Nausori Highlands Key Biodiversity Area(KBA) in upstream of Namosi River and Mt. Evans Range-Koroyanitu KBA in upstream area of Nadi River. The part of Mt. Evans Range-Koroyanitu KBA is designated "Protected Area". Also, Mt. Evans Range-Koroyanitu KBA is nominated as "Proposed Protected Area".

KBA is internationally important area for conservation of bio diversity. Its designated by the point of view of Vulnerability and Irreplaceability.



Source: Fiji National Trust

Figure 12-12 Protected Area in the Nadi River Basin

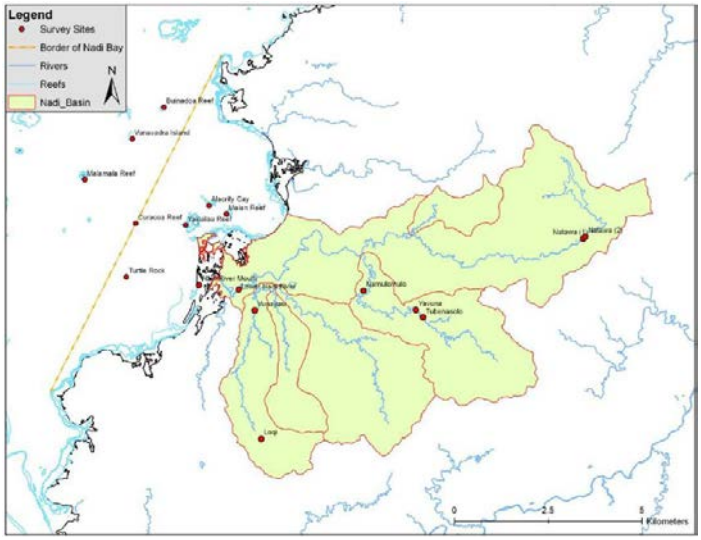
Table 12-7 Criteria of Key Biodiversity Area

Criteria		Threshold
Vulnerability This criterion is triggered when there is a regular occurrence of a significant (exceeding a threshold) population of a globally threatened species (according to the IUCN Red List) at the site.		- single individual of a Critically Endangered or Endangered species - 30 individuals of a Vulnerable species
Irreplaceability	a)Restricted-range species	with thresholds currently proposed as 5% of global population of species with a global range less than 50,000 km2 occurring at the site
	b) Species with large but clumped distributions	with thresholds currently proposed as 5% of global population at site.
	c) Globally significant congregations	with thresholds currently proposed as 1% of global population seasonally occurring at the site.
	d) Globally significant source populations	with currently proposed threshold such that the site is responsible for maintaining 1% of the global population.
	e) Bioregionally restricted assemblages	with thresholds to be determined

2) Fauna (flesh water)

[Fish]

In Nadi River Basin and coastal area, Integrated fish inventory survey had conducted by Aaron Jenkins and Kinikoto Mailautoka in 2010. In the river, they had survey by using electrical shocker, gill net and brail net, in the ocean, sight survey by scuba had conducted.

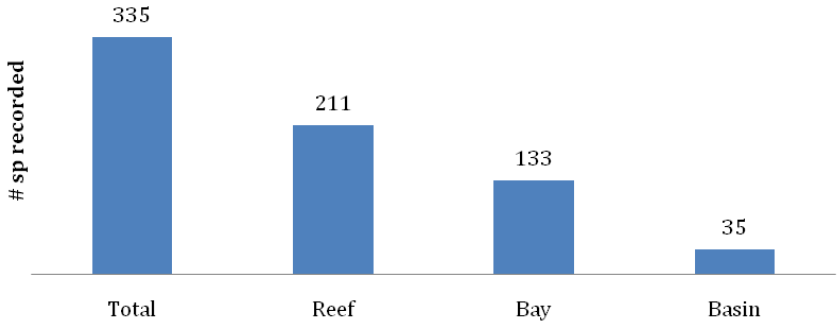


Source: Fishes of Nadi Basin & Bay:Conservation ecology & habitat mobility

Figure 12-13 Locations of Survey (Aaron Jenkins & Kinikoto Mailautoka, 2010)

According to the survey, At least 335 species of fishes from 158 genera and 73 families reside in the Nadi Basin and Bay area. This is 27% of known species in Fiji are fund in the survey. Of these, 317 are indigenous, 15 are endemic and 3 are introduced species. Species richness in Nadi river basin appears very low with an average of only five species per site and a total number of 35 species recorded.

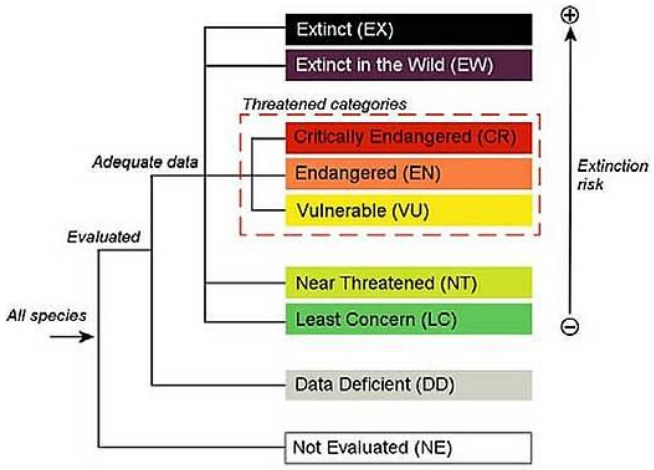
In addition, 26 species are in Nadi river area (Nadi main River, Malakua River and Namosi River). Endemic species are not recorded.



Source: Fishes of Nadi Basin & Bay: Conservation ecology & habitat mobility

Figure 12-14 Results of survey (Aaron Jenkins & Kinikoto Mailautoka, 2010)

Of the 335 species listed in this study, 70% (234) have not yet been evaluated by the IUCN Redlist, 27% (89) are listed as Least Concern (LC), 2% (7) are Near Threatened (NT), two species are data deficient (DD), two species are Vulnerable (VU) and one species is listed as Endangered (EN). This equates to around 3% of the fish fauna being officially listed as threatened.

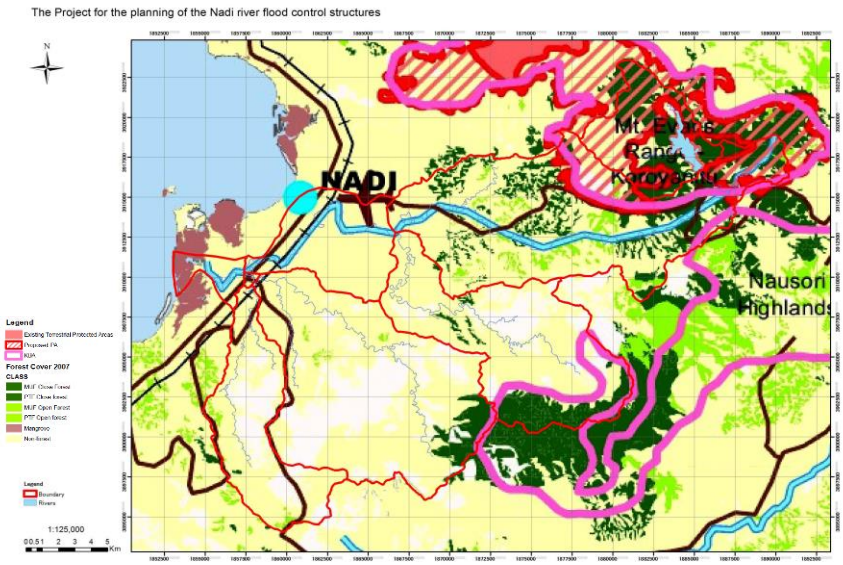


Source: IUCN

Figure 12-15 Categories of Red List by IUCN

3) Mangorve Forests

The Mangroves (titi in Fiji language) in the Nadi River Basin are well developed in the Nadi River Mouth. These Mangroves are comparatively major habitat (approximate 1,350ha).



Source: Fiji National Trust

Figure 12-16 Distribution of Mangroves in the Nadi River Basin

Table 12-8 Flora of Mangrove Forest in Nadi River Basin

Standard Name	Science name	Comment	endemic species	rare species	Important for conservation
Rain tree	*Samanea saman*	Introduced sp. One large tree			✔
Coconut	*Cocus nucifera*	Few on edge of mangrove swamp			✔
Wiriwiri	*Gyrocarpus jacquini*	Common on edge of mangroves			
Vau	*Hibiscus tiliaceus*	Found on edge of mangroves			✔
Vaivai	*Schleinitzia insularum*	Few found on open grass land			✔
Sinu	*Phaleria disperma*	Common on edge of mangrove			
Pandanus	*Pandanus vitiensis*	Few bush found at edge of swamp			✔
Mangrove	*(Tiri) Rhizophora sp.*	*Dominant flora at edge of water*			✔
	(Dogo) Bruguiera gymnorhiza	*Common, found inland*			✔
Mangrove fern (Borete)	*Acrostichum aureum*	*Common in between large trees on mud flats*			✔

Source: Nakovacke Resort Development EIA Report

(3) Items of Social Environment

1) Land Use and Vegitation

The Vegetation of Nadi River Basin, upper and middle stream of Nadi river is widely covered by pine forest. In the downstream, Sugar Cane field are speeded. In river mouth, there are Mangroves and Nadi International Airport, Nadi Town, hotels and Golf courses are located and utilized.

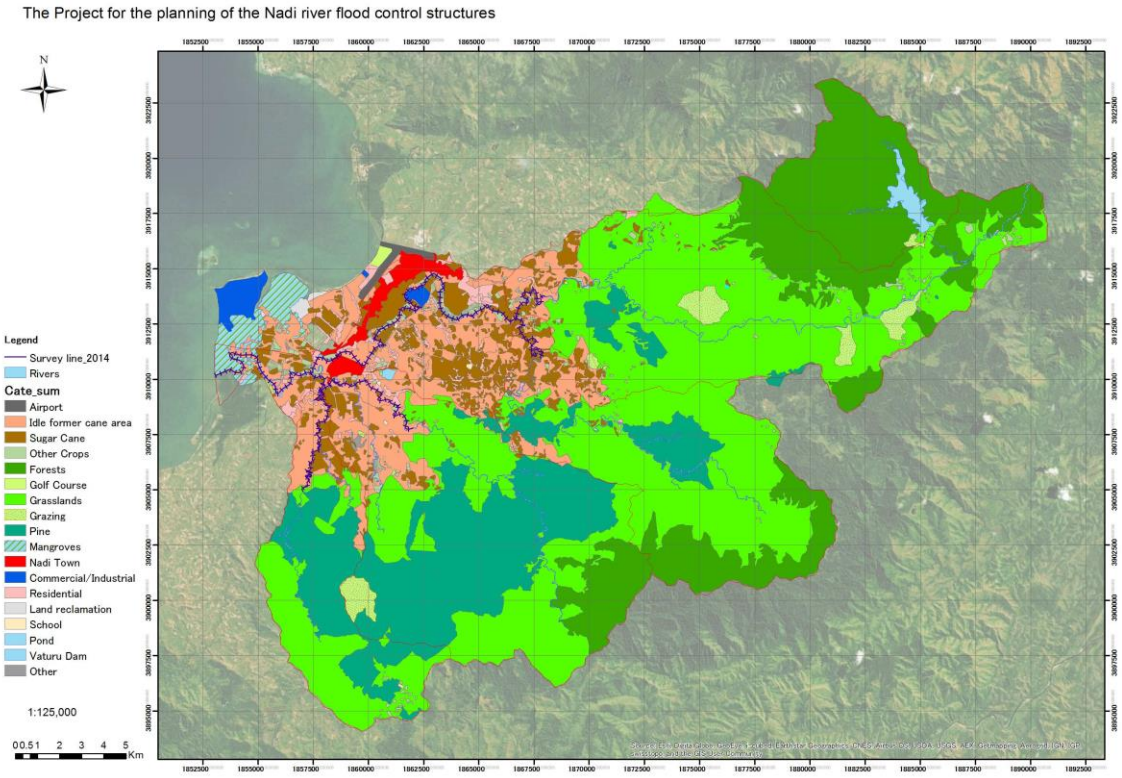


Figure 12-17 Land Type Distribution in Nadi River Basin

2) Land Owning

In Fiji, administrator of land issues is Ministry of Lands and Mineral Resources. Types of Lands are divided into major 3. 1) Native Land, 2) State Land, 3) Freehold Land. The ratio of area is shown in Table 12-9.

Table 12-9 Land owning Type Based Ratio

Type of Land	In Entire Fiji	In Nadi River Basin
Native Land	87.9%	88.4%
State Land	3.9%	3.6%
Freehold Land	7.9%	8.0%
Rotuma Land	0.3%	

Source: ratio in Entire Fiji: Fiji Facts and Figures, Fiji Bureau of Statistics, 2012

In Nadi River Basin: JICA Study Team based on the data from TLTB

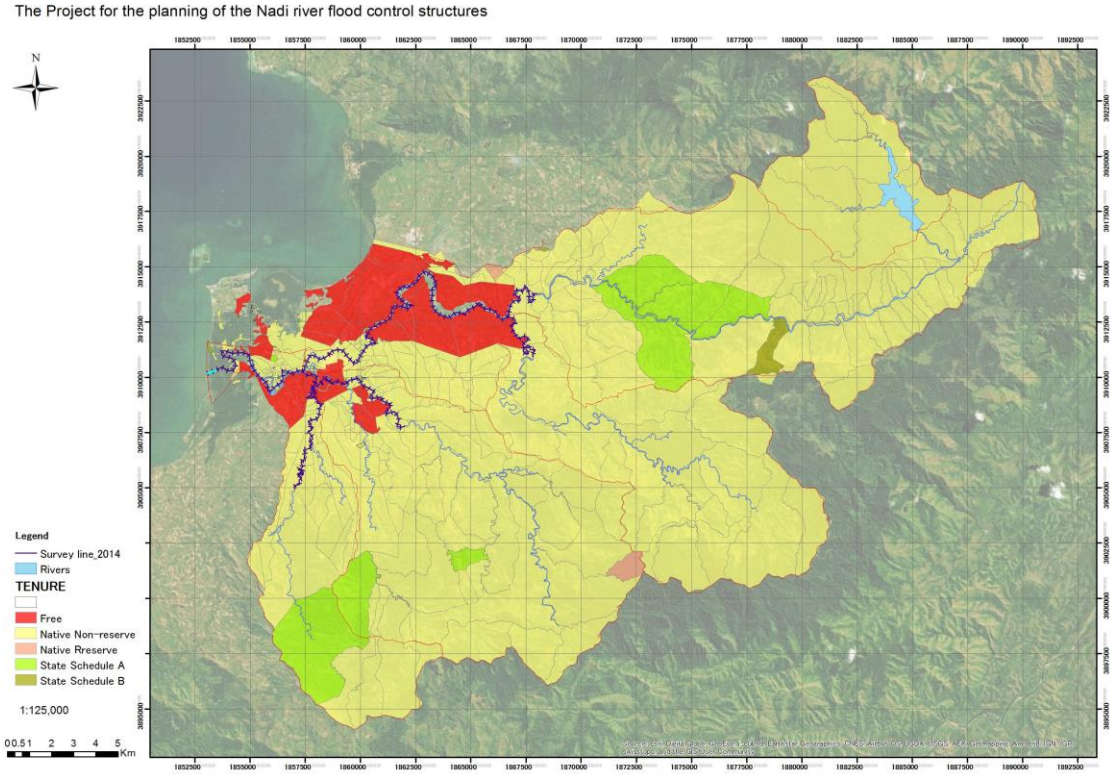


Figure 12-18 Land Type Distribution in Nadi River Basin

3) Cultureal Heritage

In Nadi River Basin, a cultural heritage which recorded by Fiji National Trust are shown in Figure 12-19. Most of the heritage sites are located in upper stream of Nadi River. However, they are recorded as "unknown".

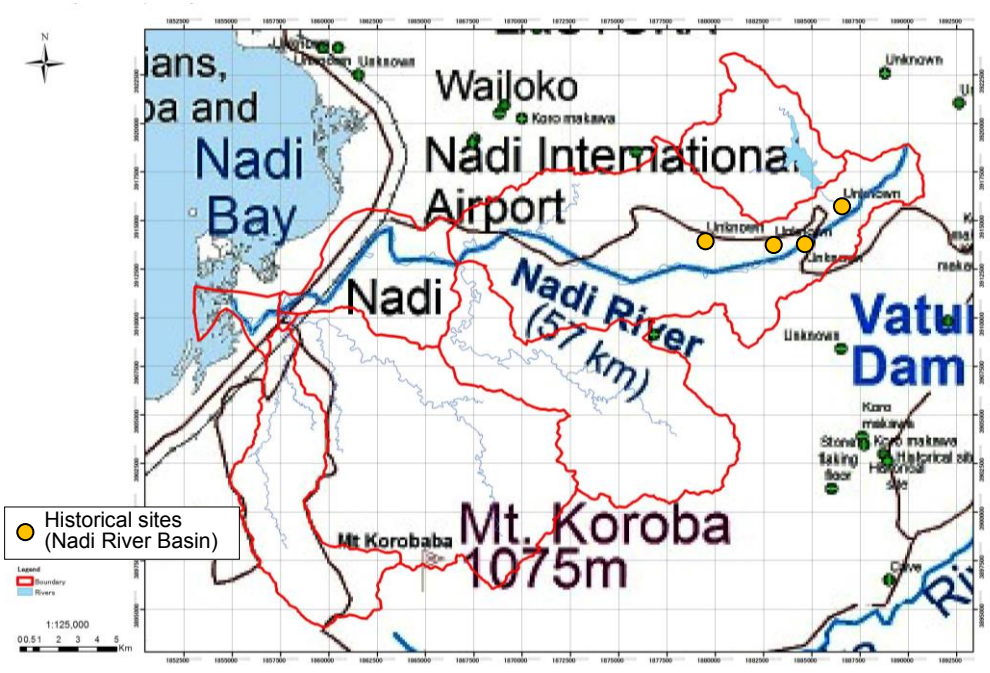


Figure 12-19 Cultural Heritage Sites in Nadi River basin

12.5 Examination of Alternatives based on the Strategic Environmental Assessment

12.5.1 The Priority Project in Master Plan

In the Master Plan of Nadi River Flood Control Structures, the Priority Project is determined as urgent components for mitigate the flood in important protection area. In this chapter, the Project stands the Priority Project in the Master Plan.

12.5.2 The Flood Control Measures to be archived in the Project

The countermeasures to mitigate the flood damage in the Nadi area are show in below.

Structural Measures

1) Securing of river flow capacity

2) Control of flood

3) Flood Protection (Prevention of flood water from the river)

Non-structural Measures

4) Flood damage mitigation measures by non-structural measures

The concrete measures for archiving the objectives shown in above are shown in below, considering with natural, social and economic situation of target area.

1) Widening of Nadi Main River

2) Development the diversion channel for flood

3) Rebuilding of existing bridge for increasing of river flow capacity

4) Development of flood control structures such as dam and reading basin

5) Flood protection by construction of dike

12.5.3 Alternatives for Examination of Master Plan

In the examination of the Master Plan, target area(Nadi River Basin) have been divided into three stretches, Down Stream (river mouth to 5.75km), Middle Stream (5.75km to 18.5km(at the point of Back Road Bridge)), and Up Stream (upper than 18.5km). Then, alternatives show in above had been examined.

The basic policy of the best combination of flood control components in the Master Plan had been approved in 2nd JCC (Joint Coordination Committee) in June, 2015.

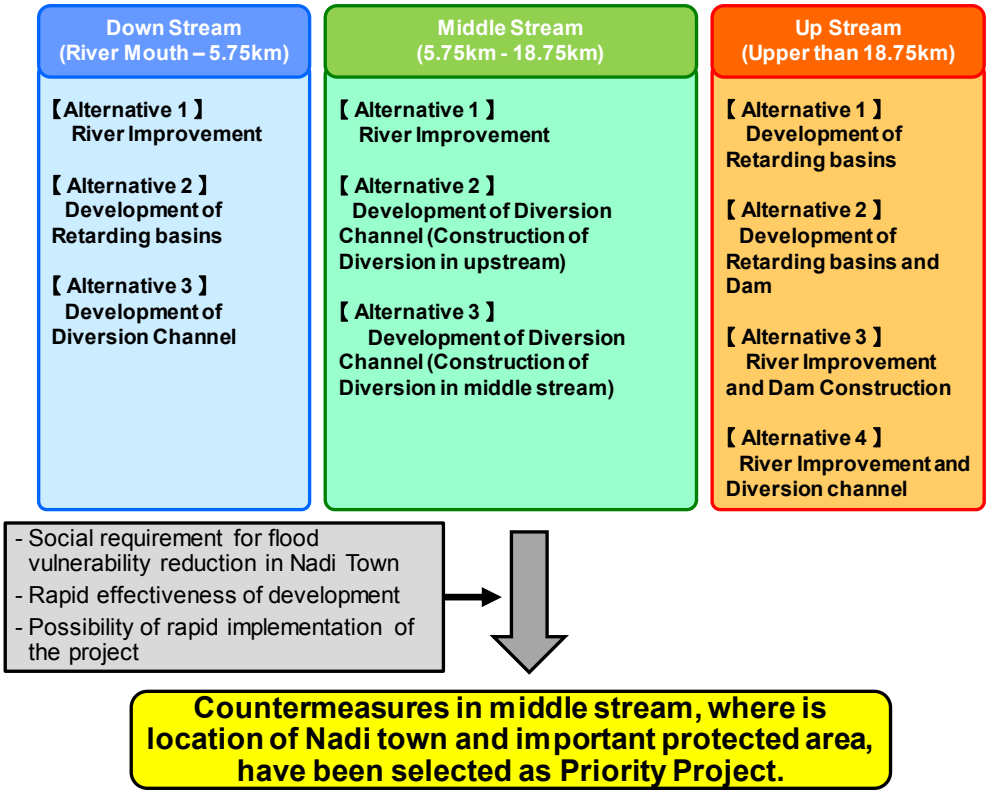


Figure 12-20 Selection Process of the Priority Project

The 4th JCC in November 2015, the Master Plan and Priority Project had been approved. The Feasibility Study for Priority Project will be conducted. The objectives of JCC are show in Table 12-10. The JCC will hold 5 times in total.

Table 12-10 Date and Objectives of JCC

Name	Date	Objectives of the meeting
1st	July 2014 (Finished)	Approval of Inception Report
2nd	June 2015 (Finished)	Approval of basic policy for structural measures in the Master Plan and the Priority Project
3rd	June 2015 (Finished)	
4th	November 2015 (Finished)	Approval of the Master Plan and Priority Project
5th	March 2016 (Planned)	Approval of the results of Feasibility Study of the Priority Projects

12.5.4 Formulation of the Basic Policy of the Master Plan and Priority Project

Selection of flood control measures for assets concentration area in the Nadi River Basin is important for development of the Master Plan and Priority Project. In 2nd JCC, discussion and selection had been conducted based on the two (2) alternatives shown in below.

(1) Plan to mitigate the inundation of important protected area by the securement of rive capacity by river widening

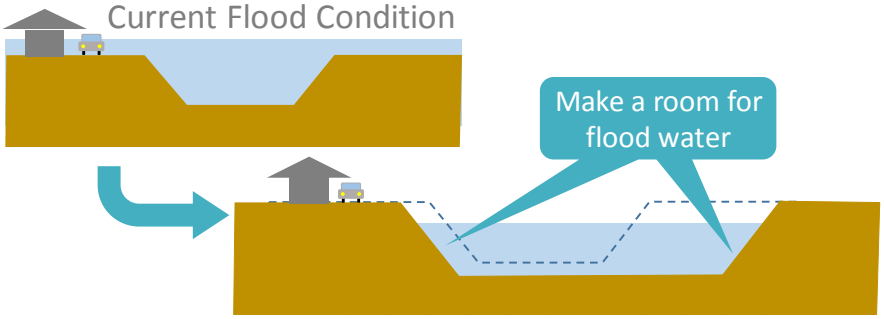


Figure 12-21 Image of River Widening

(2) Plan to mitigate the inundation of important protected area by the securement of rive capacity by development of diversion channel

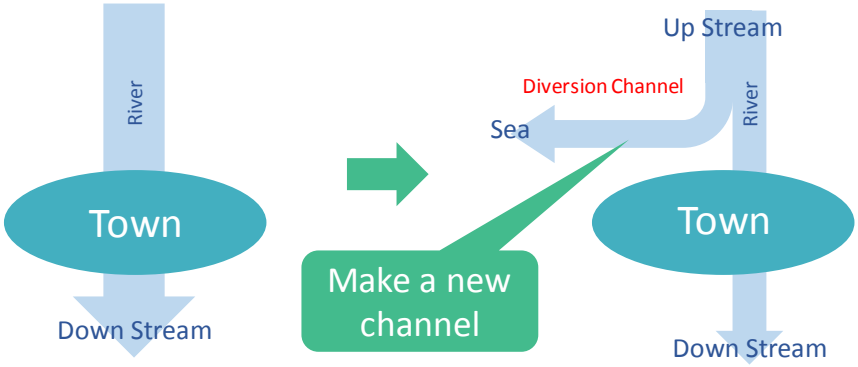


Figure 12-22 Image of Diversion Channel Development

12.5.5 Implementation Outline of Strategic Environmental Assessment (SEA)

(1) SEA for the selection of basic policy in the Project

The SEA for the Project, the proposed two (2) alternatives were evaluated by following indicators. The result of the examination had been shown in the JCC.

1) Existing social infrastructure
2) Area of improvement of inundation (important protected area and entire the basin)
3) Scale of land to be acquired for the project (Area in ha)
4) Scale of resettlement
5) Topographical variation of coastal line
6) Other major environmental and social check points

Results of evaluation of environmental and social impacts are shown in below.

Table 12-11 Outline of Evaluation of Environmental and Social Impacts in the basic policy of the Project

Item			Zero Option	(1) River Widening	(2) Diversion Channle
Existing social infrastructure		Impact	No changed from current situation	Rebuilding of existing bridge: 2 Bridges (Nadi Town Bridge and Old Queens Road Bridge)	Rebuilding of existing bridge: 1 Bridge (Old Queens Road Bridge) New bridge building: 2 Bridges (Bridge for Queens Road and bypass road (under construction))
		Evaluation	―	Nadi Town Bridge is very close to the central area of Nadi town. There is challenges for preparation of land for bridge and working yard, and countermeasures for noise mitigation. After the rebuilding, flow capacity of Nadi River will be improved. In addition, rebuilding of old bridge comes increasing of safeness against flood etc..	Rebuilding of bridge is only one. But, diversion channel require at least two (2) new bridges for existing road.
Improvement of Inundation Area *1	Important Protected Area	Impact	Inundation is not canceled	Area of Inundation: Before330ha After 0ha	Area of Inundation: Before330ha After 0ha
		Evaluation	Inundation is not canceled and the risk is remained	Both plan can cancel the inundation in the important protected area	
	Entire the Basin	Impact	Inundation is not canceled	Area of Inundation: Before5,129ha After 3,158ha (38% decreasing)	Area of Inundation: Before5,129ha After 3,006ha (41% decreasing)
		Evaluation	Inundation is not canceled and the risk is remained	The area of cancelation of inundation is almost same. There is no major difference form the aspects of effect of flood control.	
Area of the land to be acquired *2		Impact	non	Native Land: 79ha Free Hold Land: 39ha Total: 118ha	Native Land: 60ha Free Hold Land: 62ha Total: 122ha
		Evaluation	―	Total area is almost same, but the ratio of Native Land and Free Hold Land is different. The process of negotiation and consensus making is different.	
Scale of resettlement *3		Impact	non	28 households	40 households
		Evaluation	―	The average of family member in Nadi River Basin is	The average of family member in Nadi River Basin is

			4.65person/household. In this sense, total number of affected person is less than 200.	4.65person/household. In this sense, total number of affected person is more than 200.
Topographical variation of coastal line *4	Impact	Variation of -1.0m depth contour in Nadi River mouth: After 50 ys: 200m forward Variation of -1.0m depth contour in diversion channel river mouth: After 50ys: 20m forward	Variation of -1.0m depth contour in Nadi River mouth: After 50ys without flood control measures: 200m forward After 50ys with flood control measures: 200m forward	Variation of -1.0m depth contour in Nadi River mouth: After 50ys without flood control measures: 200m forward After 50ys with flood control measures: 50m forward Variation of -1.0m depth contour in diversion channel river mouth: After 50ys without flood control measures: 20m forward After 50ys with flood control measures: 140m forward
	Evaluation	Even in case no measures, costal line will forward to off shore direction.	No major changes expected in comparison to no measures case.	Sand will be accumulated at the river mouth of diversion channel. On the other hand, in Nadi River mouth, degree of formulation of terrace will decrease.
Air Quality	Impact/ Evolution	No changes	No major impacts are expected by the Project. From the aspects of Air Quality, there are no major differences.	
Noise and Vibration	Impact/ Evolution	No changes	No major impacts are expected by the Project. From the aspects of Noise and Vibration, there are no major differences.	
River Water Quality	Impact	No changes	No changes for river flow amount. River Widening causes changes of water level, velocity and tidal area.	River flow amount in Nadi River will decrease downstream after the diversion channel. In diversion channel, new estuary area will be created.
	Evaluation	—	An ingenuity for the design of new river section to mitigate the impact can be considered.	Changes from current conditions such as degradation of water quality due to decreasing of river flow, and creation of new habitat, etc. are large.
Water Utilization	Impact	No changes	The project areas are far from sources of	The project areas are far from sources of

			supply water. Changes for underground water is small because, the project not so much changes of river alignment.	supply water. Creation of estuary by dredging of diversion channel causes impact of sea water to the land side.
	Evaluation	—	Changes from current condition is small. The impact of the Project is small.	The influence of sea water will be expected due to the dredging of diversion channel.
Natural Habitat	Impact	No changes	During construction and just after the completion, changes of vegetation is expected due to the changes of river sections. Changes of physical river condition is small since there is no change of river flow amount. In addition, changes of mangrove from current situation is limited.	Due to the construction of diversion channel, habitats on grass land will be damaged and new aquatic habitat will be created. The beach will be divided into two parts by diversion channel. This changes causes variation of coastal flow and topographical changes. On the other hand, new habitat will be created. In comparison with current situation, river flow of downstream will be decrease. This changes causes changes of physical condition such as decreasing of frequency of inundation. In mangroves, frequency of disturbance will be decrease.
	Evaluation	—	An ingenuity for the design of new river section to create new habitat can be considered.	An ingenuity for the design of diversion channel river bank to create new habitat can be considered.
Protected Area and Cultural heritage	Impact	No changes	No protected area and cultural heritage in the project site.	No protected area and cultural heritage in the project site.
	Evaluation	—	Impact is not expected.	Impact is not expected.
Ethnic minorities and indigenous / Land Owning	Impact	No changes	Changes of land owing are expected for Native lands.	Changes of land owing are expected for Native lands.
	Evaluation	—	A land along the Nadi river is needed to be	A land along the Nadi river and land for

			acquired.	diversion channel are needed to be acquired.
Industry and Economic	Impact	Inundation risks are not changed	Result of the project, the level of safeness against flood in the region will be increase and give a positive impact to industries and economy. The negative impact is limited for minor relocations.	Result of the project, the level of safeness against flood in the region will be increase and give a positive impact to industries and economy. On the other hand, due to the construction of diversion channel, decreasing of land price, changes of coastal environment are expected.
	Evaluation	Inundation is not cleared and give a negative impact to the economy.	In the river basin, large positive impact is expected. Negative impact will be limited.	In the river basin, there are large scale changes in social and environment. Therefore, the evaluation is difficult.

*1: Calculated by inundation analysis based on the equivalent flood in January 2012 (1/50 level flood)
*2: Calculated by the land owing data from iTaukei Land Trust Board (TLTB). The calculated area includes the land for additional countermeasures in upstream and downstream.
*3: Counted by aerial photo by SPC/SOPAC in 2012.
*4: Calculated by 50 years depth contour variation analysis. Elevation -1.0m is almost same as the lowest sea level of spring tide.

12.6 Projection/Evaluation, Mitigation Measures and Draft Monitoring Plan for Major Environmental and Social Impact

Specification of major environmental and social impacts and examination of methodology of projection/evaluation for flood control measures (river widening) have conducted.

Monitoring plan will be formulated through field environmental and social considerations survey during F/S stage.

12.6.1 Baseline Survey for Environment

In the F/S, following baseline survey for environment will be conducted. The purpose of baseline field survey is grasping the project area specified information which couldn't find from the available existing data.

(1) Survey for Understanding of Physical and Chemical Environment

Survey Items	Nos of location	Methodology	Items for analysis
Water Quality	5 Locations	Field Sampling and Laboratory test	pH、SS、COD、DO、Temperature
River Bed Survey	5 Locations	Field Sampling and Laboratory test	

(2) Survey for Understanding of Biological Environment

Survey Items	Nos of location	Methodology	Items for analysis
Biological Survey	5 Locations	Inventory Survey	Flora, Fauna and Habitat

(3) Survey for Understanding of Social and economic Environment

Survey Items	Nos of location	Methodology	Items for analysis
Population	All of Project Area	Interview survey	Households (including type of house) and Populations (including affected land owner who don't live in the affected area)
Lands and Assets	All of Project Area	Field inspections and Paper survey (Official Documents)	Situation of land owing and using, Buildings, crops and cattle etc.
Living and Lifestyle	All of Project Area	Interview survey	Means of obtaining income, Cultural back ground etc.
Valuable Groups	All of Project Area	Interview survey	Category and population

12.6.2 Specification of Factors of Environmental and Social Impacts

The factors of environmental and social impacts are examined though the assumptions of activities in the flood control project components. For the examination, the project area and components are determined as follows.

1) River widening in the section of from 5.75km to 18.75km in Nadi River, and short cutting in tributaries

2) Surrounding dike to prevent the inundation in Nadi Town

3) Ring Dike to protect the community in the downstream

4) Retarding basins in near 19.5 to 23.0km area to mitigate the flood to middle stream

In addition, construction of facilities and related activities are determined as follows. Based on the determination, scoping have been conducted.

1) Land acquisition and compensation for buildings etc.

2) River widening, River normalization, Construction of dike and bank protection.

3) Disposal of waste soil

4) Mobilizing of construction vehicle, logistics of materials during construction

12.6.3 Results of Scoping (Specification of major Environmental and Social Impact Items)

Results of scoping for the Projects are shown in Table 12-12.

Table 12-12 Results of Scoping (Possible Negative Impacts without Mitigations)

Environmental Components			River Widening			Surrounding Dike			Ring Dike			Retarding Basin		
			Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation
Physical-Chemical Environment (Pollution)	1	Air Pollution	B-	D	[Construction] Air pollution due to dust and emission gas by construction equipment and vehicles as well as earth works will occur. [Operation] No air pollution which is attributed to the project components will occur because the project facilities are not pollution source.	B-	D	[Construction] Air pollution due to dust and emission gas by construction equipment and vehicles as well as earth works will occur. [Operation] No air pollution which is attributed to the project components will occur because the project facilities are not pollution source.	B-	D	[Construction] Air pollution due to dust and emission gas by construction equipment and vehicles as well as earth works will occur. [Operation] No air pollution which is attributed to the project components will occur because the project facilities are not pollution source.	B-	D	[Construction] Air pollution due to dust and emission gas by construction equipment and vehicles as well as earth works will occur. [Operation] No air pollution which is attributed to the project components will occur because the project facilities are not pollution source.
	2	Water Pollution	B-	D	[Construction] Suspension of sediments and release of sediment pollutants will occur as a result of excavation/dredging for river widening. Creation of bare land and waste water from contractor base camp and/or office would also cause water pollution in the river. [Operation] There will be no pollution source of water.	B-	D	[Construction] Creation of bare land and waste water from contractor base camp and/or office would also cause water pollution in the river. [Operation] There will be no pollution source of water.	B-	D	[Construction] Creation of bare land and waste water from contractor base camp and/or office would also cause water pollution in the river. [Operation] There will be no pollution source of water.	B-	D	[Construction] Suspension of sediments and release of sediment pollutants will occur as a result of construction a facilities and excavation/dredging in the river. Creation of bare land and waste water from contractor base camp and/or office would also cause water pollution in the river. [Operation] There will be no pollution source of water.
	3	Wastes (including Dredged Material)	A-	D	[Construction] Dredged material would be generated as a result of river widening. Part of the dredged material would be use as material for dikes. General wastes and demolished structures from contractor office and base camp and would be generated. [Operation] There will be no wastes from flood control facilities.	B-	D	[Construction] General wastes and demolished structures from contractor office and base camp and would be generated. [Operation] There will be no wastes from flood control facilities.	B-	D	[Construction] General wastes and demolished structures from contractor office and base camp and would be generated. [Operation] There will be no wastes from flood control facilities.	B-	D	[Construction] General wastes and demolished structures from contractor office and base camp and would be generated. [Operation] There will be no wastes from flood control facilities.
	4	Soil Contamination	B-	D	[Construction] Dredging of riverbed sediment would cause soil contamination if the riverbed sediment is contaminated. Spilled oil from construction equipment would also cause soil contamination by oil. [Operation] There will be no pollution source of soil contamination.	B-	D	[Construction] Spilled oil from construction equipment would also cause soil contamination by oil. [Operation] There will be no pollution source of soil contamination.	B-	D	[Construction] Spilled oil from construction equipment would also cause soil contamination by oil. [Operation] There will be no pollution source of soil contamination.	B-	D	[Construction] Spilled oil from construction equipment would also cause soil contamination by oil. [Operation] There will be no pollution source of soil contamination.
	5	Noise and Vibration	B-	D	[Construction] Noise and vibration caused by construction activities and transportation will occur. [Operation] There will be no source of noise or vibration from the project facilities.	B-	D	[Construction] Noise and vibration caused by construction activities and transportation will occur. [Operation] There will be no source of noise or vibration from the project facilities.	B-	D	[Construction] Noise and vibration caused by construction activities and transportation will occur. [Operation] There will be no source of noise or vibration from the project facilities.	B-	D	[Construction] Noise and vibration caused by construction activities and transportation will occur. [Operation] There will be no source of noise or vibration from the project facilities.
	6	Land Subsidence	D	D	No ground subsidence is anticipated during both construction and operation stage because pumping of groundwater, deep excavation work, or tunneling work is not included in the project activities.	D	D	No ground subsidence is anticipated during both construction and operation stage because pumping of groundwater, deep excavation work, or tunneling work is not included in the project activities.	D	D	No ground subsidence is anticipated during both construction and operation stage because pumping of groundwater, deep excavation work, or tunneling work is not included in the project activities.	D	D	No ground subsidence is anticipated during both construction and operation stage because pumping of groundwater, deep excavation work, or tunneling work is not included in the project activities.
	7	Offensive Odor	B-	B-	[Construction] Offensive odor might occasionally occur in case the dredging work is conducted at the sludge area of the river. [Operation] There is a possibility to increase of odor from closed water area because of blooming of algae.	D	D	No occurrence of offensive odor is anticipated during both construction and operation stage	D	D	No occurrence of offensive odor is anticipated during both construction and operation stage	D	D	No occurrence of offensive odor is anticipated during both construction and operation stage
	8	Riverbed Sediment Contamination	D	D	No riverbed sediment contamination is anticipated during both construction and operation stage	D	D	No riverbed sediment contamination is anticipated during both construction and operation stage	D	D	No riverbed sediment contamination is anticipated during both construction and operation stage	D	D	No riverbed sediment contamination is anticipated during both construction and operation stage

Environmental Components			River Widening			Surrounding Dike			Ring Dike			Retarding Basin		
			Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation
Natural Environment	9	Protected Area	D	D	There is no protected area in and around the presumed project area.	D	D	There is no protected area in and around the presumed project area.	D	D	There is no protected area in and around the presumed project area.	D	D	There is no protected area in and around the presumed project area.
	10	Hydrological Situation (River flow)	B-	C+/-	[Construction] Changing of river flow would occur as a result of temporally river closure works. [Operation] Result of the Project, river discharge capacity will increase and the flood risk will be mitigated. But, possibility of the impact for ecosystem and local society by the changes of river water level and frequency of inundation are unknown. These impacts will be grasped through the further study.	D	D	No impact to hydrological situation (river flow) is anticipated during both construction and operation stage	D	D	No impact to hydrological situation (river flow) is anticipated during both construction and operation stage	D	D	No impact to hydrological situation (river flow) is anticipated during both construction and operation stage
	11	Groundwater	D	D	No pumping of groundwater, deep excavation work, or tunneling work is included in the Project.	D	D	No pumping of groundwater, deep excavation work, or tunneling work is included in the Project.	D	D	No pumping of groundwater, deep excavation work, or tunneling work is included in the Project.	D	D	No pumping of groundwater, deep excavation work, or tunneling work is included in the Project.
	12	Ecosystem	B-	B+/-	[Construction] Construction works in Nadi River would cause the clearing of vegetation and changing of topographical features. [Operation] Changing of river topography, would cause the change of frequency of inundation, flow velocity etc. These changes would cause change of river ecosystems. However, there is possibility to create new habitats.	B-	B+/-	[Construction] Construction works would cause the clearing of vegetation and changing of topographical features. [Operation] On the dike slope and crown surface, new grass land habitat will be appeared.	B-	B+/-	[Construction] Construction works would cause the clearing of vegetation and changing of topographical features. [Operation] On the dike slope and crown surface, new grass land habitat will be appeared.	B-	B+/-	[Construction] Construction works would cause the clearing of vegetation and changing of topographical features. [Operation] On the dike slope and crown surface, new grass land habitat will be appeared.
	13	Mangrove Forest	C-	C+/-	[Construction] The mangrove forest are located in Nadi River mouth, however, the project area is upstream form 5.75km. There is no direct impact to the mangrove forest. There is possibility to generate turbid water from the construction sites. Degree of impact is unknown. [Operation] In case of flood situation, mangrove forests located in Nadi River mouse would be inundated, however, an impact of sand accumulation etc. are unknown.	D	D	There is no mangrove forest in the project site. No impact to mangrove forest is anticipated.	D	D	There is no mangrove forest in the project site. No impact to mangrove forest is anticipated.	D	D	There is no mangrove forest in the project site. No impact to mangrove forest is anticipated.
	14	Topography and Geographical Features	B-	C+/-	[Construction] River widening would cause the change of topographical features along the Nadi River. [Operation] From the long term point of view, sand accumulation and bank erosion will occur however, possibility of the impact is unknown.	B-	D	[Construction] Construction of dike would cause the change of topographical features. [Operation] No impact to topography and geographical features is anticipated.	B-	D	[Construction] Construction of dike would cause the change of topographical features. [Operation] No impact to topography and geographical features is anticipated.	B-	D	[Construction] Construction of dike would cause the change of topographical features. [Operation] No impact to topography and geographical features is anticipated.
Social Environment	15	Involuntary Resettlement	B-	D	[Pre-Construction / Construction] There will be a total of approx. 28 nos. of involuntary resettlement by exploratory survey by aerial photographs. [Operation] There is no impact to involuntary resettlement.	B-	D	[Pre-Construction / Construction] No involuntary resettlement is anticipated in the surrounding dike construction area. [Operation] There is no impact to involuntary resettlement.	B-	D	[Pre-Construction / Construction] No involuntary resettlement is anticipated in the surrounding dike construction area. [Operation] There is no impact to involuntary resettlement.	B-	D	[Pre-Construction / Construction] No involuntary resettlement is anticipated in the surrounding dike construction area. [Operation] There is no impact to involuntary resettlement.
	16	Poverty Group	C-	C-	[Pre-Construction/Construction] There is possibility of a certain number of low-income families such as informal settlers are included in the affected people by river widening. The detail situation will be confirmed through the census survey. [Operation] There is possibility of inflow of informal settlers to Nadi River side.	C-	C-	[Pre-Construction/Construction] There is possibility of a certain number of low-income families such as informal settlers are included in the affected people by construction of surrounding dike. The detail situation will be confirmed through the census survey. [Operation] There is possibility of inflow of informal settlers to Nadi River side and dike side.	C-	C-	[Pre-Construction/Construction] There is possibility of a certain number of low-income families such as informal settlers are included in the affected people by construction of ring dike. The detail situation will be confirmed through the census survey. [Operation] There is possibility of inflow of informal settlers to outside of ring dike.	C-	C-	[Pre-Construction/Construction] There is possibility of a certain number of low-income families such as informal settlers are included in the affected people by construction of retarding basins. The detail situation will be confirmed through the census survey. [Operation] There is possibility of inflow of informal settlers to inside of retarding basins..

Environmental Components			River Widening			Surrounding Dike			Ring Dike			Retarding Basin		
			Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation
	17	Indigenous Peoples	C+/-	C+/-	Fiji's indigenous people, Fijian is one of the major ethnic group in Fiji. There is no possibility of existence of other indigenous group. However, the detail will be confirmed through the census survey.	C+/-	C+/-	Fiji's indigenous people, Fijian is one of the major ethnic group in Fiji. There is no possibility of existence of other indigenous group. However, the detail will be confirmed through the census survey.	C+/-	C+/-	Fiji's indigenous people, Fijian is one of the major ethnic group in Fiji. There is no possibility of existence of other indigenous group. However, the detail will be confirmed through the census survey.	C+/-	C+/-	Fiji's indigenous people, Fijian is one of the major ethnic group in Fiji. There is no possibility of existence of other indigenous group. However, the detail will be confirmed through the census survey.
	18	Local Economy such as Employment and Livelihood	C+/-	A+	[Pre-Construction/Construction] Agricultural production might be affected by river widening. However, the project would contribute for temporary job creation and accelerate local economy such as tourism industry. [Operation] Development of flood control facilities would decrease a vulnerability of flood and contribute for developing of industries.	C+/-	A+	[Pre-Construction/Construction] Agricultural production might be affected by construction of surrounding dike. However, the project would contribute for temporary job creation and accelerate local economy such as tourism industry. [Operation] Development of flood control facilities would decrease a vulnerability of flood and contribute for developing of industries.	C+/-	A+	[Pre-Construction/Construction] Agricultural production might be affected by construction of ring dike. However, the project would contribute for temporary job creation and accelerate local economy such as tourism industry. [Operation] Development of flood control facilities would decrease a vulnerability of flood and contribute for developing of industries.	C+/-	A+	[Pre-Construction/Construction] Agricultural production might be affected by construction of retarding basins. However, the project would contribute for temporary job creation and accelerate local economy such as tourism industry. [Operation] Development of flood control facilities would decrease a vulnerability of flood and contribute for developing of industries.
	19	Land Use and Utilization of Local Resources	B-	C+/-	[Pre-Construction] Land use and utilization of local resources will be changed as a result of land reformation by the project. [Operation] Current land use will be changed by the river widening. It is needed to get agreement among land owners and users.	B-	C+/-	[Pre-Construction] Land use and utilization of local resources will be changed as a result of land reformation by the project. [Operation] Current land use will be changed by the construction of surrounding dike. It is needed to get agreement among land owners and users.	B-	C+/-	[Pre-Construction] Land use and utilization of local resources will be changed as a result of land reformation by the project. [Operation] The area will be isolated during flood situation by ring dike. It is needed to get agreement among land owners and users.	B-	C+/-	[Pre-Construction] Land use and utilization of local resources will be changed as a result of land reformation by the project. [Operation] Regarding retarding basin, use as farmland for normal situation and as flood water storage for flood situation. Utilization of land will be different from current condition. It is needed to get agreement among land owners and users.
	20	Water Usage	B-	B+	[Construction] Nadi river is used as area for fishing, playing etc. During construction, restriction of access and occurrence of turbid water would be occur. [Operation] There is no possibility for negative impact for water usage since flow amount will not be changed. Moreover, is possible to increase accessibility to the river by the project.	B-	C+/-	[Construction] Nadi river is used as area for fishing, playing etc. During construction, restriction of access and occurrence of turbid water would be occur. [Operation] Existing of dike will be change the accessibility to the river. The impact will be confirmed through the census survey.	B-	C+/-	[Construction] Nadi river is used as area for fishing, playing etc. During construction, restriction of access and occurrence of turbid water would be occur. [Operation] Existing of dike will be change the accessibility to the river. The impact will be confirmed through the census survey.	B-	C+/-	[Construction] Nadi river is used as area for fishing, playing etc. During construction, restriction of access and occurrence of turbid water would be occur. [Operation] Existing of dike will be change the accessibility to the river. The impact will be confirmed through the census survey.
	21	Existing Social Infrastructures and Services (Sensitive Facilities)	B-	B+/-	[Construction] The access to school and commercial facilities would be affected by rebuilding the bridges. Usage and operation of these facilities would be affected by noise etc. by the construction works. [Operation] Increasing of traffic convenience in the region by rebuilding of bridges. However there is possibility of changes of access routes.	B-	B-	[Construction] Usage and operation of these facilities would be affected by noise etc. by the construction works. [Operation] Existing of dike will be change the accessibility to the river.	B-	B-	[Construction] Usage and operation of these facilities would be affected by noise etc. by the construction works. [Operation] Existing of dike will be change the accessibility to the river.	B-	B-	[Construction] Usage and operation of these facilities would be affected by noise etc. by the construction works. [Operation] Existing of dike will be change the accessibility to the river.
	22	Social Institutions such as Social Infrastructure and Local Decision - making Institutions	D	D	This Project aims at flood risk mitigation done by Fiji government. Thus, it is not expected that this Project is affected to the social infrastructure and Local Decision-making Institutions.	D	D	This Project aims at flood risk mitigation done by Fiji government. Thus, it is not expected that this Project is affected to the social infrastructure and Local Decision-making Institutions.	D	D	This Project aims at flood risk mitigation done by Fiji government. Thus, it is not expected that this Project is affected to the social infrastructure and Local Decision-making Institutions.	D	D	This Project aims at flood risk mitigation done by Fiji government. Thus, it is not expected that this Project is affected to the social infrastructure and Local Decision-making Institutions.
	23	Misdistribution of Benefits and Damage	C-	C-	[Pre-Construction] Misdistribution of benefits and damage could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of misdistribution of benefits and damage between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Misdistribution of benefits and damage could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of misdistribution of benefits and damage between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Misdistribution of benefits and damage could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of misdistribution of benefits and damage between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Misdistribution of benefits and damage could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of misdistribution of benefits and damage between priority project area and other areas, inside and outside of dykes etc.

Environmental Components			River Widening			Surrounding Dike			Ring Dike			Retarding Basin		
			Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation	Pre-Construction, Construction	Operation	Explanation for the evaluation
	24	Local Conflicts of Interest	C-	C-	[Pre-Construction] Local conflicts of Interest could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of local conflicts of Interest between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Local conflicts of Interest could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of local conflicts of Interest between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Local conflicts of Interest could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of local conflicts of Interest between priority project area and other areas, inside and outside of dykes etc.	C-	C-	[Pre-Construction] Local conflicts of Interest could be observed among the people who need resettlement and those who do not need along the river when land acquisition is required for the project facilities. [Operation] There is possibility of generation of local conflicts of Interest between priority project area and other areas, inside and outside of dykes etc.
	25	Cultural Heritage	C-	D	[Pre-Construction/Construction] There is possibility of existing of Local level cultural facilities, sensitive facilities such as grave site, shrine etc. in the project area. [Operation] There is no possibility of influence for cultural heritage.	C-	D	[Pre-Construction/Construction] There is possibility of existing of Local level cultural facilities, sensitive facilities such as grave site, shrine etc. in the project area. [Operation] There is no possibility of influence for cultural heritage.	C-	D	[Pre-Construction/Construction] There is possibility of existing of Local level cultural facilities, sensitive facilities such as grave site, shrine etc. in the project area. [Operation] There is no possibility of influence for cultural heritage.	C-	D	[Pre-Construction/Construction] There is possibility of existing of Local level cultural facilities, sensitive facilities such as grave site, shrine etc. in the project area. [Operation] There is no possibility of influence for cultural heritage.
	26	Landscape	C-	B+/-	[Construction] Change of landscape is evaluated by the situation of after construction phase. [Operation] River widening would cause obstruction to landscape views especially at the vicinity where the dike is relatively high. However, there is positive impact by re-construction of bridges.	C-	B-	[Construction] Change of landscape is evaluated by the situation of after construction phase. [Operation] River widening would cause obstruction to landscape views especially at the vicinity where the dike is relatively high.	C-	B-	[Construction] Change of landscape is evaluated by the situation of after construction phase. [Operation] River widening would cause obstruction to landscape views especially at the vicinity where the dike is relatively high.	C-	B-	[Construction] Change of landscape is evaluated by the situation of after construction phase. [Operation] River widening would cause obstruction to landscape views especially at the vicinity where the dike is relatively high.
	27	Gender / Socially Vulnerable Groups	C-	C+/-	Affected persons would include a certain number of socially vulnerable groups, such as the elderly, the handicapped, the poor, single-parent households, child-headed households etc.	C-	C+/-	Affected persons would include a certain number of socially vulnerable groups, such as the elderly, the handicapped, the poor, single-parent households, child-headed households etc.	C-	C+/-	Affected persons would include a certain number of socially vulnerable groups, such as the elderly, the handicapped, the poor, single-parent households, child-headed households etc.	C-	C+/-	Affected persons would include a certain number of socially vulnerable groups, such as the elderly, the handicapped, the poor, single-parent households, child-headed households etc.
	28	Rights of Children	C-	D	No major impact to the children rights is anticipated by the project. However, poverty group, opportunity of education. Children labor, schooling etc. will be confirmed through the cercus survey.	C-	D	No major impact to the children rights is anticipated by the project. However, poverty group, opportunity of education. Children labor, schooling etc. will be confirmed through the cercus survey.	C-	D	No major impact to the children rights is anticipated by the project. However, poverty group, opportunity of education. Children labor, schooling etc. will be confirmed through the cercus survey.	C-	D	No major impact to the children rights is anticipated by the project. However, poverty group, opportunity of education. Children labor, schooling etc. will be confirmed through the cercus survey.
	29	Infectious Diseases such as HIV/AIDS	C-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	C-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	C-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	C-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.
	30	Labor Environment (Including Occupational Safety)	B-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	B-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	B-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.	B-	D	[Pre-Construction/ Construction] Labor environment of Construction works is considered, since the construction works of the Project is in a certain scale.
	31	Accidents	B-	B-	[Construction] Construction related accidents by heavy equipment and transportation vehicles might occur. [Operation] There is a possibility to occur of accidents in the maintenance road along the river.	B-	B-	[Construction] Construction related accidents by heavy equipment and transportation vehicles might occur. [Operation] There is a possibility to occur of accidents in the maintenance road on the dike.	B-	B-	[Construction] Construction related accidents by heavy equipment and transportation vehicles might occur. [Operation] There is a possibility to occur of accidents in the maintenance road on the dike.	B-	B-	[Construction] Construction related accidents by heavy equipment and transportation vehicles might occur. [Operation] There is a possibility to occur of accidents in the maintenance road on the dike.
	32	Global Warming	D	D	The scale of changes are large. However, the project will be conducted in the river area. The impact will not exceeding the area. In addition, no impact for global warming is anticipated.	D	D	The scale of changes are large. However, the project will be conducted in the river area. The impact will not exceeding the area. In addition, no impact for global warming is anticipated.	D	D	The scale of changes are large. However, the project will be conducted in the river area. The impact will not exceeding the area. In addition, no impact for global warming is anticipated.	D	D	The scale of changes are large. However, the project will be conducted in the river area. The impact will not exceeding the area. In addition, no impact for global warming is anticipated.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Possibility of impact and its magnitude are unknown.
(A further examination is needed, and the impact could be clarified as the study progresses.)
D: No impact is expected.

12.7 Abbreviated Resettlement Action Plan

The Resettlement Action Plan (RAP) for this project will be prepared based on JICA Environmental and Social Considerations, April 2010 and World Bank Safeguard Policy.

Regarding Rap, details are shown in **15.7** .

12.8 Environmental and Social Considerations Components for F/S Stage (Draft TOR)

Based on the Scoping, TOR for Environmental and Social Considerations examination for the Priority Project is shown in below.

Table 12-13 TOR for Environmental and Social Considerations Study

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
1	Alternatives	(a) Proposed combination of flood control measures. (b) Arrangement of river arraignment. (c) Construction method, method/manner to demolish the existing structures, management of dredged soil. (d) Mobilization of laborer, construction materials. heavy equipment, etc. and transportation rules.	(a) Examination of management measures aiming to maximize project benefit and minimize land acquisition and resettlement. (b) Examination of construction / waste management method to minimize the environmental impacts.	—
2	Air quality	(a) Clarification of environmental standards such as WHO standards etc. (b) Survey of land use in the project area. (c) Survey on location of sensitive facilities such as school, hospital, residential area, etc. (d) Survey on emission of pollutant from heavy equipment. (e) Environmental impacts during construction.	(a) Data collection on legal basis. (b) Collection on secondary data, interview survey. (c) Construction method, period, location, area, type of heavy equipment, location of moving, number and route of construction vehicle, etc.	Impact Prediction: Magnitude of dust and emission gas. Formulation of EMP: Mitigation measures to minimize dust and emission gas during construction phase. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed. (No results of air pollution survey are obtained. It is difficult to prepare air monitoring equipment in Fiji local market. Therefore, examination of quantitative method to minimize the impacts by construction work will be conducted.)
3	Water Pollution	(a) Clarification of environmental standards such as WHO standards etc. (b) Survey on baseline condition of river water quality. (c) Survey on potential pollution sources.	(a) Data collection on legal basis. (b) Collection on secondary data and baseline survey by sub-contracting. (c) Parameters to be analyzed (Temperature, pH, Salinity, DO, Turbidity, Conductivity, TSS, TDS, TP, TN, BOD, COD) (The parameters area selected based on the Japan's river water quality standard and analysis capacity of laboratory in Fiji)	Impact Prediction: Possibility of water pollution during construction. Formulation of EMP: Examination of mitigation measures to minimize water pollution during construction. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
4	Wastes (including Dredged	(a) Clarification of current system of waste management in Fiji. (b) Volume of waste to be generated due to the project, including general waste and dredged	(a) Data collection on legal basis. (b) Interview survey to relevant agencies. (c) Estimation of the volume of wastes to be generated based on project components.	Impact Prediction: Estimation of volume of wasted during construction and prediction of environmental variation of disposal sites.

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
	Material)	materials. (c) Possibility of waste soil transfer to other construction site and/or farm land etc.	(d) Examination of waste soil management	Formulation of EMP: Examination of adequate waste transportation and disposal. Formulation of EMoP: Examination of monitoring items (kind of wastes to be generated, disposal and reuse method, etc.) and frequency.
5	Soil Contamination (River bed materials)	(a) Clarification of environmental standards such as WHO standards etc. (b) Survey on baseline condition of river bed materials quality.	(a) Data collection on legal basis. (b) Collection on secondary data and baseline survey by sub-contracting. (c) Parameters to be analyzed (pH, Organic matter, Dry Matter, Ash, Manganese, Phosphorous, Nitrate, Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)) (The parameters area selected based on the situation of Nadi River and analysis capacity of laboratory in Fiji)	Impact Prediction: Possibility of soil and river bed materials pollution during construction. Formulation of EMP: Examination of mitigation measures to minimize soil and river bed materials pollution during construction. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
6	Noise and Vibration	(a) Clarification of environmental standards such as WHO standards etc. (b) Survey on baseline condition of land use of project area. (c) Survey on location of sensitive facilities (schools and hospitals) (d) Noise and vibration level of construction vehicle and equipment. (e) Quantitative influence by construction vehicle and equipment	(a) Data collection on legal basis. (b) Collection on secondary data, interview survey. (c) Construction method, period, location, area, type of heavy equipment, location of moving, number and route of construction vehicle, etc.	Impact Prediction: Noise and vibration levels due to construction works. Formulation of EMP: Examination of mitigation measures to minimize noise and vibration during construction. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed. (No results of noise and vibration survey are obtained. It is difficult to prepare air monitoring equipment in Fiji local market. Therefore, examination of quantitative method to minimize the impacts by construction work will be conducted.)
7	Land Subsidence	No impacts is anticipated. Therefore, This component is delisted from the target for EIA.	—	—
8	Offensive Odor	(a) Existence of sludge, wastes in the project area for river dredging.	(a) Construction method, period, location, area, etc.	Impact Prediction: Possibility of generation of offensive odor during

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
				construction work in river bed. Formulation of EMP: Examination of mitigation measures for predicted offensive odor. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
9	Riverbed Sediment Contamination	This component is integrated with soil contamination.	—	—
10	Protected Area	No impacts is anticipated. Therefore, This component is delisted from the target for EIA.	—	—
11	Hydrological Situation	(a) Changes of hydrological situation in the major points. (b) Changes of water level, velocity, etc. by construction method. (c) Utilization of river and surrounding area.	(a) Variation of water level in major sections by non-uniform flow calculation (b) Grasping of river utilization by field survey (sub-contracting) (c) Grasping the habitats in the river by field survey (sub-contract) (the results of survey are shared with the below component, ecosystem)	Impact Prediction: Variation of river utilization and natural habitat caused by variation of hydrological condition Formulation of EMP: Examination of mitigation measures to minimize impact to river utilization and natural habitats by variation of hydrological condition. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
12	Ecosystems	(a) Clarification of vegetation and physical river condition along the project area. (b) Identification of flora, fauna (c) Clarification of threatened species listed in Red List of the IUCN. (d) Identification of major habitat and ecosystem network (e) Identification of potential location of nature restoration works.	(a) Collection on secondary data, aerial photo and filed inspections. (b) Baseline survey (inventory survey) by sub-contracting. (Once in dry season) (c) Examination of creation of natural habitat at the F/S stage.	Impact Prediction: Negative impact on ecosystem due to loss of surface vegetation, dredging and variation of topography. Formulation of EMP: Examination of mitigation measures to minimize impact to ecosystem by the project, and design ideas to maximize environmental value. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
13	Mangrove Forest	Examination regarding mangroves is included in the component of ecosystem.	—	—
14	Topography and	(a) Long term variation of topography (river bed)	(a) Prediction of amount of river bed variation by river bed variation analysis.	Impact Prediction: Impact of river bed variation on river flow and

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
	Geographical Features			river environment. Formulation of EMP: Examination of adequate river bed variation Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
15	Involuntary Resettlement	(a) Confirmation of legal basis of land acquisition and resettlement (b) Confirmation of details of necessity land and required resettlement. (c) Preparation of Resettlement Action Plan	(a) Review of acts, guidelines and existing plans related land acquisition and settlement. (b) Identification of affected houses and buildings on aerial photo. (c) Conduct of resettlement related survey (social and economic, needs for restructuring of living, replacement cost etc.) (d) Preparation of necessity assistance and compensation for consultation with affected persons.	Impact Prediction: Effects of living level of settled persons Formulation of EMP: Examination of mitigation measures to minimize negative effects of living level of resettled persons. Formulation of EMoP: Actual implementation schedule of resettlement plan, parameters and frequency of monitoring (status of job, income and physical and mental health of resettled persons)
16	Poverty Group	(a) Confirmation of poverty line in Fiji. (b) Current situations (income, livelihood, sanitary, etc.) of persons to be resettled.	(a) Identification of average income by relevant statistical data. (b) Conduct of social and economic survey	Impact Prediction: Effects of living level of poverty group among persons to be resettled. Formulation of EMP: Examination of mitigation measures to minimize negative effects of living level of resettled persons. Formulation of EMoP: Actual implementation schedule of resettlement plan, parameters and frequency of monitoring (status of job, income and physical and mental health of resettled persons)
17	Indigenous Peoples	(a) Land owning type by Fijians (b) Area of affected by the projct	(a) Collection on secondary data, interview survey. (b) Identification of affected area by overlaying land owning data and project area.	Impact Prediction: Changes of income of land owner/ owning group Formulation of EMP: Examination of mitigation measures to minimize negative impacts for income of land owner/ owning group. Formulation of EMoP: Monitoring method of payment of compensations to land owner/ owning group.
18	Local Economy	(a) Confirmation of local business among persons	(a) Conduct of social and economic survey	Impact Prediction:

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
	such as Employment and Livelihood	to be resettled (b) Current status of local economy	(b) Identification of condition of local economy form statistic data	Changes of income of local businesses / sugar cane farms by persons to be resettled. Formulation of EMP: Examination of mitigation measures to minimize negative impacts for local economy. Formulation of EMoP: Monitoring method of impact on local business and their employee.
19	Land Use and Utilization of Local Resources	(a) Identification of current land use (agriculture, sand mining etc.) of project area.	(a) Collection on secondary data, interview survey (part of social and economic survey by sub-contract).	Impact Prediction: Effect on changes of land use by the project. Formulation of EMP: Examination of mitigation measures to minimize negative impacts on land use or utilization of natural resources. Formulation of EMoP: Monitoring method of impact on land use or utilization of natural resources.
20	Water Usage	(a) Identification of use of water such as fishing, bathing and other daily activities of living.	(a) Collection on secondary data, interview survey (part of social and economic survey by sub-contract).	Impact Prediction: Effect on changes of water use by the project. Formulation of EMP: Examination of mitigation measures to minimize negative impacts on water use. Formulation of EMoP: Monitoring method of impact on water use.
21	Existing Social Infrastructures and Services (Sensitive Facilities)	(a) Confirmation on social infrastructures located near the project area such as road, bridges, public facilities, commercial facilities, schools, hospitals, culture facilities, temples etc.	(a) Collection on secondary data, interview survey (part of social and economic survey by sub-contract).	Impact Prediction: Impact on access to social infrastructures and environmental changes of sensitive facilities. Formulation of EMP: Examination of mitigation measures to minimize negative impacts on access to social infrastructures and environmental changes of sensitive facilities. Formulation of EMoP: Monitoring method of impact on access to social infrastructures and environmental changes of sensitive facilities.
22	Social Institutions such as Social	No impacts is anticipated. Therefore, This component is delisted from the target for EIA.	—	—

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
	Infrastructure and Local Decision - making Institutions			
23	Misdistribution of Benefits and Damage / Local Conflicts of Interest	(a) Survey and identification of such case as there are people who need resettlement and those who do not need in a same area (community) due to the project. (b) Survey and identification of such case as there is conflict between the communities that need resettlement and that does not need.	(a) Conduct of social and economic survey	Impact Prediction: Impact on possibility and magnitude of misdistribution of benefits and damage. Formulation of EMP: Examination of mitigation measures to minimize negative impacts. Formulation of EMoP: Monitoring method of impact on condition of targeted communities.
24	Cultural Heritage	(a) Identification of location of cultural heritages	(a) Collection on secondary data, interview survey	Impact Prediction: Negative impact for cultural heritages in the project sites. Formulation of EMP: Examination of mitigation measures to minimize negative impacts to a cultural heritages. Formulation of EMoP: Monitoring method for mitigation measures in case of existing of .cultural heritage.
25	Landscape	(a) General landscape of the project area. The landscape along the river. (b) Confirmation of public opinion for new bridges.	(a) Conducting photo shooting and field survey. (b) Conducting public consultation and grasping public opinion for bridge design.	Impact Prediction: Effects of flood mitigation structures on river front and/or water front, and their magnitude. Formulation of EMP: Examination of mitigation measures to minimize negative impacts to landscape. Formulation of EMoP: Examination of monitoring location and frequency and parameters to be analyzed.
26	Gender / Socially Vulnerable Groups	(a) Confirmation of society vulnerable groups such as elderly, handicapped, poor, single-parent households, child-headed households, etc. among the persons to be resettled. The current situation of them also will be confirmed.	(a) Conduct of social and economic survey	Impact Prediction: Effects of living level of settled society vulnerable groups and their related matters made through settlement. Formulation of EMP: Examination of mitigation measures to minimize

No.	Components	Elements to be clarified	Survey Method	Impact prediction, Formulation of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)
				negative impacts of living level of resettled society vulnerable groups. Formulation of EMoP: Examination of monitoring items. (status of job, income level, physical and mental health)
27	Rights of Children	(a) Confirmation of children in poor groups among persons to be resettled. The current situation of them also will be confirmed.	(a) Conduct of social and economic survey	Impact Prediction: Effects of living level of settled children in poor groups and their related matters made through settlement. Formulation of EMP: Examination of mitigation measures to minimize negative impacts of living level of settled children in poor groups. Formulation of EMoP: Examination of monitoring items. (parent's status of job, income level, physical and mental health)
28	Infectious Diseases such as HIV/AIDS	(a) Confirmation of current status of HIV/AIDS and other infections situations in and around Nadi area.	(a) Conduct of interview to local authorities	Impact Prediction: Impact of infections through construction workers and local residents. Formulation of EMP: Examination of program for infectious disease if any. Formulation of EMoP: Examination of monitoring items, parameters and frequency. (status of infectious disease among construction workers)
29	Labor Environment (Including Occupational Safety) / Accident	(a) Clarification of standards such as WHO standards etc.	(a) Data collection on legal basis. (b) Collection on secondary data	Impact Prediction: Work environment during construction phase and possibility of happening of accident in the project area. Formulation of EMP: Examination of safeness for construction work and mitigation measures to minimize the accidents. Formulation of EMoP: Examination of monitoring items, parameters and frequency for safety education of construction workers, and accidents.

CHAPTER 13 Implementation and O/M Structures

In this chapter, the results of data/information collection and analysis are described on implantation and O/M structures which are one of the key factors for project implementation.

Through the intensive discussion with and among related organizations of GOF, optimal implementation and O/M structures will be proposed with referring the contents of M/P and priority projects.

13.1 Basic Information on Project Implementation

13.1.1 Public Sector Investment Program

For the public sector investment, the Government of Fiji puts the Public Sector Investment Program (PSIP) in place to facilitate and coordinate the budget approval process of government public investment in Fiji. For the budgetary timeline, the process takes almost 8 months for preparation to allocate the budget for the following year. The Following table summarizes a typical timeline of the PSIP projects and budget preparation.

Table 13-1 Process Timeline of Public Sector Investment Program

Phase	Month	Week	Activities	Remarks
Phase 1 Rolling over and prioritization of the PSIP	March	1	Circular issued on PSIP	
		2	First Draft PSIP produced by 'rolling over' PSIP of the previous year	
		3	Update and Consultations end with Ministries on First Draft PSIP	
		4	Discussions on prioritization of projects by Ministries through Divisions	Continue till June
Phase 2 Updating and submission of new proposals for PSIP	April	1	Capital budget baseline	
		4	Ministry projects received by Divisional Officers	
	May	4	Priority project endorsed by Divisional Development Committee (DCC)	
	June	1	Release of 2011 budget strategy	Continue till July
		2	Closing for submission of projects for PSIP	
		3	Appraisal of PSIP projects and consultation	
Phase 3 Consultation and appraisals	July	2	PSIP design list presented to Cabinet	
	Aug.	2	Combined consultation with ministries	
		4	Combined design list ready, internal consultations within the government: MOF, PSC and concerned ministries.	
Phase 4 Finalization and presentation	Sept.	1	Final design list presented to CSB	
	Oct.	1	Final Estimates of revenue & expenditure signed off by Cabinet	

Source: Public Sector Investment Program Process Timeline, 2011, MOA
Remark: PSC: Public Service Commission

It is noted that, because of the emergency restoration budget reservation for the extensive damage caused by the T/C Winston that occurred in late February 2016, change of the budget year is being carried out in 2016. The budget year is changed from August 1st up to July 31th of the following year and the time line of the budget planning is expected to be from November or December to May or June (about 7 months). (2016.7, Hearing results to Ministry of Finance)

13.1.2 Regulatory Framework for Project Implementation by ODA

(1) Current Status of ODA in Fiji

The Overseas Development Assistance Policy framework has been endorsed by the Budget and Aid Coordinating Committee (BACC) in 2013. The total ODA accounted for around 4.3% of total budget in 2010, 5.2% in 2011, 6% in 2012 and 6% in 2014 recently. The main areas of Aid-in-Kind (AIK) assistance were in Training, Infrastructure, Technical Assistance, Health, and Technical Cooperation. The main sectors of assistance are in Education, Health, Infrastructure, Law and Justice, Disaster Rehabilitation and Labor.

ODA is currently administered by the three (3) different Offices which are listed below.

Table 13-2 Responsible Administration

Ministry	Administration	Responsibilities
Ministry Of Finance	The Overseas Development Assistance Unit	Cash grants and aid in kind
Ministry of Foreign Affairs and International Cooperation	The International Cooperation Division	Technical and economic cooperation diplomacy gateway
Office of the Prime Minister	The Development Cooperation Division	Direct development assistance for the development agenda

Source: Overseas Development Assistance Policy, ODA Unit Ministry of Finance, 2013

The ODA Unit of the Ministry of Finance administers both cash grants and aid in kind whilst the International Cooperation Division of the Ministry of Foreign Affairs looks after technical and economic cooperation matters and is the diplomatic window for ODA in the Government Machinery. The Office of the Prime Minister specializes in administering the development assistance that donors transmit to the Prime Minister for his development agenda.

(2) Administrative Procedure of ODA Projects and Approvals

The application of project assisted by donor is described in detail in the Overseas Development Assistance Policy issued by Ministry of Finance. According to it, all project submissions for donor assistance are forwarded to the Overseas Development Assistance Unit through respective line Ministry, and the Unit has the responsibility to liaise with donors and line Ministries (applicants), and collects information, and ensures that all requirements are met to enable the approval for funding by the donors

The required steps to promote the project are as shown below.

Table 13-3 Procedure for Project Promotion

Step	Case of Grant Aid	Case of Loan Finance
Step 1	Receive all aid related project submissions (including those for operating and capital expenditure)	Submission of F/S report with required documents from the implementation agency to SPO: Strategic Planning Office of Ministry of Finance.
Step 2	Confirm the most appropriate donors to provide assistance in the specific field.	SPO shall examine to the submitted F/S report. This process takes usually 1 to 2 months.
Step 3	Liaise with donors to establish all project related information, aspects of project design required for a favorable consideration and exchange necessary information with concerned agencies.	SPO shall prepare the Preliminary Concept Paper within 1 to 2 months, and submit to the Ministry.
Step 4	Prepare project papers focusing on key information for the consideration of the BACC (Budget & Aid Coordinating Committee).	Ministry of Finance shall evaluate the national financial budget for the possibility of loan finance.
Step 5	Liaise with development partners after approval has been given to finalize and action implementation arrangements.	After the decision of project implementation, Ministry of Finance as Executing agency shall arrange the loan process.

Source: JICA Study Team based on hearing results to Ministry of Finance

(3) Administrative Framework for Grant Aid

The application of project assisted by donor is described in detail in the Overseas Development Assistance Policy issued by Ministry of Finance. According to it, all project submissions for donor assistance are forwarded to the Overseas Development Assistance Unit through respective line Ministry. It became clear by the hearing result in the Ministry of Finance that the section in charge of the Ministry of Finance changes with either grant or loan finance among the proposed projects. The rough procedure is shown in below.

- Step 1: Receive all aid related project submissions (including those for operating and capital expenditure);

- Step 2: Confirm the most appropriate donors to provide assistance in the specific areas;
- Step 3: Liaise with donors to establish all project related information, and aspects of project design required for a favorable consideration;
- Step 4: Liaise with applicant line Ministries and agencies to acquire all necessary information and changes to aspects of project design;
- Step 5: Prepare project papers focusing on key information for the consideration of the BACC; and
- Step 6: Liaise with development partners after approval has been given to finalize and action implementation arrangements.

The Ministry of Strategic Planning, National Development & Statistics then assesses against alignment and consistency with national, sectoral and Ministry priorities. Particular attention is paid here to the projects contribution to national development. In the case of capital investment projects, attention is paid on their contribution to encouraging higher growth rates. In terms of operating expenditure submissions, economic projects are considered in terms of their direct contribution to growth, social projects in terms of their direct contribution to welfare.

Based on these findings, the Ministry of Strategic Planning, National Development & Statistics can take following actions:

- Consider and allocate under either PSIP or direct to national budget (or donor funding consideration) with recommendations for approval to the BACC;
- Recommend further follow-up action or consideration by BACC;
- Recommend BACC return to applicant for further work and revision to design, activities, or other information required; or
- Recommend BACC reject the submission due to insufficiency of information and/or non-alignment or consistency with priorities.

(4) Administrative Framework for Loan Projects

For an implementation of loan projects, the lending agency and the Fiji Ministry of Finance draw a draft of lending conditions of the loan, and thereafter the proposal is submitted to the Parliament budget session to obtain a Parliament approval for its deliberations. Normally the proposal submission deadline is in November for the approval to be made in December. A formal agreement with the lending agency is signed after obtaining the Parliament approval, normally in January of the following year.

For the investment of public works Fiji government has two types of loans: international loans and domestic loans. With regard to the procedures of international loans, the Ministry of Finance of Debt and Cashflow Management Unit: DCFMU is in charge of its administration. DCFMU plays also the focal coordination function in the case of the project uses a mixed financial modalities both loans In case of loan project, the BACC is not involved while it will discuss matters related to grant projects. In the case of the only grant aid, the ODA unit is in charge of the administration and the BACC will be implicated.

1) Debt and Cashflow Management Unit: DCFMU

DCFMU is in charge of management of the debt level and risk control of the Government. The main mandate of the Unit is to manage the transactions in the following three areas in terms of portfolio, cash control, risk control, compliance and new and replenishment of loan.

- Loan Portfolio
- Domestic Debt Portfolio
- Contingent Liabilities Portfolio

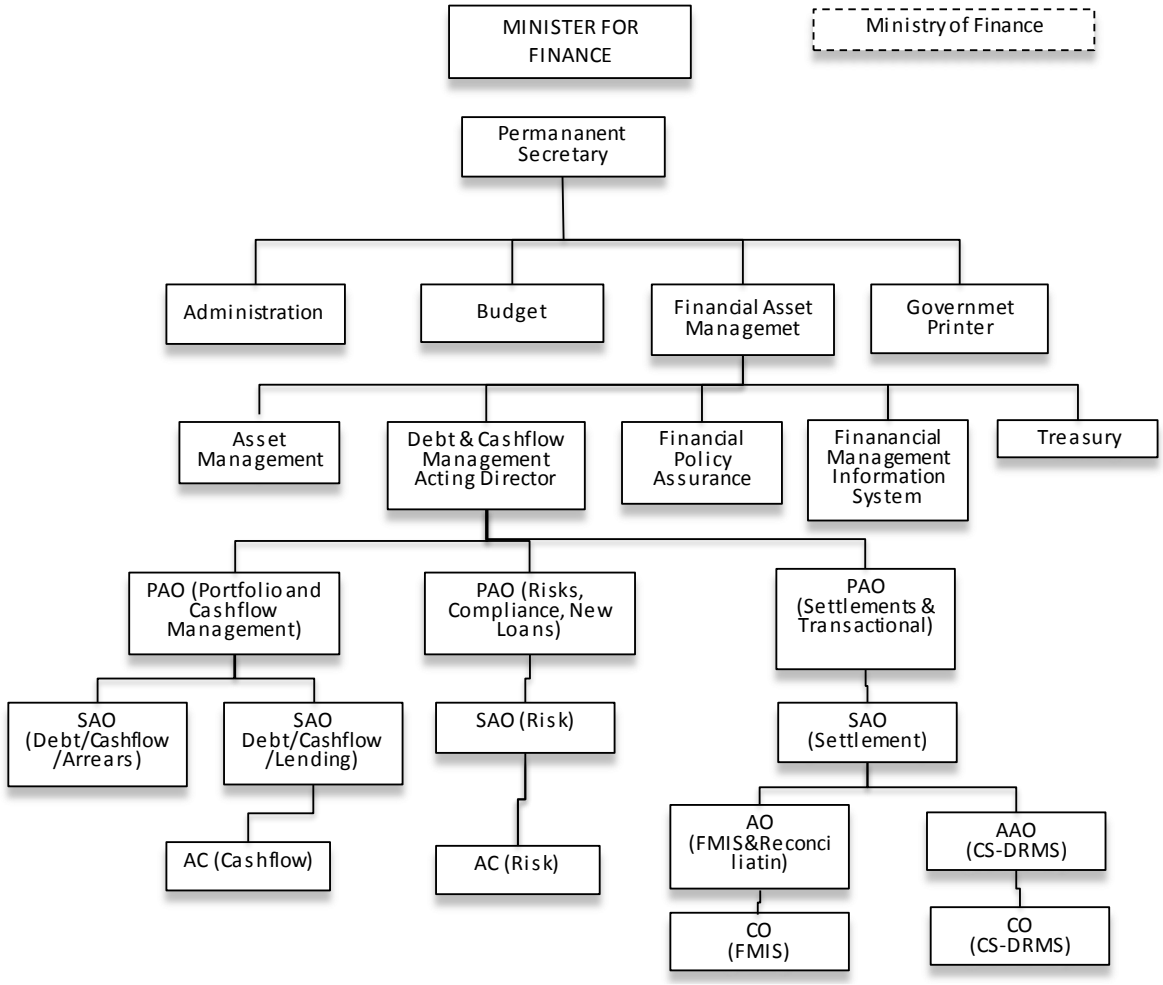
a) Financial Management

The Government of Fiji has been using a computer integrated software as a reporting system, Financial Management Information System：FMIS throughout the all Ministries. The system records and administers the transactions registered in the projects. The system is used to support budget preparation, execution and

to assist financial statement preparation. Accounting standards are based on the Financial Management Act 2004 and Financial Instructions. DCFMU supervises the transactions made within FMIS.

b) The Organisational Structure of DCFMU

The organizational structure of DCFMU is illustrated below.



Source: Ministry of Finance, Business Plan 2015

PAO：Principle Administration Officer, SAO: Senior Administration Officer, AC: Administration Officer, CO: Clerk Officer, AAO: Acting Administration Officer

Figure 13-1 The Organizational Structure of DCFMU

2) Laws and Guidelines of Finances

The following legal documents are the guiding principles for financial administration of the State.

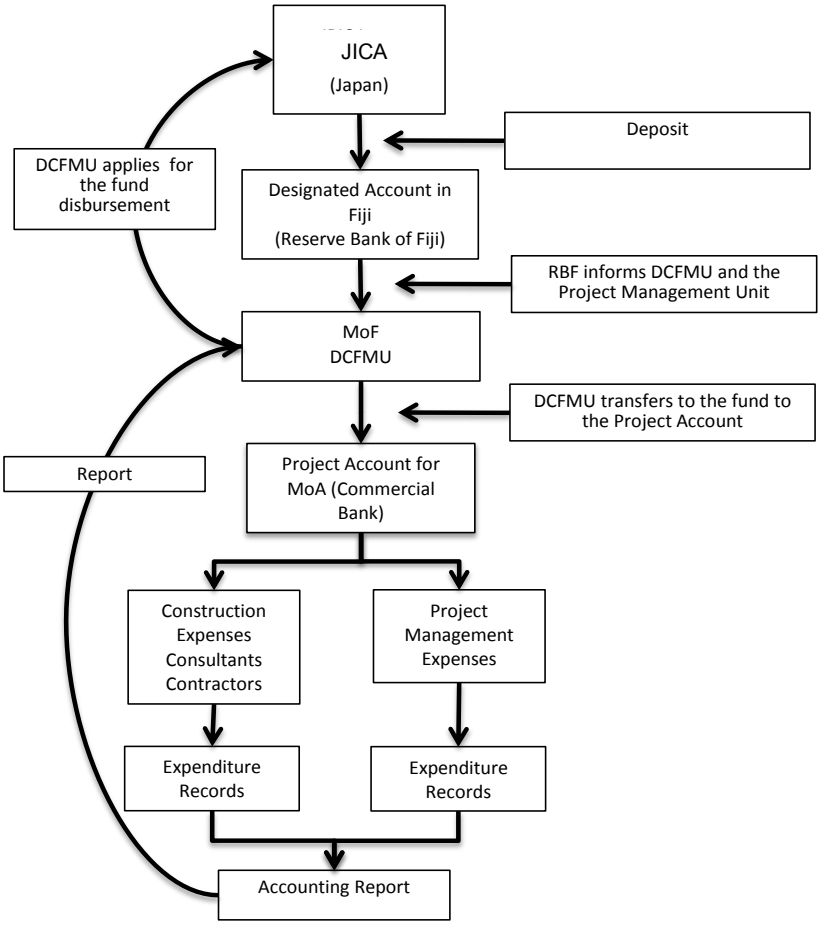
Table 13-4 Laws and Guidelines on National Finance

Laws and Guidelines	Purpose of the documents
2013 Fiji Constitution, Chapter 7 Revenue and Expenditure	Constitutional clauses for financial matters for the state
Financial Management Act 2004 (FM Act)	Law on the financial administration
Finance Instructions 2010	Instructions on national finance

Sources: JICA StudyTeam

3) Flow of Project Finance

Based on the loan agreement with the lending agency, the fund is transferred from the account that is opened in the of the bank of the lending agency for the designated project, to the account opened for the project in Reserve Bank of Fiji (RBF) for the Ministry of Finance. At the Ministry who implements the project, a project account is opened in a commercial bank. The implementing Ministry or agency applies for a payout of project funds to DCFMU at the Ministry of Finance and receives the remittance to the commercial bank account from RBF. The flow of funds is illustrated below for implementation of a project, suppose a loan is arranged with the Japan Bank for International Cooperation (JBIC).



Source: JICA Study Team

Figure 13-2 Flow of the Project Finance (in case of JICA Loan)

13.1.3 Process of Procurement

In the case of the domestic procurement, Fiji Procurement Office is responsible for its process. On the other hand, for the sectors that have statutory corporations such as the road sector, the statutory corporation has developed its own procurement guidelines. Therefore, the statutory corporation conducts directly the procurement. For road projects that are carried out by the ADB loan, the National Road Authority has made a direct selection of tenderers. The provision of loans can come with conditionality set by the lending agency as well. In such a case, based on the agreement with the lending countries and PMU and Debt Unit, the loans are provided with particular conditions.

For the river management project, no statutory corporation or river management authority exists in Fiji, thus either the Fiji Procurement Office conducts procedures following the Fijian laws and regulations or it would be subject to the provisions of the lending agency.

(1) Fiji Procurement Office

The Procurement Office is established in the Ministry of Finance to facilitate and administrate the handling of procurement processes required to conduct public investments and governmental services. The Procurement Office has four units: tender unit, policy unit, logistics unit and compliance unit. The main mandates and duties of each unit are listed below.

1) Tender Unit

- Facilitates the tender process for the procurement of all goods, services and works over $50,000;
- Provides Secretariat Support for the Government Tender Board;
- Provide advice on contract negotiations and contract management issues;
- Manage the disposal process for unserviceable and surplus assets.

2) Policy Unit

- Facilitates the tender process for the procurement of all goods, services and works over $50,000;
- Provides Secretariat Support for the Government Tender Board;
- Provide advice on contract negotiations and contract management issues;

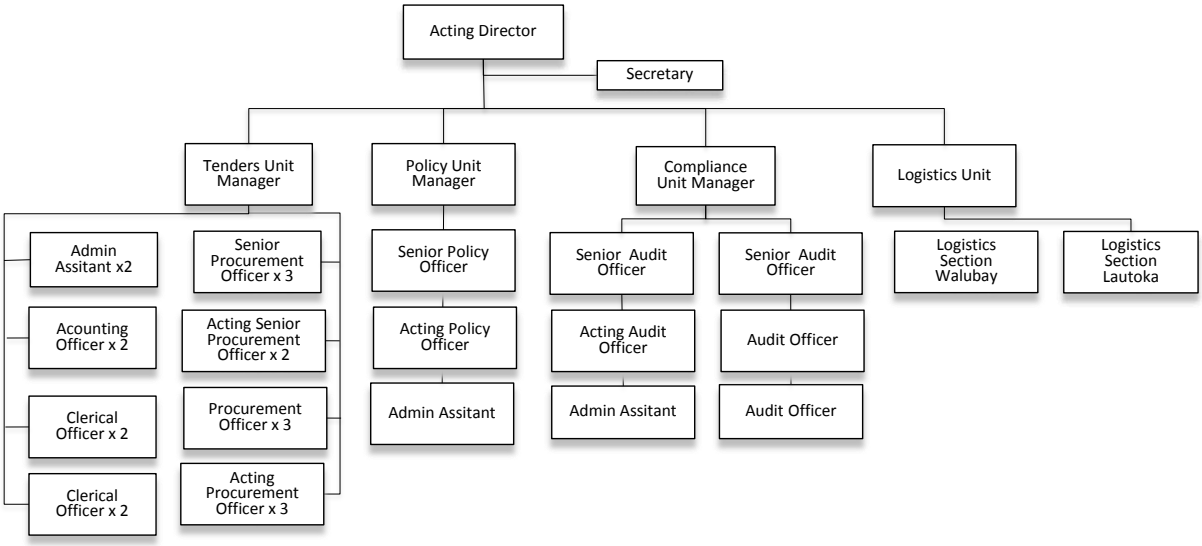
3) Logistics Support Unit

- Responsible for the clearance and delivery of goods imported from overseas;
- Provide logistical and warehousing support and advice to ministries and departments;
- Logistic Strategic Planning;
- Logistics Management and Operation;
- Supplies Management;
- Contract Management.

4) Compliance Unit

- Conducts compliance checks on all government agencies to ensure compliance with procurement guidelines and procedures;
- Monitors the usage of supplier contracts;
- Conduct investigations on any complaints regarding any procurement issues.

The organizational structure of the procurement office is shown below.



Source：The Study Team produced based on Fiji Procurement Office HP

Figure 13-3 The Organizational Structure of Procurement Office

The procurement office handles administrative procedures and other relevant matters related to purchase, acquisition or rendering services of goods or services. The following items are not included in the mandates of the procurement office.

- Grants (whether in the form of a contract or conditional gift);
- Investment (or divestment);
- Sales by tender;
- Loans;
- Purchases of property or services for resale or of property or services used in the production of goods for resale;
- Any property right not acquired through the expenditure of public money - for example, a right to pursue a legal claim for negligence;
- Statutory appointments;
- Appointments made by a Minister using the executive power - for example, the appointment of a person to the Government Tenders Board; or
- The engagement of employees - such as under an agency's enabling legislation, or under the common law concept of employment.

Source: Procurement guidelines, The procurement policy framework 2010

(2) Laws and Guidelines for Procurement

The procurement office handles administrative procedures and other relevant matters related to purchase, acquisition or rendering services of goods or services. The following items are not included in the mandates of the procurement office.
For procurement procedures, Procurement Guidelines: The Procurement Policy Framework 2010 is to be basis of implementation. These guidelines are stipulated in response to a series of procurement procedures reviews conducted in 2010 by the Ministry of Finance to comply with the Procurement Regulations 2010, Section25.
Following regulations and guidelines should be compliant to governmental procurement.

Table 13-5 Laws an Guidelines for Procurement

Laws and Guidelines	Purpose of the documents
Financial Management Act 2004 (FM Act)	Law on national finance
The Procurement Regulations 2010	Regulations on the procurement procedures
The Procurement Guidelines: The Procurement Policy Framework	Procurement Guidelines
Guide to the Tender and Evaluation Process 2010	Practical guide for tendering process

Sources: The Study Team

1) International Competitive Bidding

There are no particular regulations or guidelines for international tenderers for international competitive bidding (ICB) in Fiji. The same tender rules apply to all tenderers regardless of their nationalities with some elevation of the performance bond. These are stipulated in Guide to the Tender and Evaluation Process 2010. It is not restrictive to the foreign national bidders to participate in tenders. It is not necessary to have a business register or postal address in Fiji, should a foreign bidder wishes to bid in for a procurement request. The tender notice is published in newspaper, on the website and sent to embassies. The documents required for bidders are listed below.

Table 13-6 List of documents and information required for Tender

Documents required for Tender	
1	Background/History of the Company including details of Parent companies and subsidiaries
2	Local Bidders are to provide quotes which include Duty, VAT and delivery-to-site on an "as and when required" basis. Overseas Bidders are to provide quotes which include Cost and Freight to the respective destination port.
3	Furnish prescribed forms (if any) and any other relevant documentation
4	Warranty Period
5	Payment should be upon satisfactory execution of the order in compliance with the tendered prices, delivery time and full supply of quantity ordered
6	Bids are to be clearly written or typed on official letter-heads, signed and designating all relevant contact details
7	Product samples and technical literature/brochures
8	FRCA Compliance letter (local bidders only) (Mandatory)
9	FNPF Compliance letter (local bidders only) (Mandatory)
10	General Terms and Conditions (signed and return) (Mandatory)
11	Price must be valid for 90 days from the Closing Date of Tender (Mandatory)
12	Company Registration (Local/Overseas) (Mandatory)
13	Business License((Local/Overseas) (Mandatory)
14	Separate Quoting for each item unless required to do so in RFT documents (Mandatory)
15	Contract Price after award should be for a period of contract duration. (Mandatory)
16	The business relationship between the Bidder(s) and their Partner(s)/Supplier(s) must be confirmed in writing(where applicable) (Mandatory)
17	Delivery period/plan (Mandatory)
18	Subcontractor Information
19	GTB Form (Company Particulars) to be fully completed, signed & stamped (Mandatory)

Sources: Procurement Office HP

2) Selective Competitive Tendering

With this tender process, a tender notice is published to call for a submission of expression of interest (EOI) for selective competitive tendering. Selected bidders are shortlisted based on the submission. Tender notices are published on newspaper, website or sent to embassies to inform international bidders. The general procurement for infrastructure construction is administrated by the procurement office.

13.2 Institutional Challenges and Needs of Related Organization for Implementation and O/M

13.2.1 Roles and Responsibilities of Related Organizations

The current roles and responsibilities of major organizations related to flood control are summarized in Table 13-7. However, as discussed in "**Section 4.1.3 Institution and structure**", there is no organization which is conducting comprehensive flood management programs and projects considering the whole basin management.

Thus, it is necessary to establish a new organization or to facilitate coordination of related organizations for implementation and management of projects.

Table 13-7 Current Roles and Responsibilities of Major Organizations

Organization	Roles and Responsibilities	Challenges and Needs
MOFA	・ Diplomatic Window ・ Progress Monitoring	-
LWRM of MOA	・ Planning and Implementation of Flood Control ・ Planning/Design/Implementation/O/M of Flood Control Projects	・ Lack of comprehensive flood management programs and projects in whole basin. Institutional structure shall be established. ・ Capacity building is required on planning, design, management and O/M of flood control project.

MOIT	・ Policy Making, Planning, Design, Regulation, Management, and Implementation of Large Scale Infrastructure Development in Public Works, Meteorology and Transport Sectors. ・ Flood control and river management is not included; however, projects on meteorology, water supply and water resources are included in the roles.	・ Based on its experiences to implement large scale infrastructure projects, it is expected that MOIT has enough capacity to conduct large scale flood control projects.
FMS	・ Coordination in Planning and Implementation of Flood Control ・ Coordination in Operation such as Hydrological Monitoring and Flood Warning	・ Hydrological monitoring, forecasting and warning are conducted by FMS. Flood control project will be conducted mainly by LWRM; however, coordination with FMS is important.

Source: The Study Team

13.2.2 Current Conditions of Executing Agency

Among the related ministries to flood control, MOA will be the executing agency for the proposed project. Its capacity is summarized in the following table such as roles and responsibilities of related divisions, tender process, numbers of staff and engineers, project experiences, budgets and financial status.

As a conclusion of analysis of institutional capacity of MOA, improvement of resources such as budget and human resources is inevitable by means of coordination with other agencies or establishment of new executing agency.

Table 13-8 Current Conditions of Executing Agency

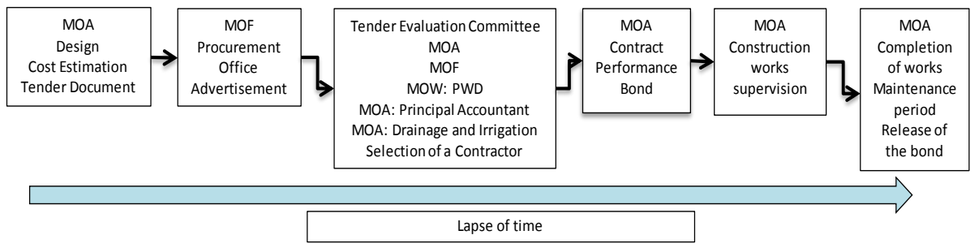
<table>
<tr><th>Ministry</th><th>Division</th><th>Roles and Responsibility</th><th>No. Staff (Engineer)</th><th>Recent Experiences</th><th>Budgets and Financial Status</th></tr>
<tr>
<td>MOA</td>
<td>LWRM</td>
<td>・ Planning and Implementation of Flood Control
・ Planning/Design/Implementation /O/M of Flood Control Projects</td>
<td>15 (7)
*In LWRM</td>
<td>(1) PSIP
・ Construction of Reinforced Cement Concrete (RCC) Retention Weir at Namosi River (Namosi-2), Nadi River Catchment May 2014: FJD 1,500,000
・ Rehabilitation Nawaka1 Retention Weir, Vatutu Village & Namosi 1 Retention Weir Mulomulo 2013: FJD 600,000
(2) International Cooperation with MOA
MOA has worked on projects with overseas cooperation in recent years. The international corporation partners are: AUSAid, New Zealand, Taiwan and China. The record since 2011 to 2015 is shown below.

Recent Projects with International Cooperation Partners (Unit: FJD)
<table>
<tr><th rowspan="2">Country</th><th rowspan="2">Project</th><th colspan="5">Year</th></tr>
<tr><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th></tr>
<tr><td>AUSaid</td><td>Market Access (in kind)</td><td>-</td><td>932,780</td><td>1,066,142</td><td>-</td><td>865,951</td></tr>
<tr><td>NZAID</td><td>Fiji TA Milk Purchase Agreement (in kind)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>71,863</td></tr>
<tr><td></td><td>Fiji Agriculture Sector Support (in kind)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>235,627</td></tr>
<tr><td>Taiwan</td><td>Agriculture Technical Assistance Project</td><td>-</td><td>-</td><td>-</td><td>-</td><td>874,400</td></tr>
<tr><td>China</td><td>Mushroom Tech Demonstration Centre (in kind)</td><td>-</td><td>14,000,000</td><td>-</td><td>10,000,000</td><td></td></tr>
<tr><td>Others</td><td>Enhancing Livelihood through Food Security</td><td>-</td><td>-</td><td>-</td><td>245,061</td><td>123,480</td></tr>
<tr><td></td><td>IWRM Project Nadi - UNDP/GEF</td><td>-</td><td>-</td><td>258,340</td><td>-</td><td>-</td></tr>
<tr><td></td><td>Pacific Adaptation to climate change</td><td>-</td><td>-</td><td>346,802</td><td>-</td><td>-</td></tr>
</table>
Source: Capital Budget Provision 2015, MOA</td>
<td>MOA has no budget allocated to regular operation and maintenance of constructed river management public utilities. In case needs are identified to repair or rehabilitate, MOA plans a new project and submit a budget proposal for the anticipated works. The performance bond is 10% of the contracted amount. The supervision of the construction works is done by MOA through divisional offices. The maintenance period is 3 to 6 months approximately depending on the size of the project. After 1 month of issuance of completion certificate, the performance bond will be released.

Budget of MOA (Unit: FJD)
<table>
<tr><th>Year</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th></tr>
<tr><td>Budget Total</td><td>22,979,892</td><td>30,982,961</td><td>24,200,000</td><td>34,303,061</td><td>36,286,000</td></tr>
</table>
Source: Capital Budget Provision 2015, MOA

The projects budgets for the year 2015 as well as records of previous years which have been implemented are listed in the table below.

Table-3 Draft Budget for Projects Related Flood Control(unit:FJD)
<table>
<tr><th rowspan="2">Project</th><th colspan="5">Year</th></tr>
<tr><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th></tr>
<tr><td>Sugar/ Drainage Development</td><td>300,000</td><td>500,000</td><td>1,500,000</td><td>1,500,000</td><td>1,500,000</td></tr>
<tr><td>Maintenance of Completed Irrig./Services</td><td>4,000,000</td><td>7,000,000</td><td>6,000,000</td><td>6,000,000</td><td>8,000,000</td></tr>
<tr><td>Land Drainage & Flood Protection</td><td>300,000</td><td>1,500,000</td><td>1,000,000</td><td>1,000,000</td><td>1,000,000</td></tr>
<tr><td>Watershed Management Project</td><td>1,500,000</td><td>2,000,000</td><td>-</td><td>1,000,000</td><td>2,000,000</td></tr>
</table>
Source: Capital Budget Provision 2015, MOA</td>
</tr>
<tr><td colspan="6">Tender Process</td></tr>
<tr><td colspan="6">The tender process goes as follows for implementation of construction works in conjunction with the MOA, in order to initiate and implement the selection of contractor and supervision of works.

Source: Study Team Interview at MOA, 2015

Tender Process of Public Infrastructure Construction Project by MOA</td></tr>
</table>

13.3 Assumption of Project Implementation Structure

When the Nadi river improvement work has been selected as a Priority Project, project implementation structure is assumed as follows.

(1) Borrower

On behalf of the Fiji government, the Ministry of Finance become as a borrower. Strategic planning office (SPO) will be in charge.

(2) Implementation Agency

Implemenation agency of the Project will be LWRM (MOA): Land and WaterResources management Division. Future staff number of LWRM is proposed 28 staffs, but there is available 15 staff as shown in below. In the present organization control, the absolute number of executive personnel is insufficient.

Table 13-9 Present Organization Structure of LWRM (MOA) : as of 2015 year

Name of Section	Job Title	Number of Staff
Administration	Director	1
	Secretary	1
	Operator/Typist	1
	Car Driver	2
River Engineering Section	Principal Engineer (River Engineer)	1
	Senior Engineer (River Engineer)	1
	Senior Technical Engineer (Operation and Maintenance)	1
	Technician	1
	Senior Assistant Engineer	1
	Typist	1
Environmental and Hydrology	Environmental Specialist	1
	Technician	2
	Assistant	1
	Total	15

Source: Land and Water Resources Management Division internal document, 2014, MoA

Figure 13-4 shows a tentative Project Implementation Structure among the related agencies in case of JICA loan based on the on-going project managed by FRA (Fiji Roads Authority) financed by ADB.

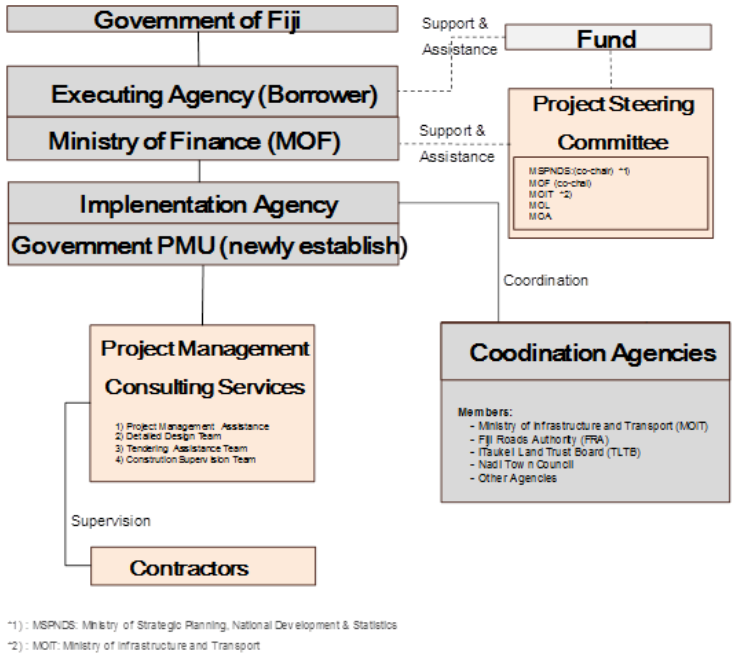


Figure 13-4 Project Implementation Structure in case of Japanese JICA Loan (Tentative)

(3) Necessity of Establishment of Project Management Unit (PMU)

Although newly starting an organization like FRA for river basin management work is considered in the future, a considerable preparation period is required much time so that it cannot be recommend.

For this reason, it is necessary to establish the executive organization as Government Project Management Unit (Government PMU) which belongs to MOA.

When MOA undertakes this project, employment of international consultant is definitely required. The employed international consultants will assist the established Government PMU in the project management activities, and it composed of four (4) teams: 1) PMU assistance Team, (Assistance of Government PMU), 2) Detailed Design Team, 3) Tendering Assistance Team and 4) Construction Supervision Team.

The Government PMU and PMU Assistance Team in the employed international Consultants is set to PMU, and carries out the project fund management, management of the detailed design, procurement of contractors, management of construction supervision works and other necessary coordination works. Especially, assistance of procurement of process of JICA loan is important and it is not familiar with Fiji government, some of JICA experts are required to be dispatched in early stage.

Task and responsibility of PMU are listed below and its organization structure is shown in Figure 13-2.

- Annual Action Program including financial plan
- Monitoring of RAP and EIA Process
- Procurement of the Consultants and Contractors
- Monthly /or Quarterly Monitoring Meeting between JICA and Executing Agency
- ODA Disbursement Acceleration Meeting
- Daily Discussion with Executing Agency
- Analysis of the Monthly and Quarterly Progress Reports
- Site Visit with Executing Agency
- Exchange of letters

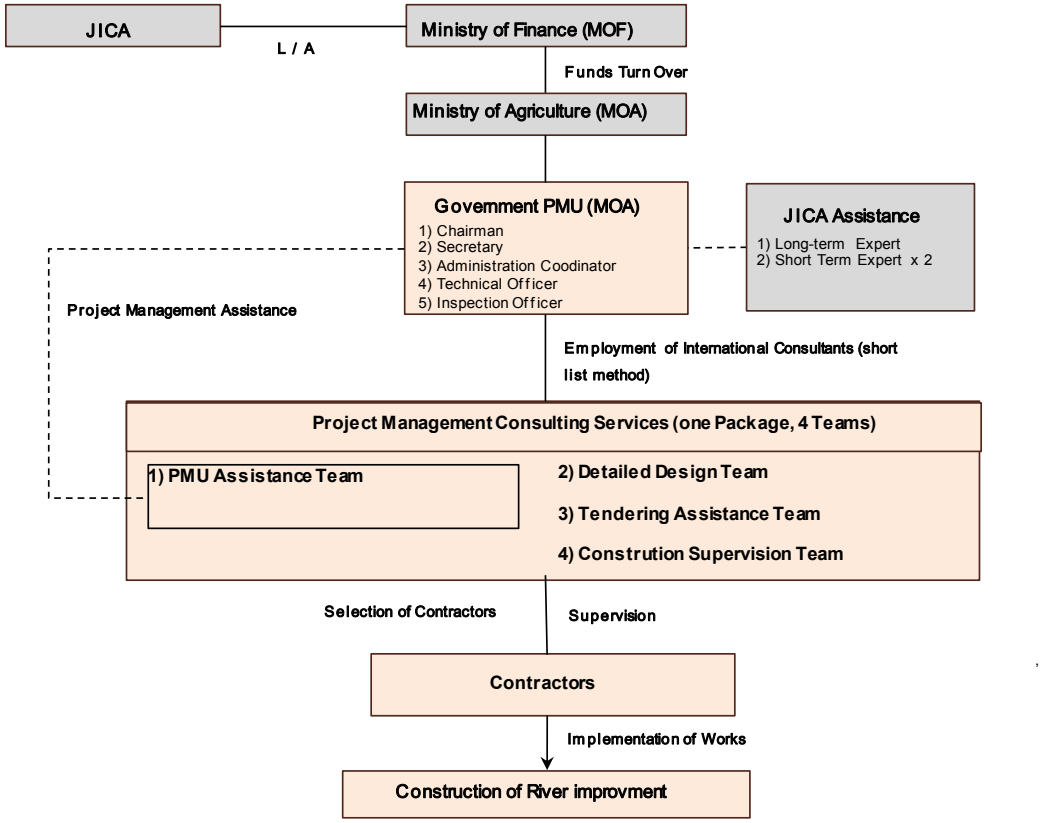


Figure 13-5 Organization Structure of PMU in case of JICA Loan (tentative)

Chapter 14 Master Plan for Flood Control

14.1 Approaches for the Master Plan

(1) General

The Nadi River runs Nadi Town which is the third largest town in Fiji. Despite this town occupies an important position in Fiji, systematic flood control plan has not been taken except small scaled bank protection works and construction of retention dams.

Under such conditions, JICA implemented the development study "The Study on Watershed Management and Flood Control for the Four Major Viti Levu Rivers in the Republic of Fiji Islands" (hereinafter referred to as the "1998 Development Study") in 1996 to 1998. In this study, master plan targeting the year of 2015 for completion with design scale 1/50 was formulated and the priority project including construction of diversion channel targeting the year of 2005 for completion with design scale 1/20 was also proposed.

However, the priority project proposing diversion channel has passed 16 years without being implementation, economy in the basin has greatly developed, and land use, the asset situations as well as the external force changes such as areal and duration of rainfall have also greatly changed in the basin. Based on the changes in the basin, new issues such as hydraulic analysis on rivers, comprehensive sediment management in the basin, impact on coastal environment and capacity development for relative organization were also confirmed. In recent years, this area was seriously damaged by floods in January 2009, January and March 2012.

Considering drastic changes and the damage potential by flood in the Nadi basin, review of the previous master plan has become the urgent need. According to the statistical analysis on flood scale in this study, flood event in March 2012 is ranked as history's largest flood and generally identified as 1/50 scale.

(2) Comprehensive Flood Control Approach Based on the Integrated Flood Management

Since Integrated Flood Management (hereinafter referred to as "IFM" defined by the World Meteorological Organization, WMO) aims at minimizing the losses of life and properties due to flood by looking over an entire river basin, it is important for implementation to combine strategies and measures such as structural measures and non-structural measures as well as short-term measures and long-term measures.

In the present master plan (the "Master Plan"), based on the flood and river basin characteristics as well as properties in the upstream, midstream and downstream of the Nadi River, taking into account measures in an entire basin, comprehensive flood control plan consisting of dam, river improvement including tributaries, retarding basins and ring dikes was proposed. In the selection process for flood control plan, sediment movement (riverbed fluctuation and sediment discharge to the sea) and impact on coastal environment were examined and necessity of mitigation measures was examined. Combination measures with structural and non-structural measures as well as long and short term measures were also taken in consideration for formulation of resilient and sustainable flood control plan.

(3) Combination with Structural and Non-Structural Measures for Flood Damage Mitigation

Taking into account a long term and the large budget to complete the structural measures, and also taking into account the risk due to flood exceeding design scale, perfect protection measures for flood inundation are not feasible. Therefore, flood control should be aimed at mitigation of flood damage. For the implementation of the project including on-going project, it is important to carry out the coordination and complement by applying structural measures and non-structural measures.

Based on the ideas shown above, in the Mater Plan, structural measures such as river channel improvement and retarding basin were proposed and non-structural measures such as strengthening of awareness on flood risk mitigation due to dissemination of hazard maps were also proposed. Non-structural measures play roles not only for complimenting flood prevention function but also for flood damage mitigation function due to flood exceeding design scale.

(4) Set for Priority Protected Areas (Important Protected Areas)

In the formulation of the master plan, it is an important to clarify priority protected areas from the view point of clarification on the contents of flood control plan and addressing the road map for the integration of short, middle and long term flood control plan.

Therefore, "Nadi Town" which is concentrated many properties, Nadi Airport which is the gateway for international tourism, and surrounding urban were designated as the priority protected areas in the flood control plan and these areas were set for important protected areas.

(5) Environmental and Social Considerations and Social Acceptance for Flood Control Plan

Environmental and social considerations have become an important study to formulate the master plan for the project. EIA (Environmental Impact Assessment) system exists in Fiji, and there is a need for the implementation of EIA in accordance with the legal system. On the other hand, it was also found differences in the guidelines between JICA and Fiji. In addition, Fiji has unique land ownership system, buying and selling of land is basically prohibited except for “Free Fold Land” which can free to buy and sell or state government-owned land which owned by the government. In terms of land acquisition of “Native Land”, it is necessary to obtain an agreement from the land owner in long term basis.

In formulation of the master plan, taking into account these situations and social environment, social impacts at IEE (Initial Environmental Examination) level has been identified, based on the strategic environmental assessment, its assessment results was fed back to the alternatives of flood control plan.

With relation to consultation with local stakeholders’, it is necessary to promote harmony with the demands and expectations of residents who live in vulnerable affected area by floods. In order to implement the master plan, as meeting within the governmental agencies, TWG (Technical Working Group) and JCC (Joint Coordination Committee) were held several times. In addition, the PC (Public Consultation) to consult to the opinions from local residents and stakeholders (outside of the government) was also held in Nadi Town. At the PC, social needs, demands, opinions and supports for the project were gathered and discussed, and finally utilized for the decision making on the master plan.

14.2 Planning Conditions for the Master Plan

(1) Basic Policy

Master Plan shall be developed as an integrated plan considering the entire river basin from the upstream to the downstream based on the approaches described above.

There is a central mountain range called Nandrau plateau (more than 1,200masl) in the upstream of the Nadi River basin. West highland and east highland are mainly formed from plates-like terrain with 300 to 600 masl, and the Nadi River basin side is mainly covered with grass and shrubs. Even though there is Vaturu Dam, which is used for water supply, in the upstream of the Nadi River, a few right sites for a flood control dam such as V-shaped or U-shaped valleys can be found in the Nadi River. Narrow alluvial plain and coastal plain in the middle-stream and the downstream of the Nadir River and tributaries uniting at the Nadi Town / property concentration area increase the burden on the Nadi River. Therefore, flood control with only single facility such as dam and retarding basin is not enough.

Considering the above situation, flood control with dam and retarding basin in the upstream of the basin to store flood water, and river widening to raise flow capacity in the low land middle stream where there are a lot of assets, difficulties to acquire land are set as a basic concept of integrated flood control in the Nadi River basin. In the low-lying downstream area, which is a natural retarding basin, the inundation characteristics of this area shall be considered and utilized as a designed retarding basin. In addition, because the appropriate site for dam is also limited in the basin of the tributaries, a series of retarding basins and river improvement to secure the discharge capacity of the tributaries shall be

considered as the flood control measures for tributaries in order to reduce the burden on the Nadi River. River widening in the middle stream of the Nadi River is selected as the Priority Project from these structural measures and it is described in the later chapter.

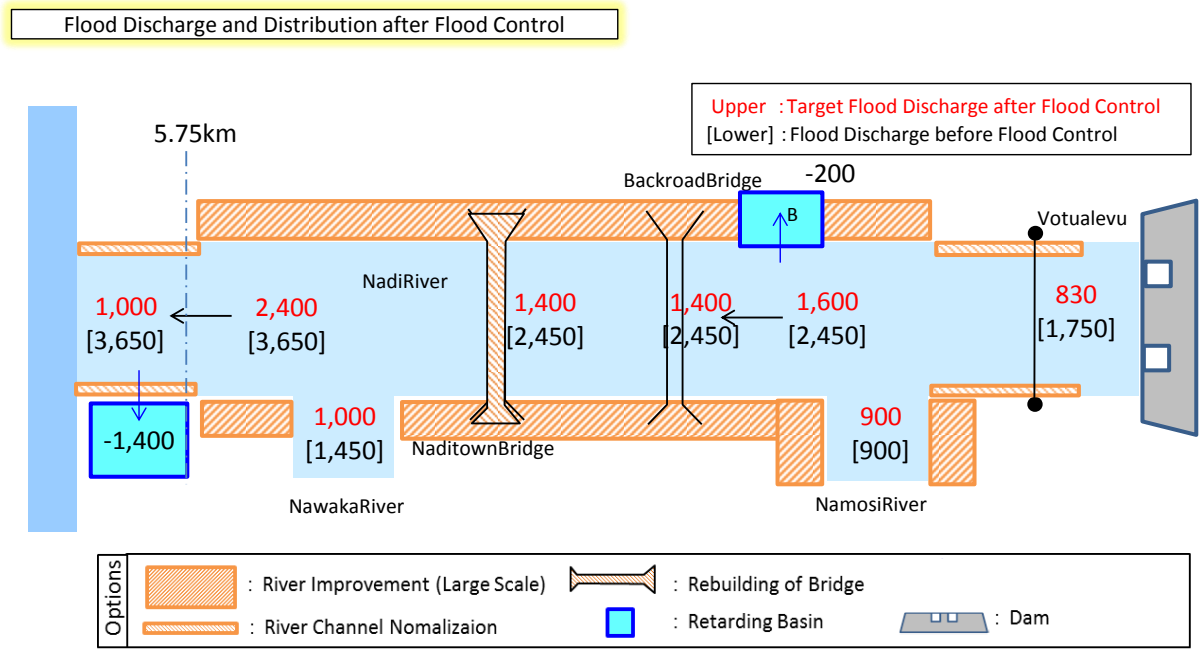
Non-structural measures shall be taken to complement / support the structural measures aiming disaster risk reduction. Following contents are considered as a non-structural measures to be taken in the Nadi river basin considering the pre-disaster phase to post-disaster phase based on the current situation and challenges of non-structural measures: understanding disaster risk and risk avoidance by strengthening of understanding flood risk with flood hazard map and strengthening flood forecasting technology; enhancing disaster preparedness for effective response by strengthening disaster management system, such as disaster prevention planning, development and update of SOP, economic evaluation of disaster prevention investment, and strengthening of emergency assistance system; disaster risk management and risk avoidance in middle to long term by land-use regulation and river basin management; economic disaster risk management by development of regional BCP, evaluation and feedback by establishing a system of evaluation of Pre-disaster activity / existing measures and feedback. Non-structural measures: understanding disaster risk and risk avoidance by strengthening of understanding flood risk are proposed as the Priority Project in order to protect human life, and directly link to people's recognition and evacuation activities and it is described in the later chapter.

(2) Target Area for the Plan

Target area of the master plan is Nadi River Basin with catchment area of 516 km^2.

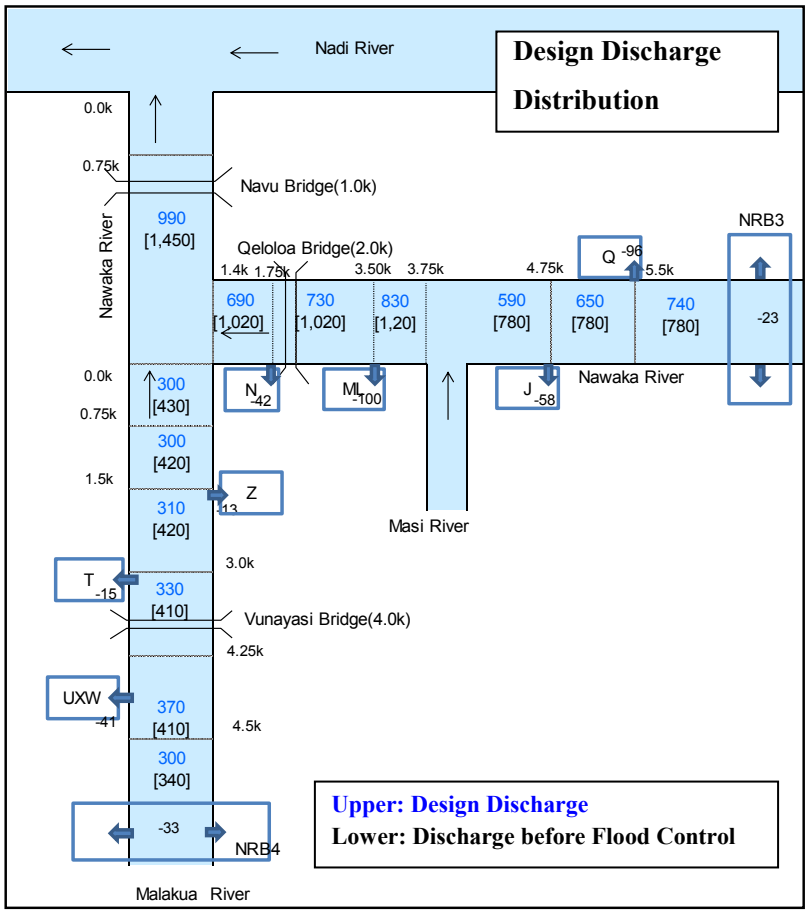
(3) Design Flood Scale and Flood Discharge Distribution

Design flood scale for the master plan is set as 1/50 with regard to previous maximum flood event occurred in March 2012.



Note) Dam and retarding basins in upstream might be substitute by future situation.
Source: JICA Study Team

Figure 14-1 Design Discharge Distribution (Nadi River)



Source: JICA Study Team

Figure 14-2 Design Discharge Distribution (Malakua & Nawaka River)

14.3 Components of the Master Plan

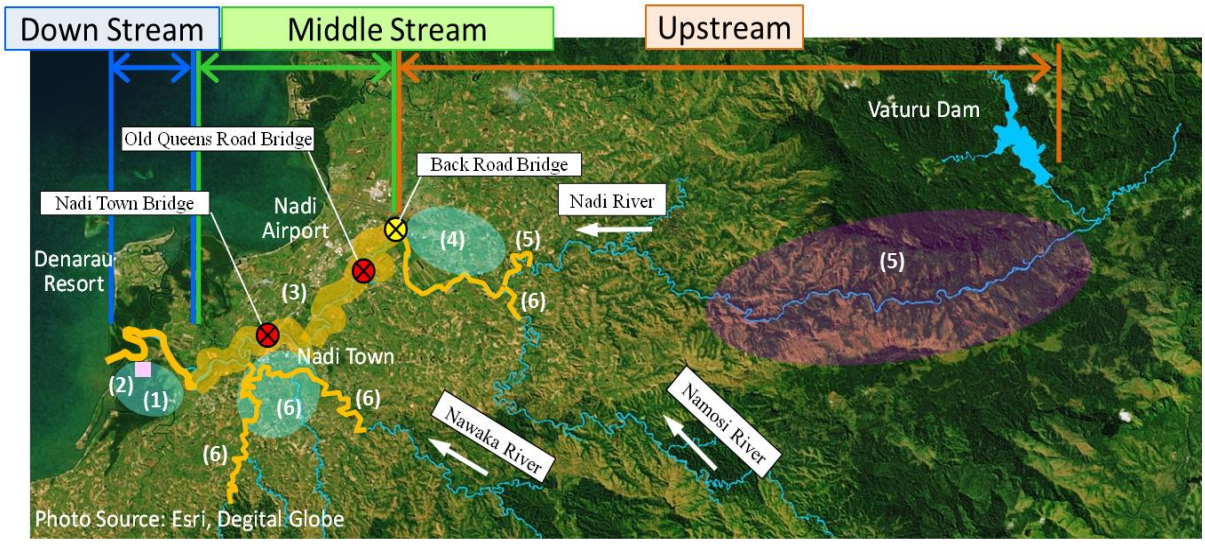
14.3.1 Description of the Major Component

(1) Structural Measures

In order to mitigate flood damage in Nadi River, following structural measures will be implemented.

Table 14-1 Major Contents of the Master Plan (Structural Measures)

	River, Location		Component of the Master Plan		Quantities	Remarks
Structural Measures	1. Nadi River	Downstream	(1)	Retarding Basin and River Improvement in downstream	A=725 ha V=9,715 千m3	—
			(2)	Ring Dike	L=1.8 km	—
		Middlestream	(3)	River Widening[2)]	L=13 km	Including rebuilding of 2 (two) bridges
			(4)	Retarding Basin A	A=35 ha V=795 千m3	
				Retarding Basin B	A=178 ha V=6,920 千m3	—
		Upstream	(5)	Dam and River improvement in upstream	1	
	2. Tributaries	Nawaka Maralua Namosi River	(6)	River Improvement	L=21 km	Including rebuilding of 4 (four) bridges in tributaries
				Retarding Basins (13 sites)	A=340 ha V=11,600 千m3	



(1)		: Retarding Basin in downstream incl. surrounding dike of retarding basin in downstream
		: River Improvement in downstream
(2)		: Ring Dike
(3)		: River Widening incl. Rebuilding of 2(two) bridges
(4)		: Retarding Basin A,B in upstream
(5)		: Dam
		: River improvement in upstream
(6)		: Retarding Basins in Tributaries incl. surrounding dike
		: River Improvement in Tributaries incl. Rebuilding of 4(four) bridges

Note) Planned dam and retarding basins in upstream might be substitute by future situation.

Source: JICA Study Team

Figure 14-3 Major Contents of the Master Plan (Structural Measures)

Details for the major components are explained as follows.

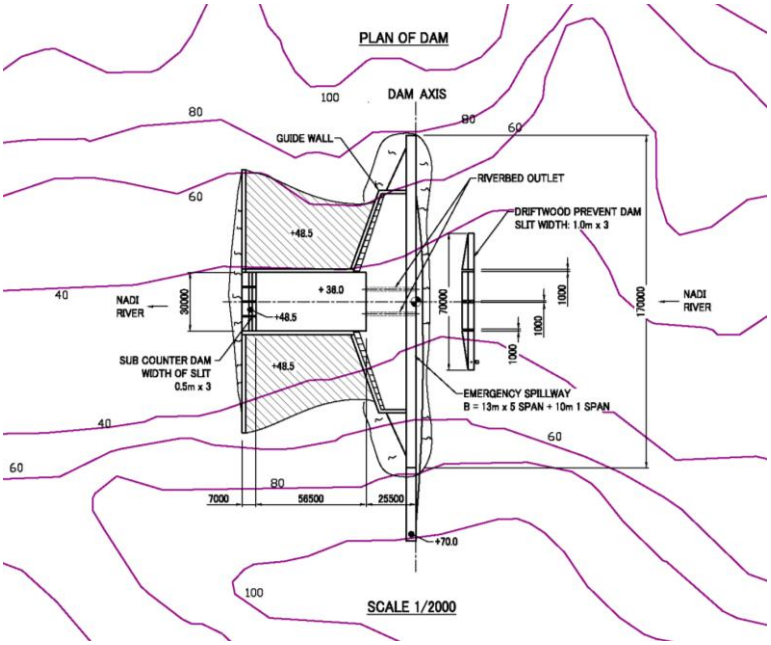
1) Dam Located in Upstream Section

In order to control flood, dam was planned and designed in upstream section of the Nadi River. Basic specification of reservoir and dam is shown in Table14-2, Figure 14-4 and Figure 14-5.

Table14-2 Specification of Reservoir and Dam

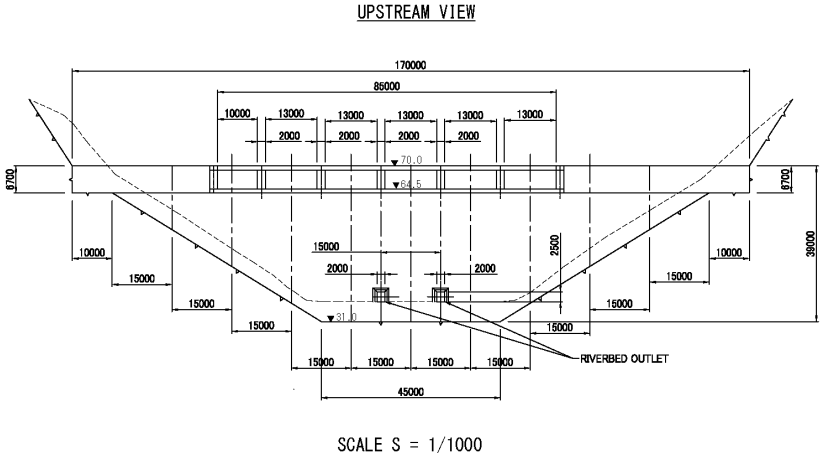
Item			Specification	Remarks
Reservoir		Catchment area	110km^2	
		Reservoir area	1.66km^2	At the height of S.W.L
		Reservoir capacity	28,600,000m^3	Freeboard: 20% of flood control capacity
		Design high water level	D.H.L 68.5m	
		Surcharge water level	S.W.L 64.5m	
		Design flood discharge	1,200m^3/sec	Design scale 1/50
Dam	Dam site	Type	Concrete gravity dam with riverbed outlets	
		Crest elevation	EL 70.0m	
		Lowest elevation of foundation	EL 31.0m	Elevation of current ground surface – 5.0m
		Dam height	39.0m	
		Crest length	170.0m	
		Dam volume	87,000m^3	
		Slope gradient of upstream	1 : 0.10	
		Slope gradient of downstream	1 : 0.75	
	Outlet	Emergency spillway	Free overflow weir type, 13.0m width x 5 gates + 10.0m width x 1 gate	Overflow depth 4.0m
		Outlet (ordinary times)	Riverbed outlets, 2.0m width x 2.5m high x 2 outlets	
		Target flood discharge for flood control	1,200m^3/sec	
		Regulating capacity	940m^3/sec	
		Flood discharge after the regulation	260m^3/sec	
		Target discharge for energy dissipator	800m^3/sec	2/3 of target flood discharge
		Type of energy dissipator	Hydraulic jump type with apron and counter dam	
		Apron length	50.0m	
		Apron width	30.0m	
		Height of counter dam	5.0m	Overflow depth 5.6m
		Height of side wall	12.5m	Overflow depth 7.5m

*This specification needs to be reviewed at the detailed design stage

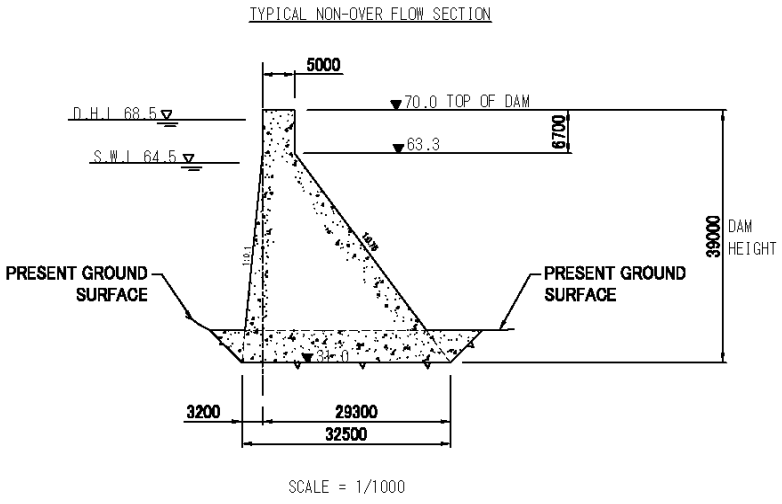


Source: JICA Study Team

Figure 14-4 General Plan of Planned Dam (Nadi River)



Source: JICA Study Team



Source: JICA Study Team

Figure 14-5 Standard Cross Section and Cross Section of Dam Axis

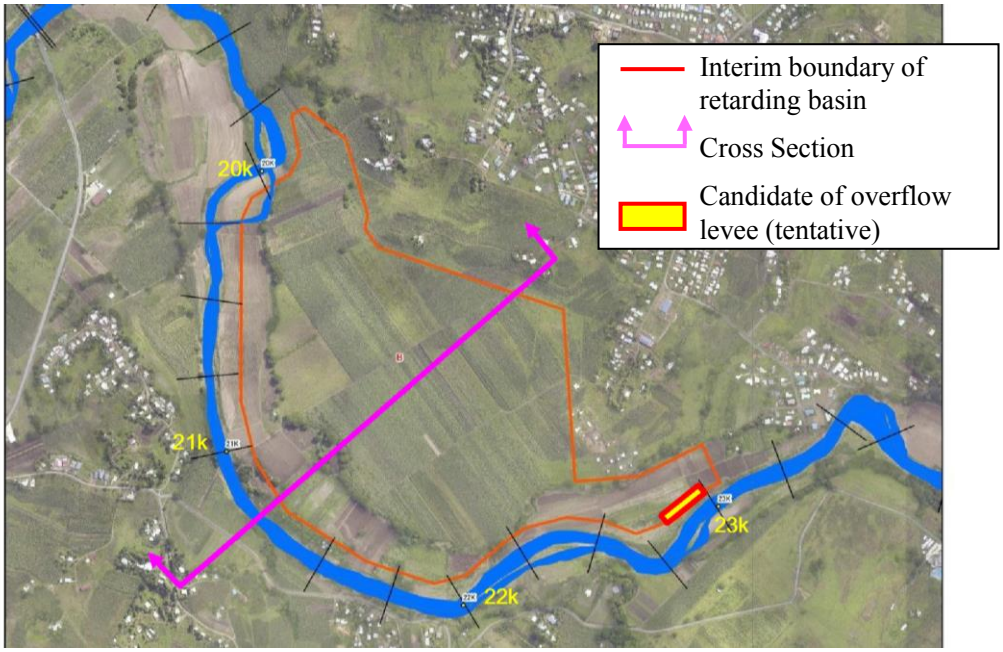
2) Retarding Basin in Upstream of the Nadi River

In order to control flood, retarding basin was planned and designed in upstream and both sides of the Nadi River.

Table14-3 Specification of Retarding Basins in the Upstream of the Nadi River

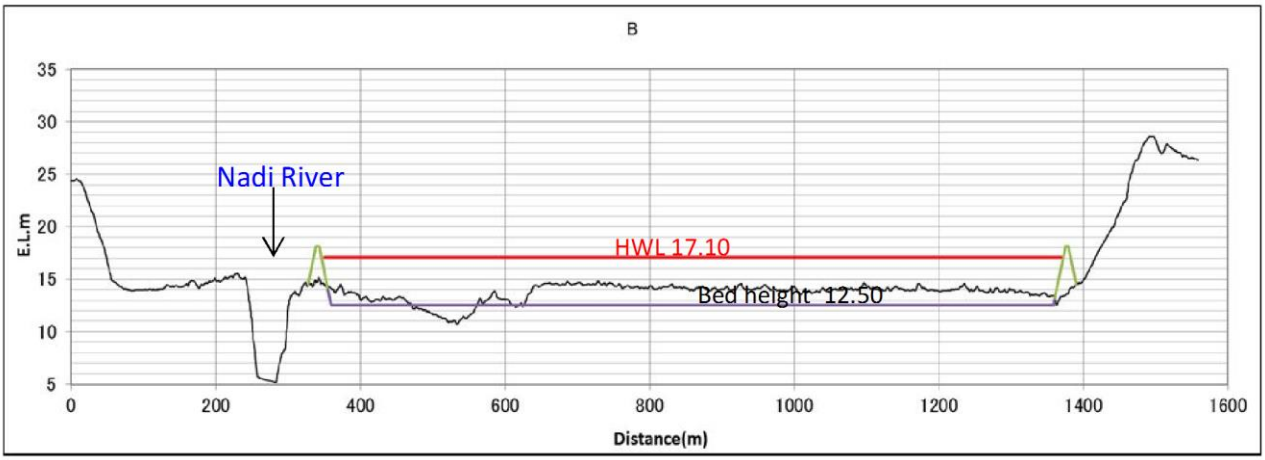
Item	Retarding basin A	Retarding basin B
Location	Left bank, 18.75k – 21.00k of the Nadi River	Right bank, 19.75k – 24.10k of the Nadi River
Capacity (1,000 m^3)	795	6,920
Peak water level (calculation basis, EL. m)	14.00	18.37
Length and location of overflow levee	200m, 20.55k – 20.75k	400m, 23.70k – 24.10k
Elevation and bed height of overflow levee	13.39 (20.75k HWL – 0.5m)	16.85 (23.75k HWL – 1.0m)
Design height of surrounding dike	14.89 (Design bank height of 20.75k)	19.20 (Design bank height of 24.10k)
Sluice gate	2.0m width x 2.0m height x one gate	3.5m width x 3.5m height x 2 gates

*This specification needs to be reviewed at the detailed design stage



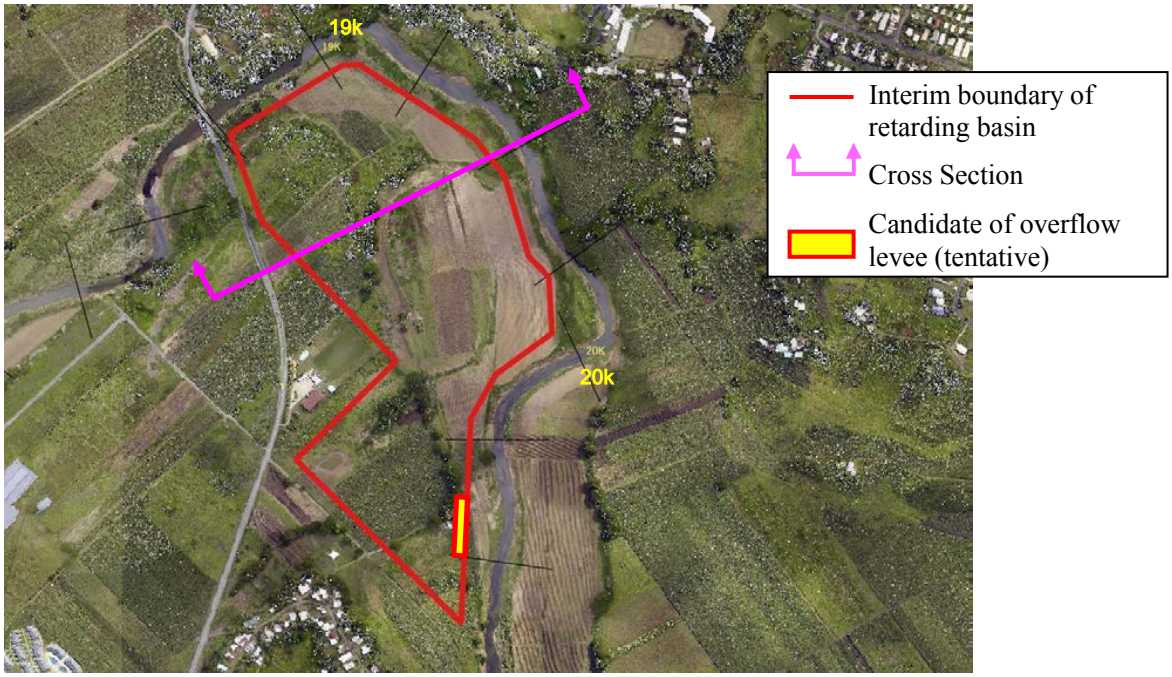
Source: JICA Study Team

Figure14-6 Plan of Retarding Basin (Right bank, upstream of the Nadi River)



Source: JICA Study Team

Figure14-7 Cross Section of Retarding Basin B (Right bank)



Source: JICA Study Team

Figure14-8 Plan of Retarding Basin (Left bank, upstream of the Nadi River)

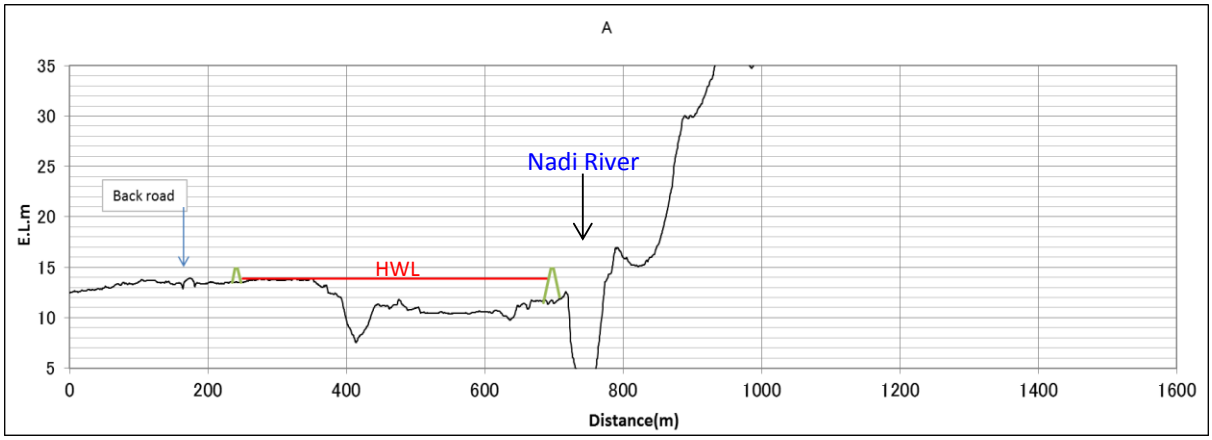


Figure14-9 Cross Section of Retarding Basin A (Left bank)

3) River Channel Widening in Middle Stream Section of Nadi River

In order to flow down the design discharge in the Nadi River, river channel widening was planned and designed in the middle stream of the Nadi River (refer to Table14-4, Figure14-10 and Figure14-11).

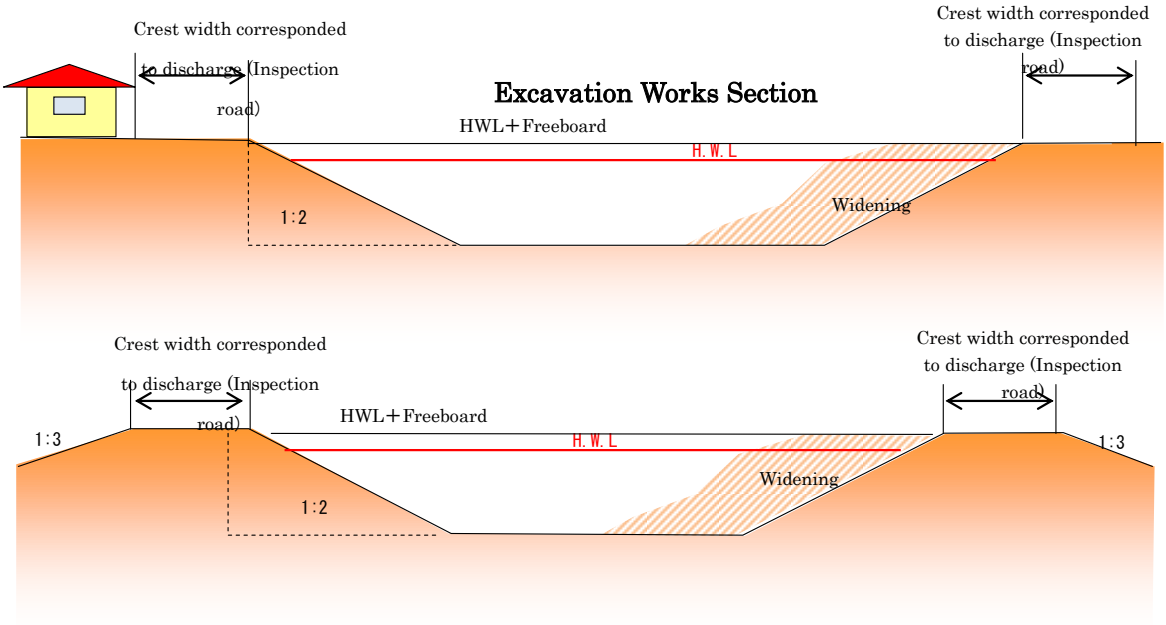
Table14-4 Approximate Amount of River Widening of Middle Stream of the Nadi River

Major content	Approximate amount
Section	5.75km to 18.75km of the Nadi River
Length of widening	L = 13 km
Excavation soil volume	V_1 = 5,800,000 m^3
Embankment soil volume	V_2 = 300,000 m^3

*This amount needs to be reviewed at the detailed design stage

Source: JICA Study Team TUDY

Figure14-10 Plan of River Channel Widening Works (Middle Stream Section)



Source: JICA Study Team

Figure14-11 Typical Cross Sections for River Channel Widening (Middle Stream Section)

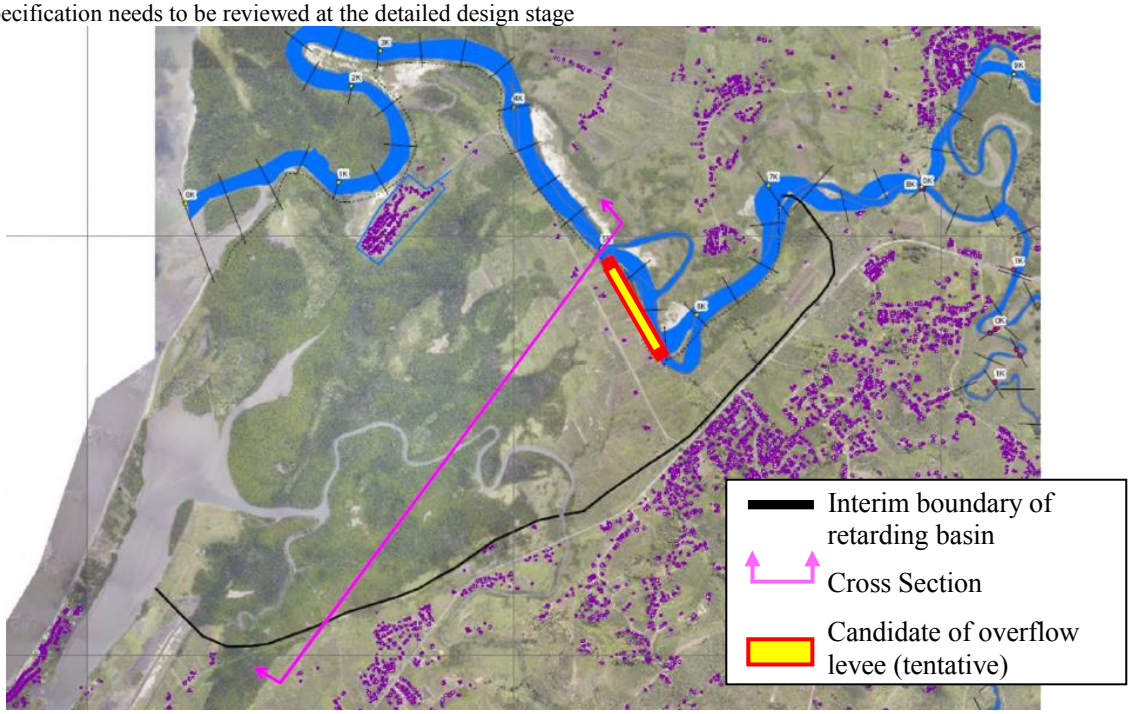
4) Retarding Basin in Downstream Section of Nadi River

In order to control design discharge, retarding basin is also planned and designed in the downstream of the Nadi River.

Table14-5 Specification of Retarding Basins in the Downstream of the Nadi River

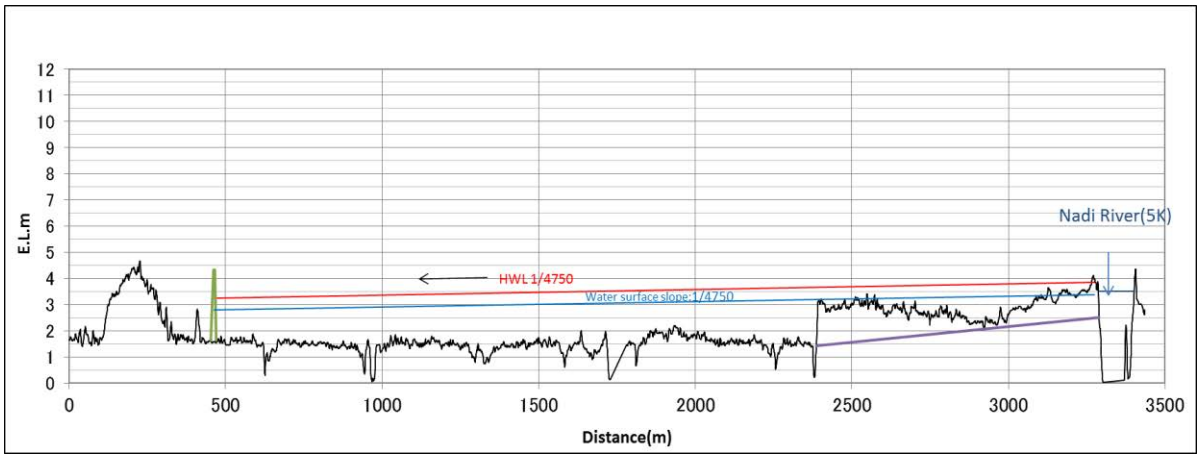
Item	Retarding basin in the downstream
Location	Left bank, 0.00k – 7.25k of the Nadi River
Capacity (1,000 m^3)	9,715
Peak water level (calculation basis, EL. m)	3.86
Length and location of overflow levee	700m, 5.05k – 5.75k
Elevation and bed height of overflow levee (EL. m)	2.86 (HWL 3.86m)
Design height of surrounding dike (EL. m)	2.98 to 4.35
Sluice gate	- (Natural discharge)

*This specification needs to be reviewed at the detailed design stage



*Necessity of surrounding dike needs to be reviewed at the detailed design stage based on the topographical survey (surrounding / road topography), which shall be conducted at the detailed design stage.
Source: JICA Study Team

Figure14-12 Cross Section for Retarding Basin in Downstream of the Nadi River

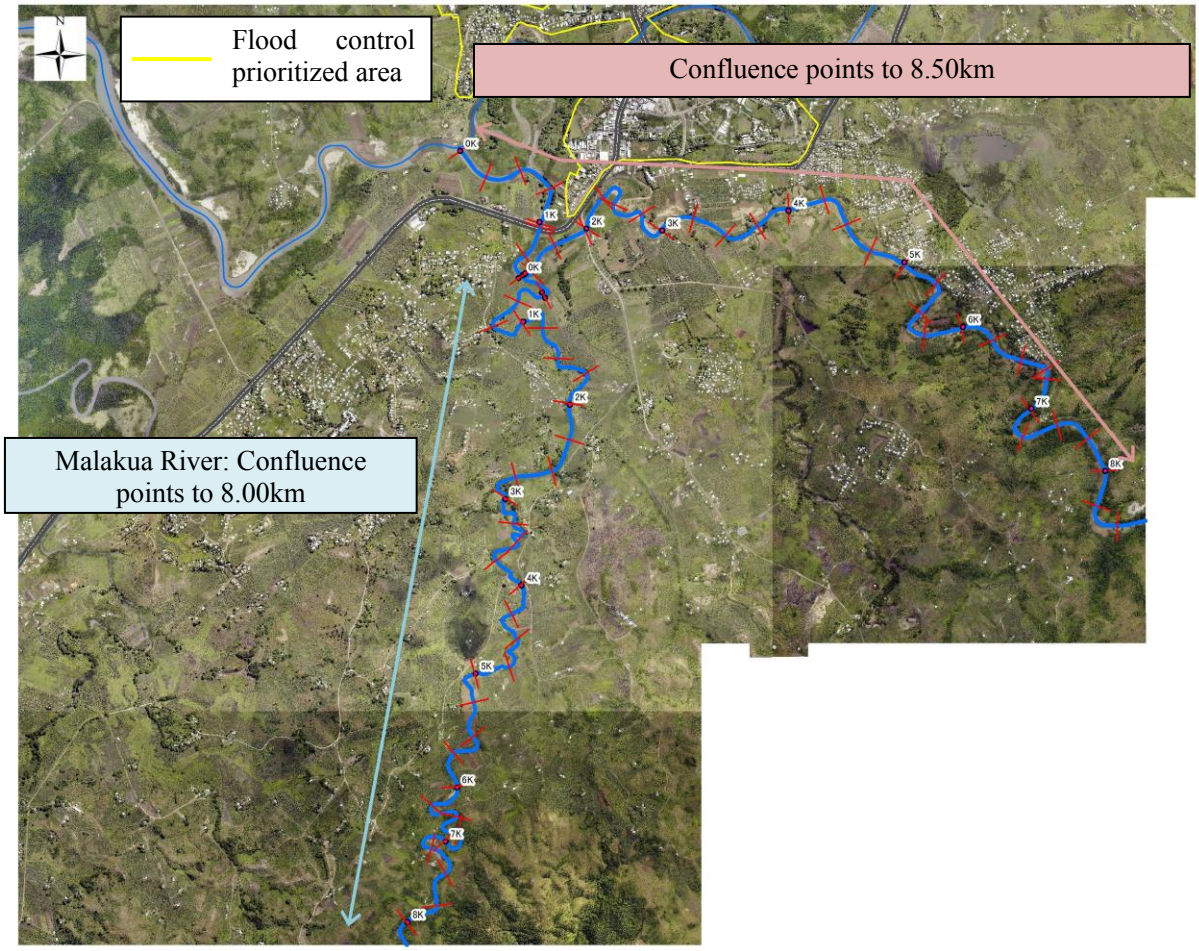


*HWL in the retarding basin has a gradient in line with the topographic gradient since the flood water will spread widely in the retarding basin.

Figure14-13 Plan for Retarding Basin in Downstream of the Nadi River

5) River Channel Improvement and Retarding Basin in the Tributaries

In the tributaries of the Nadi River, the Nawaka and Malakua River, river channel improvement and retarding basins were planned and designed.



Source: JICA Study Team

Figure14-14 Area of River Improvement Work in Tributaries (Nawaka and Malakua River)

Malakua River Section1: 0.0k to 8.0km

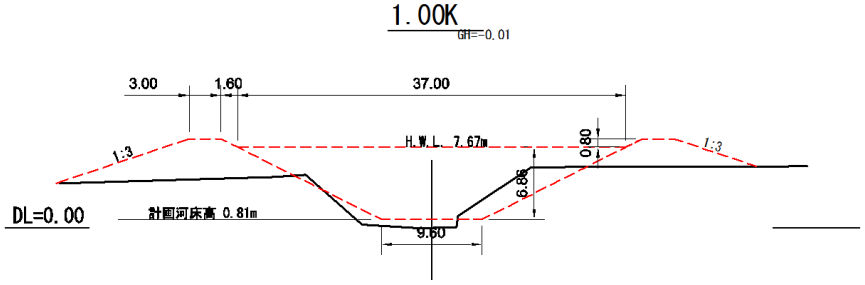
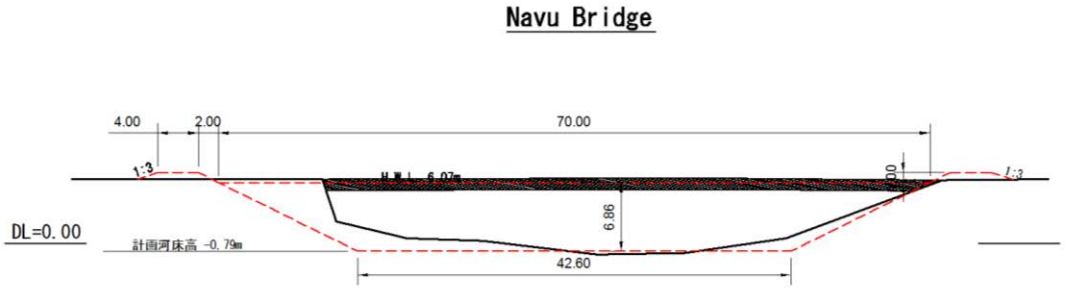


Figure14-15 Cross Sections of River Improvement Work in Tributaries (Malakua River)

Nawaka River Section1: 0.0k to Confluence Point



Nawaka River Section1: Confluence Point to 8.5km

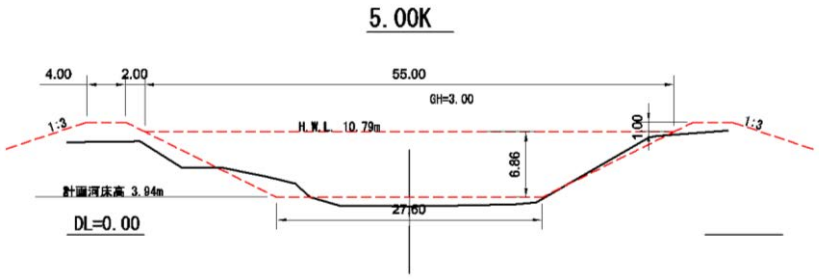
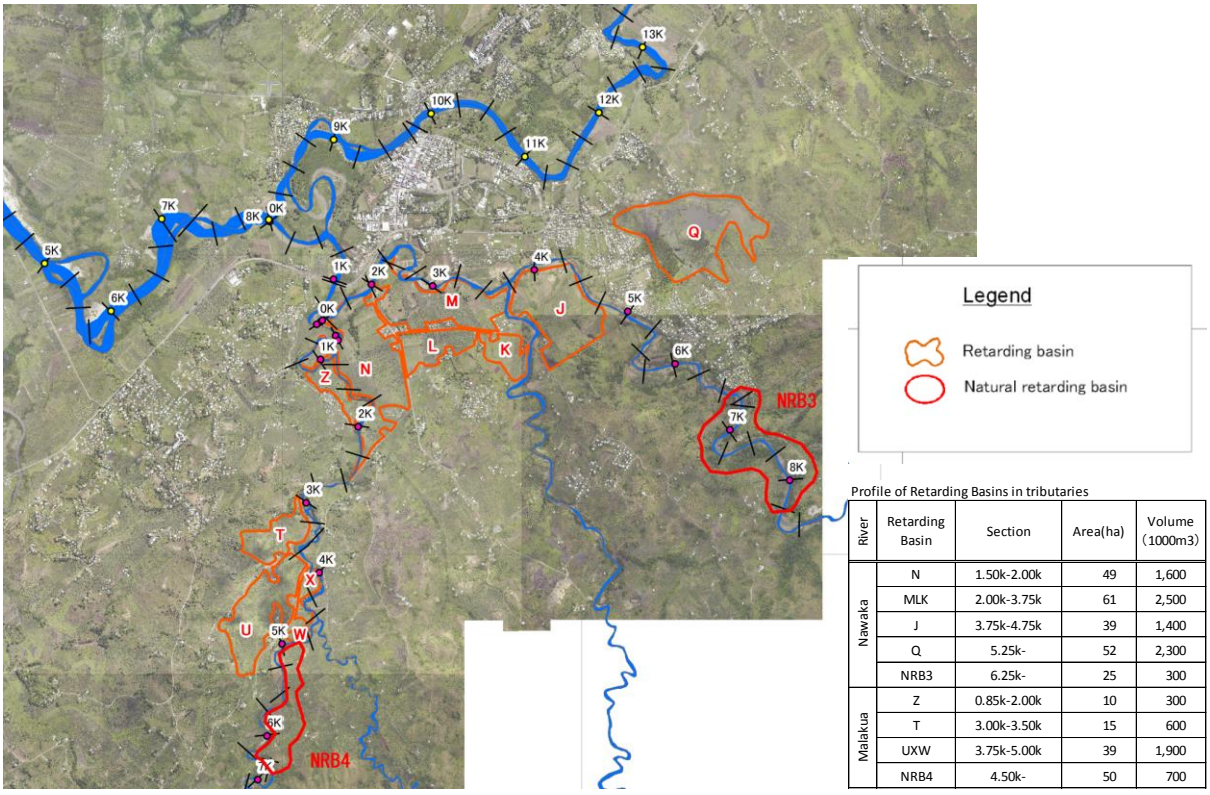


Figure14-16 Cross Sections of River Improvement Work in Tributaries (Nawaka River)



Profile of Retarding Basins in tributaries

River	Retarding Basin	Section	Area(ha)	Volume (1000m3)
Nawaka	N	1.50k-2.00k	49	1,600
	MLK	2.00k-3.75k	61	2,500
	J	3.75k-4.75k	39	1,400
	Q	5.25k-	52	2,300
	NRB3	6.25k-	25	300
Malakua	Z	0.85k-2.00k	10	300
	T	3.00k-3.50k	15	600
	UXW	3.75k-5.00k	39	1,900
	NRB4	4.50k-	50	700

Figure14-17 Plan of Retarding Basins in Tributaries (Nawaka and Malakua River)

(2) Non-Structural Measures

In order to mitigate flood damage in Nadi River, following non-structural measures will be also implemented.

Table14-6 Major Non-Structural Measures for Master Plan

	Effect of Measure (Large Classification)	Major components
Non-Structural Measures	(1) Understanding disaster risk and risk avoidance	1-1) Strengthening of understanding flood risk with flood hazard map 1-2) Strengthening flood forecasting technology
	(2) Enhancing disaster preparedness for effective response	2-1) Strengthening disaster management system
	(3) Disaster risk management, risk avoidance	3-1) Technical assistant for land-use regulation 3-2) Strengthening river basin management
	(4) Economic disaster risk management	4-1) Strengthening economic disaster risk management by regional BCP
	(5) Evaluation and feedback	5-1) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

Summary of major components of Non-structural Measures are described below (details are described in Chapter 11).

A) Strengthening of understanding flood risk with flood hazard map

Understand flood risk with flood hazard map and encourage early voluntary evacuation to the safer place, and avoid the flood risk. Moreover, expand the hydrological observation system, which contributes to appropriate flood forecast and early evacuation.

B) Strengthening flood forecasting technology

Strengthen flood forecasting technology in order to understand flood risk by appropriate flood forecast, to encourage early evacuation, and to avoid the flood risk Moreover, aiming accuracy improvement of flood forecasting and enhance of early evacuation in future, expand the hydrological observation system.

C) Strengthening disaster management system

Strengthen disaster risk governance to manage disaster risk and effective disaster response before the disaster and during disaster. Moreover, encourage early and appropriate evacuation, and disaster risk avoidance by effective disaster management and response.

D) Technical assistant for land-use regulation

Understand the flood risk based on the flood hazard map and avoid the risk caused by land development/use in flood-prone area or in retarding basin by land-use regulation. Moreover, mitigate the negative effects of development regarding drainage, and manage and avoid the new disaster risk.

E) Strengthening river basin management

Plantation in the upstream aiming the prevention of the land from sliding has been conducted by MOA as a part of the river basin management. Flood risk reduction will be enabled by continuous integrated flood management considering the whole river basin and the measures against sediment disaster.

F) Strengthening economic disaster risk management by regional BCP

Minimize the flagging economy in the region due to disaster by sharing the measures of disaster prevention and recovery plan among municipality and each sector, and reduce economic damage by economic disaster risk management utilizing BCP and encourage early recovery after the disaster.

G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

Enable "Build Back Better" and "Better Disaster Prevention (understanding of disaster risk and management)" by evaluation of Pre-disaster activity / existing measures and feedback, and encourage disaster risk reduction and risk avoidance for the disasters in the future.

14.3.2 Phased Implementation for the Project

In order to improve the flood safety level and mitigate flood damage in the Nadi River basin, clarifying the roadmap for the project, it is necessary to prioritize the component to be implemented by taking into account the necessity and feasibility. For these reasons, the masterplan consisting of components with structural measures and non-structural measures will be carried out by appropriate phased implementation shown as follows.

(1) Priority Project (Short Term Measures)

In order to protect "priority protected areas" from floods, major components for structural measures to be implemented as short term measures, river channel widening in midstream and retarding in upstream section as well as ring and enclosed dikes will be carried out. In this project, area located in the left side of the river in downstream section will be used for retarding basin.

As a priority project of Non-Structural Measures to avoid risks and to mitigate damages will be carried out with regard to protection of human lives for the top priority as well as to understand disaster risks and evacuation, under condition that the progress of structural measures project will be at initial phase.

Therefore, activities accompanied with development and disclosure of hazard maps and development of hydrological devices for awareness of flood risks will be implemented. Since the results of the project can be utilized for these components as parts, these components can be implemented from the initial phase. In addition, in order to evaluate the effect of non-structural measures in the past or priority projects, and in order to connect to "Better disaster prevention (improvement of existing non-structural measures)", evaluation and feedback system on the past projects will be designed and built up.

(2) Middle Term Measures

Major components for structural measures to be implemented as middle term measures, to mitigate flood damage in downstream section and tributaries of the Nadi River, "natural retarding land" located at the left side of downstream section will be planned and designed as retarding basin. River improvement in the tributaries, Nawaka and Malakua River, will be also implemented.

As the major components for non-structural measures in middle-term, applying same measures as short term, measures to avoid risks and to mitigate damages will be carried out with regard to understanding disaster risks and evacuation.

Specifically, strengthening of flood forecasting system and technical assistance on land-use regulation as well as watershed management will be planned to be implemented. Moreover, strengthening of disaster management system and urgent relief system will be designed and implemented as the major components of non-structural measures for the purpose of rapid assistance due to effective emergency response and relief in the event of disasters as well as damage mitigation.

In addition, as measures that will contribute to reduce economic damage, economic disaster risk management by adopting a wide BCP (Business Continuity Plan) will be also implemented for the purpose of early recovery on economic activities after disaster as well as achievement on reduction of economic damage due to disasters.

(3) Long Term Measures

Major components for structural measures to be implemented as long term measures, to mitigate flood damage, dam will be constructed in upstream section of the Nadi River. Because it takes a long time

until the completion of the dam construction, and it is difficult to expect the benefit by the project, this project is positioned as long-term measures.

Components for each term of the master plan examined above are summarized as follows:

Table14-7 Phased Implementation of the Measures for the Mater Plan

Measures	Phasing	Components
Structural Measures	i) Priority project (Short-term Measures)	(1) River channel widening works in midstream section (L=13km) (2) Retarding basin works in upstream section (A=km2, km2) (3) Enclosed dike works in Nadi river (L= km, km) (4) Ring dike works in Nadi River
	ii) Middle-term Measures	(5) Retarding basin works in downstream section (A=km2) (6) River channel works in tributaries (L= km, km) (7)Retarding basin works in tributaries (A=km2)
	iii) Long-term Measures	(8)Dam construction in upstream section (H= m)
Non-structural Measures *No. of the components in this table is the same with Table14-6	i) Priority Project (Short-term Measures)	(1) Understanding disaster risk and risk avoidance A) Strengthening of understanding flood risk with flood hazard map (5) Evaluation and feedback G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback
	ii) Middle-term Measures	(1) Understanding disaster risk and risk avoidance B) Strengthening flood forecasting technology (2) Enhancing disaster preparedness for effective response C) Strengthening disaster management system (3) Disaster risk management, risk avoidance D) Technical assistant for land-use regulation E) Strengthening river basin management (4) Economic disaster risk management F) Strengthening economic disaster risk management by regional BCP

14.4 Implementation schedule of the Master Plan projects

Suggested entire implementation schedule of the Master Plan projects is shown in Table 14-8

Table 14-8 Suggested Entire Implementation Schedule of the Master Plan

	Work Item	20XX-20XX	20XX-20XX																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Study on M/P																															
	Detailed Design																															
I. Structural Measures																																
I-A. Priority Project (Short Term Measures)																																
1	**River channel widening works in midstream section**																															
1)	River channel widening works in midstream section, L=13km																															
2	**Retarding basin works in upstream section**																															
1)	Retarding basin (A) works in right bank side in Nadi River, A=35ha																															
2)	Retarding basin (B) works in left bank side in Nadi River, A=178ha																															
3	**Ring dike**																															
1)	Ring dike, L=1.8km																															
4	**Shortcut in tributaries / Surrounding dike works in Nadi River**																															
1)	Shortcut in tributaries, A=0.5km																															
2)	Surrounding dike, L=4.5km																															
I-B. Middle Term Measures																																
1	**Retarding Basin in downstream section (A=km2)**																															
1)	Retarding Basin in downstream section, A=725ha																															
2	River improvement in tributaries																															
1)	Nawaka River, L=8.5km																															
2)	Malakua River , L=8.5km																															
3)	Namosi River , L=4.0km																															
I-C. Long Term Measures																																
1	**Dam construction in upstream in Nadi River (H= m)**																															
1)	Dam construction in upstream in Nadi River																															
II. Non-structural Measures																																
1	**Understanding disaster risk and risk avoidance**																															
1-1)	Strengthening of understanding flood risk with flood hazard map																															
1-2)	Strengthening flood forecasting technology																															
2	**Enhancing disaster preparedness for effective response**																															
2-1)	Strengthening disaster management system																															
2-2)	Strengthening emergency assistance system																															
3	**Disaster risk management, risk avoidance**																															
3-1)	Land use regulations																															
3-2)	Strengthening river basin management																															
4	**Economic disaster risk management**																															
4-1)	Strengthening economic disaster risk management by regional BCP																															
5	**Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback**																															
5-1)	Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback																															

Note: *including loan agreement, EIA, land acquisition, procurement of consultant (D/D, C/S), detailed design, preparation of PQ and tender document and so on.

14.5 Project Cost for Master Plan

Project cost (tentative) for the Master Plan is temporarily estimated as shown in Table 14-5.

This project cost includes only base cost and does not include amount of price escalation, contingency, construction interest and so on.

Table 14-9 Project Cost for Master Plan

(Tentative as or summarization of Interim Report)

Rough Project Cost for Master Plan

Item				Rough Project Cost for Priority Project[1] FJD (million)	Rough Project Cost for Priority Project JPY(million)	Rough Project Cost for Priority Project JPY(million)
Construction	Construction Cost (1)	Direct Construction Cost(A)	Permanent Works(a)	297	17,835	—
			General Works(b)	32	1,924	
		In-direct Construction Cost (B)=(a+b)×30%		99	5,928	
		Sub Todal (A+B)		428	25,688	
	Construction Administrative Cost (2)=(1)×20%			86	5,138	
	Sub Total (1)+(2)			520	30,830	
Land Acquisiton and Compensation	Land Acquisiton Cost (3)[2]			31	1,847	—
	Compensation Cost (4)[3]			3	203	
	Administrative Cost (5)=((3)+(4))×20%			7	410	
	Sub Total (3)+(4)+(5)			41	2,470	
Consultant Fee[4]	PMU(Project Management Unit) (6)			16	925	3% of Construction Cost.
	Ordinary Consulting Services (7)			52	3,083	10% of Construction Cost.
	Sub Total (6)+(7)			68	4,010	
Total (1)+(2)+(3)+(4)+(5)+(6)+(7)				629	37,310	

1) Rate: 1FJD=JPY60
2) Unit Price of Land Acquisiton Cost at surburban area is estimated as a harf of that at town area. It shall be reviewed by Department of Land in the feasibility study stage.
3) Unit Price Source: The Study on Watershed Management and Flood Control for the Four Major Viti Levu Rivers in the Republic of Fiji Islands (October, 1998/ Yachiyo Engineering Co., Ltd)
4) Consultant fee is roughly estimated as 3%(PMU) and 10%(Ordinary Consulting Services) of Construction Cost.

14.6 Evaluation of Master Plan

14.6.1 Estimation of Damage Reduction and Effect of Projects

(1) Location and Quantity of Structural Measures

Number of work sites and lengths of structural measures are shown above. Out of proposed structural measures, channel improvement in the middle stream section is to be implemented as the priority project (short term measure).

Thus far, comprehensive flood management measure has not yet been implemented in Nadi River Basin. Reduction of flood damage is expected by implementation of proposed structural measures in the master plan.

(2) Flood Damage Reduction Area

By implementing the proposed structural measures with design scale of 1/50, damage reduction area by the master plan and the priority project is estimated as shown in Table 14-7. As the effect of the proposed project, flood disaster of estimated area can be eliminated.

Table 14-10 Estimated Flood Damage Reduction Area

Stage	Flood Damage Area (ha) (Before)	Flood Damage Area (ha) (After)[1)]	Damage Reduction Area (ha)
Priority Project [2)]	5,129 330	3,158 0	1,971 (-38%) 330 (-100%)
Master Plan	5,129	0	5,129 (-100%)

[1)] Inundation area in the proposed retarding basin is excluded.
[2)] Upper figure is inundation area in whole Nadi River Basin while lower figure is that of the priority area

14.6.2 Economic Evaluation (Tentative)

Project Cost (tentative) of Master Plan lead to EIRR 11.1%, B/C=1.11 and NPV JPY1.7billion (F$31million) respectively. This economic valuation is beyond the target investment rate of 10% in Fiji and show the adequate positive economic effect.

Economic Evaluation for priority project is reviewed through feasibility study.

Table 14-11 Economic evaluation for Master Plan

(Tentative as or summarization of Interim Report)

	EIRR	ENPV	B/C
Master Plan	11.1%	JPY 1.7 billion JPY	1.11

14.6.3 Natural and Social Environmental Considerations

(1) Impacts on Natural Environment

In general, the proposed structural measures are planned so as to maintain current water environment without drastic alternation of river course.

The proposed dam in upstream section is planned as dry dam which stores only flood discharge and functions as ordinary river course for normal discharge. Thus, no sediment is deposited in the reservoir area like storage dam. However, there is a possibility that the proposed structure will be changed to a group of small scale retarding basins in future depending on development of flood control technology, change of social environment in upstream basin and environmental issues.

The channel improvement in middle stream section is mostly widened without change of current riverbed level. Thus, current river environment is maintained in general.

In the downstream section, retarding basin is developed at left side with maintaining current land-use such as mangrove forest or agricultural land. Thus, current river environment is maintained in general.

(2) Initial Environmental Examination (IEE)

Expected environmental impact by implementation of the proposed structural measures in master plan is evaluated as initial environmental examination (IEE) as described in Chapter 12. As the results, environmental impacts can be prevented by optimal monitoring so that implementation of the proposed project is recommended.

(3) Resettlement

The number of resettlement by priority project is estimated as 28 households while that of master plan is 44 households. The projects shall be implemented with consensus with local residents.

(4) Non-structural Measures

As a non-structural measure, watershed conservation is proposed to maintain the natural environment in the basin.

14.6.4 Adaption against Climate Change

Regarding the environmental impacts of climate change, the Fifth Assessment Report (AR5) is published in 2013 to 2014 by IPCC. However, in the Stage-2 of Project, there was no specific assessment result in and around Fiji. Thus, based on the Fourth Assessment Report (AR4), changes of design scale assuming 21% increase and 16 % decrease of precipitation are examined. As described in section 5.5.4, the current design scale of 1/50 will be changed into approx. 1/15 in case of 21% precipitation increase and into approx. 1/200 in case of 16% precipitation decrease.

Under this circumstance, river channel is planned to minimize water level of flood discharge lower than top of bank elevations or natural ground surface out the dyke. By this means, risk of dyke break with higher water level is avoided resulting mitigation of disaster risk by excess floods. Besides, flood safety in surrounding area is also improved by reclamation or embankment of depressions and lowlands near river course. Furthermore, the non-structural measures are also proposed to mitigate flood disaster such as preparation of hazard map.

14.6.5 Relation with Integrated Water Resources Management (IWRM)

Flood control measures shall be discussed as a part of integrated water resources management (IWRM). Through this perspective, promotion of water resources management efficiency is proposed in the master plan such as establishment of water resources management system, water resources potential survey and watershed conservation.

14.6.6 Technical Evaluation

The proposed structural measures composed of the structures and methods which are commonly applied in flood control project. There is no technical difficulty for implementation and O/M.

14.6.7 Institutional Framework

Executing agency of project shall be clearly defined in the government of Fiji. Since the project implementation effects to many aspects, it is recommended to establish a Project Management Unit (PMU) consisting of relevant governmental agencies. It is also recommended to establish an organization and system to conduct O/M permanently.

14.7 Conclusions and Recommendations

14.7.1 Conclusion on Master Plan

In this Study, the flood control master plan is formulated with purpose of flood disaster mitigation in Nadi River Basin, consisting of structural and non-structural measures. It is evaluated as technically and economically feasible. Also, expected social environment issues are evaluated by IEE/EIA of which results are discussed in Chapter 12.

Table 14-12 Components of Master Plan (same table with Table14-7)

Measures	Phasing	Components
Structural Measures	i) Priority project (Short-term Measures)	(1) River channel widening works in midstream section (L=13km) (2) Retarding basin works in upstream section (A=km2, km2) (3) Enclosed dike works in Nadi river (L= km, km) (4) Ring dike works in Nadi River
	ii) Middle-term Measures	(5) Retarding basin works in downstream section (A=km2) (6) River channel works in tributaries (L= km, km) (7)Retarding basin works in tributaries (A=km2)
	iii) Long-term Measures	(8)Dam construction in upstream section (H= m)
Non-structural Measures *No. of the	i) Priority Project (Short-term Measures)	(1) Understanding disaster risk and risk avoidance A) Strengthening of understanding flood risk with flood hazard map

components in this table is the same with Table14-6		(5) Evaluation and feedback G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback
	ii) Middle-term Measures	(1) Understanding disaster risk and risk avoidance B) Strengthening flood forecasting technology (2) Enhancing disaster preparedness for effective response C) Strengthening disaster management system (3) Disaster risk management, risk avoidance D) Technical assistant for land-use regulation E) Strengthening river basin management (4) Economic disaster risk management F) Strengthening economic disaster risk management by regional BCP

14.7.2 Recommendations on Master Plan

(1) Steady Implementation of Master Plan

Severe flood risk mainly due to insufficient flow capacity of main channel of Nadi River shall be mitigated by steady implementation of the master plan. Especially, administrative process shall be commenced as soon as possible such as approval of the priority project in the government of Fiji, consensus building within the government and with local residents, financial arrangement, land acquisition and compensation, environmental monitoring and so on.

(2) Review of Master Plan

The master plan shall be reviewed considering change of socio economic and natural conditions of region such as progress of urbanization, flood occurrence and so on.

(3) Study on Proposed Dam in Upstream Section

Dam construction in upstream section and retarding basin construction in downstream and tributaries are proposed as a mid-term measures in the master plan. Further study shall be conducted early for implementation of both construction works.

(4) Land-use Control and Implementation of Non-structural Measures

After completion of the proposed structural measures initiating the priority project, inundation may happen in certain locations before the completion of the master plan. The priority project aims at preventing flood in the priority area including Nadi Town, and flood risk may remain the same along the tributaries such as Nawaka River and Malakua River. Besides, disaster risk against excess floods also remains even if the proposed structural measures in master plan are completed. Thus, land-use control and non-structural measures such as hazard map and early warning system are important especially flood prone areas after the priority project and the locations of retarding basins.

(5) Enhancement of Hydrological Monitoring and Analysis System

Hydrological monitoring system such as rainfall, water level, discharge, sediment flow and so on, shall be improved for future river management, capacity building on hydraulic and hydrological analysis, establishment and improvement of flood forecasting model, early warning system, monitoring and evaluation of flood control measures, and so on.

(6) Recording of Flood Disaster Data

Currently, flood disaster records are collected mainly by Natural Disaster Management Office (NDMO), however, it is not collected by uniform format. Flood disaster records are important basic data for city planning as well as flood control measures. Recording of flood disaster data in a certain manner and its accumulation are necessary.

(7) Drainage and Sewerage Improvement

Nadi Town is located in middle and downstream basin of Nadi River and suffers from inland water inundation as well as river flooding, especially lowland areas. Since the master plan does not cover the countermeasures against inland water inundation, drainage improvement shall be separately required to secure safety against flood disaster. Formulation of a master plan for drainage and sewerage is recommended.

(8) Water Resources

1) Support for the establishment of responsibility-taking organization and related organizations for IWRM

In the Nadi River Basin new development activities and population increase are to be anticipated by the implementation of flood control measures in the Nadi Basin. The necessity of management of water resources (quantity and quality) is to be anticipated to be increase. An integrated water resources management system will be necessary to be established as early as possible because the demand of irrigation water is to be increase due to the national policy to increase agricultural production and irrigation water disputes are possible to increase.

By the issue of "National Water Resources Management and Sanitation Policy", advisory groups such as "National Water Council" and "National Water Committee" and so on are to be established for integrated water resources management. After this the collection of data, information and arrangement of data-base and a secretariat are to be established in order to use effectively the function of the advisory groups and effective deliberations on decision of Ministry to have responsibilities of IWRM is to be possible to be conducted. The following support for arrangement is recommended.

- To promote the establishment of an office to have function of a secretariat of National Water Council and National Water Committee and strengthening of its fun
- To promote the establishment of an office for collection of data/information necessary to make decisions at national level on water resources management and public hygiene.

IWRM is recommended to be conducted by the organization under the Ministry of Infrastructure and Transport (MoIT) which is knowledgeable of planning, implementation and operation / management of public works. Department of Water and Sewage (DWS, under MoIT) is recommended to be a secretariat of National Water Council and National Water Committee since they have a specialty in the fields of water resources management and public health.

IWRM is to be managed by two districts of east and west due to the administrative system and IWRM of the Nadi River basin is promoted as a pilot of IWRM.

2) To support effective use of basin water resources

The water resources are to be used effectively based on the grasp of water demand.

In order to conduct effective use of the water resources integrated water resources management (IWRM) of water use sectors are necessary. In order to conduct effective use of irrigation water technical support for increase of agricultural production by water-saving type agriculture through a pilot project is recommended.

3) To support of the promotion of groundwater investigation and management

In the Nadi River Basin there are Fissure type aquifer, Artesian and Meigunyah Aquifer (60 km²) which is promising aquifer for water resources. But detailed groundwater investigation has not conducted yet, and the potential amount of groundwater resources is not grasped. In the Nadi River Basin the groundwater development (irrigation water, domestic water and mineral water) is anticipated to be increasing, and the grasp of groundwater amount and the introduction of groundwater management (monitoring and control of drilling boreholes) are recommended in order to promote optimum groundwater development.

4) To support of the promotion of groundwater investigation and management

In order to reduce pollution loads of the rivers and pollution of groundwater, in an early stage the arrangement of an effluent standard for industries and others is recommended.

Sewerage system is still in the stage of primary treatment, however, WAF has intentions to introduce secondary treatment, examine the quality of waste water discharge from industries, prepare an effluent standard and formulate a M/P for sewerage system, but the country is lack of experiences and technical supports are required.

5) To support for watershed management

Though conservation of the forest area, it is recommended to promote reforestation of thin forest area and grass land area, however, the forest area is all belong to land owners and the reforestation is desired to become sustainable production forest and for the purposes technical support is desired..

(9) Watershed Management

Runoff control in upstream basin is a key component of flood management. In Upper Nadi River Basin, devastation is processed due to surface erosion by slush and burn cultivation or intensive rainfall according to LWRM. Watershed conservation such as reforestation, forest conservation and land-use control is required.

In Middle and Lower Nadi River Basin, retarding basins are proposed in the master plan. Land-use control is important to maintain retarding functions.

By completion of the proposed structural measures in master plan, flood disaster cannot be prevented in certain locations along the main river. Disaster mitigation measures in the basin are also required such as land-use control and heightening of houses and road as second dyke is also required as well as non-structural measures.

(10) Establishment of Permanent Organization and System for River and Basin Management

Currently, river management is partially implemented by Ministry of Agriculture to protect villages and farmlands. Scale of target flood in the master plan is large and affects wide area in the whole basin such as forest areas in upper basin and urban areas in middle and lower basins. Integrated river management covering whole basin is required and permanent organization and systems for river and basin management is inevitable.

(11) Establishment of Management System for River Area

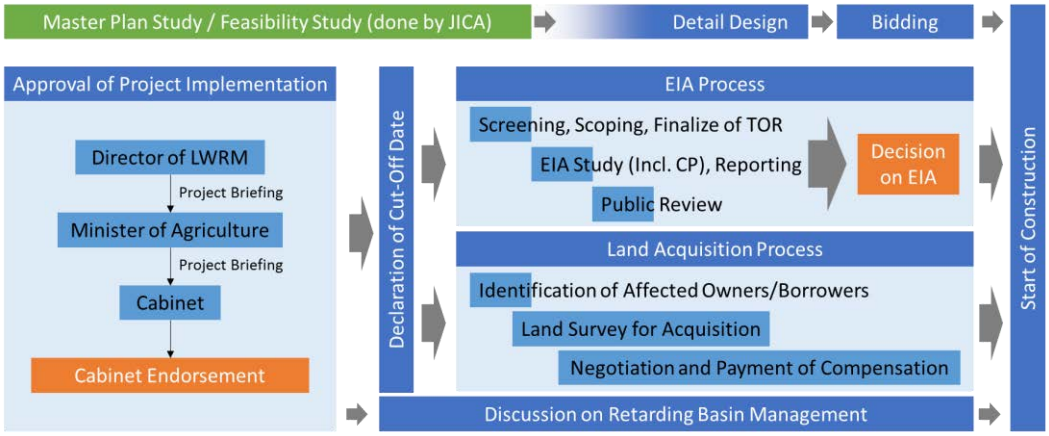
Through this Study, boundary of river area is established in the locations of priority project. The river area within the boundary shall be properly managed and utilization of the river area such as activity, building and land-use control shall be implemented with consensus building with relevant agencies, local governments and residents. Besides, the river boundary shall be clearly defined in the land-use plan of Nadi Town and surrounding areas.

The current river boundaries are set based on normal water levels in rainy season or past highest water levels, and its concept of river boundary setting is different from the concept of boundary setting for the priority project. Thus, current legal system for river boundary shall be reviewed.

(12) Further Process for Project Implementation by Fiji Side

1) Process to Project Implementation

Necessary process for implementation of the priority project is shown in Figure 14-OO which shall be commenced during or after F/S. Especially, EIA and land acquisition process shall be started immediately after approval of project implementation by the government of Fiji.



Source: JICA Study Team based on interview to Fiji Government

Figure14-18 Process for Project Implementation

2) EIA Proecss

Administrative process related EIA is governed by Department of Environment (DOE) of Ministry of Local Government, Housing and Environment and EIA of development project in whole country is handled by three EIA officers in DOE.

As described in Chapter 12, executing agency shall employ the registered EIA consultant for study and reporting related EIA. Screening to judge necessity of EIA, scoping to analyze estimated environmental impacts and to set survey items for EIA, and preparation and approval of EIA TOR can be implemented by executing agency itself.

All the necessary cost for EIA process shall be borne by each executing agency even public works (MOA in this project).

3) Land Acquisition Process

Administrative process related land acquisition is governed by Department of Lands (DOL) of Ministry of Lands and Mineral Resources. DOL provides documents to prove land ownership such as register book and executing agency conducts survey for land acquisition with utilizing private survey company. As to the public works, DOL can implement land acquisition survey by their survey unit when the unit has allowance in resources.

Based on survey results conducted by executing agency, compensation is determined through evaluation of land and building by Valuation Division of DOL and evaluation of crops by MOA. For public works, negotiation with land owners and related administrative process such as discussion with related agencies such as TLTB and Ministry of Town and Country Planning is conducted by DOL while financial arrangement and payment shall be done by executing agency. According to Valuation Division of MOA, half to one year period is required for land acquisition process for the priority project.

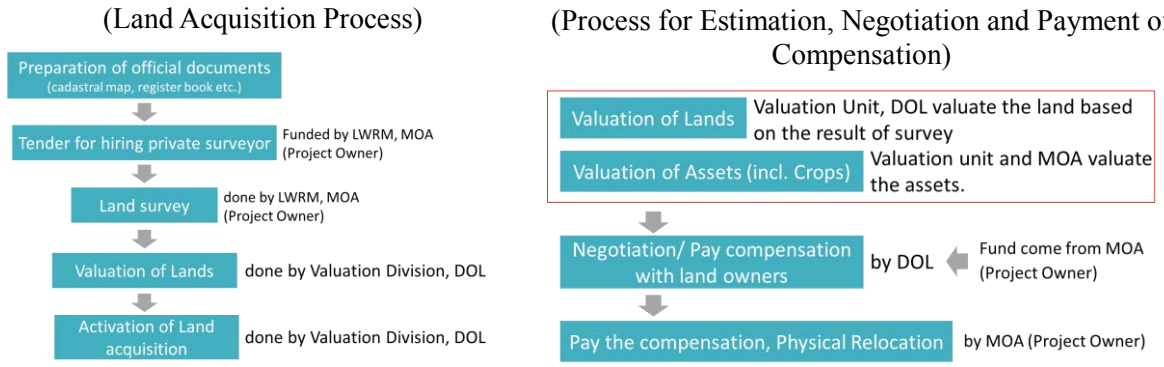
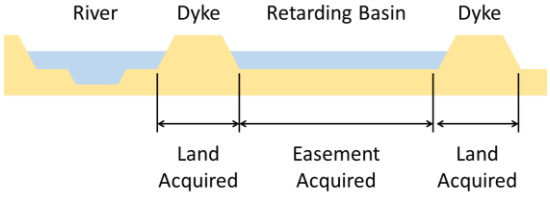


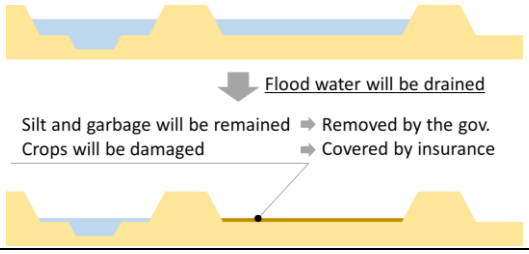
Figure14-19 Process and Responsible Organization for Land Acquisition

4) Management of Retarding Basin

Retarding basin, which is one component of the priority project, is newly introduced to Fiji by the Study and management system shall be established. According to DOL, regarding basins will be managed by LWRM as administrator. It is expected that retarding basin is managed with a guideline under current legal system which would be approved by Director of LWRM through dialogue between LWRM and DOL. Dialogue for establishment of retarding basin management system shall be commenced immediately after project approval. For a reference, examples of retarding basin management in Japan are shown below.

There are two cases of retarding basin management. One is that only land of dyke is acquired while retarding basin is managed with easement agreement. Another case is that all land is acquired. Sediment removal deposited in the retarding basin is conducted by public. Damaged crop is not compensated, however, agricultural insurance is provided as risk management of farmers.





Chapter 15 Selection of the Priority Project

15.1 Components of the Priority Project

15.1.1 Structural Measures

The Priority Project is determined as a plan which widen river channel in middle stream in Nadi River in order to protect Important Protected Area and mitigate negative impact by the priority project, which is approved through JCC as mentioned in Chapter 7, 7.7.3 and Chapter 15.

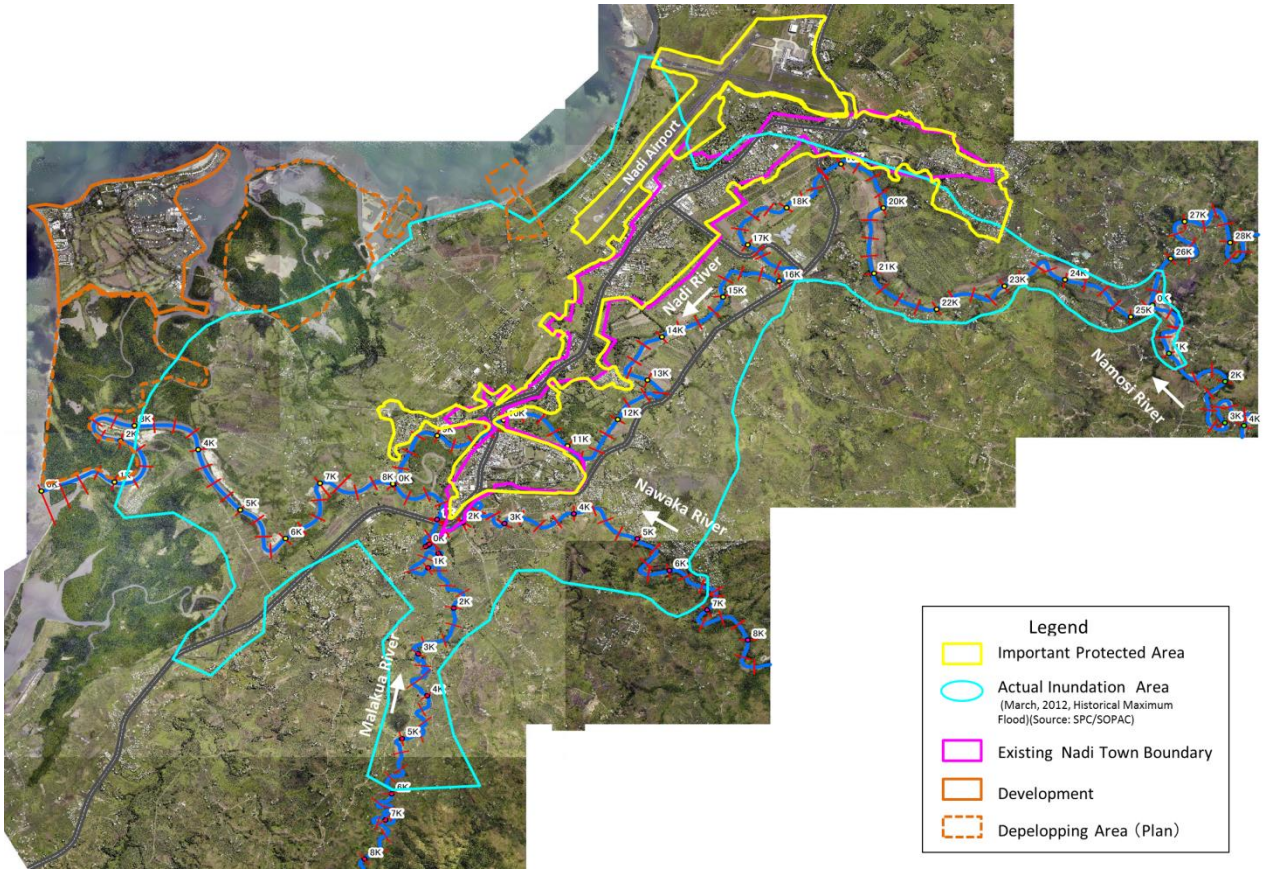


Figure 15-1 Important Protected Area

15.1.2 Non-Structural Measures

As a priority project of Non-Structural Measures, to avoid risks and to mitigate damages will be carried out with regard to protection of human lives for the top priority as well as to understand disaster risks and evacuation, under condition that the progress of structural measures project will be at initial phase.

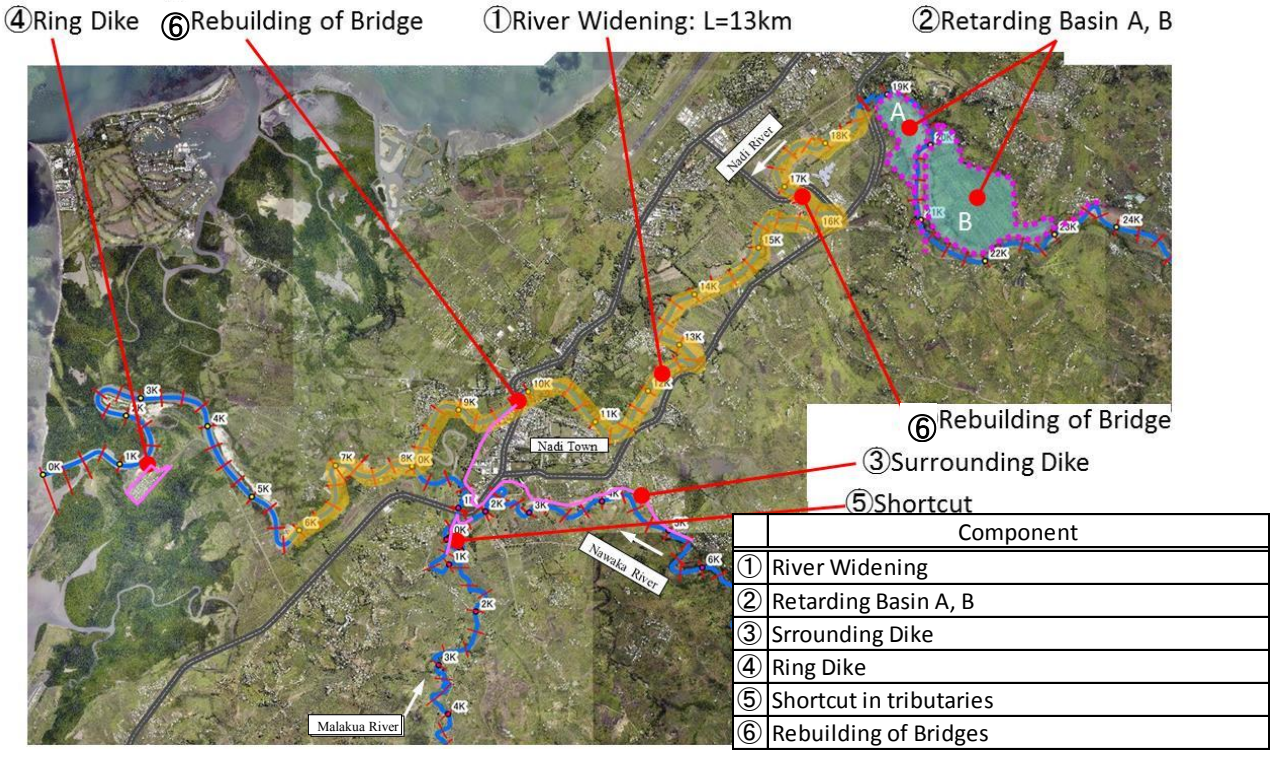
15.2 Goal Year of Completion of the Priority Project

Goal year of completion of the Priority Project is set as five years after the start of the Priority Project.

15.3 Contents of the Priority Project

15.3.1 Structural Measures

Contents of the structural measures are shown in Figure 15-2 and Table 15-1 aiming at prevention of flood in the flood protection prioritized area.



	Component
①	River Widening
②	Retarding Basin A, B
③	Srrounding Dike
④	Ring Dike
⑤	Shortcut in tributaries
⑥	Rebuilding of Bridges

Figure 15-2 Contents of the Priority Project (Structural Measures)

Table 15-1 Contents of the Priority Project (Structural Measures)

	River, Location		Component of the Master Plan	Component of the Priority Project		Remarks
				Main Component	Quantities	
Structural Measures	1. Nadi River	Downstream	(1) Retarding Basin and River Improvement in downstream	—	—	—
			(2) Ring Dike	④ Ring Dike	L=1.8 km	—
		Middlestream	(3) River Widening[2)]	① River Widening Rebuilding of Nadi TOwn Bridge Rebuilding of Old Queens Road Bridge	L=13 km L=108 m L= 96 m	—
			(4) Retarding Basin A	② Retarding Basin A	A=35 ha V=795 千m3	
			Retarding Basin B	② Retarding Basin B	A=178 ha V=6,920 千m3	—
		Upstream	(5) Dam and River improvement in upstream	—	—	
	2. Tributaries	Nawaka Maralua Namosi River	(6) River Improvement	⑤ Shortsut of Tributaries ③-2 Surrounding Dike of Nadi Town	L=0.5 km L=4.5 km	Shortcut and Surrounding dike in tributaries are preceded to construction as part of the master plan
			Retarding Basins (13 sites)	—	—	

15.3.2 Non-Structural Measures

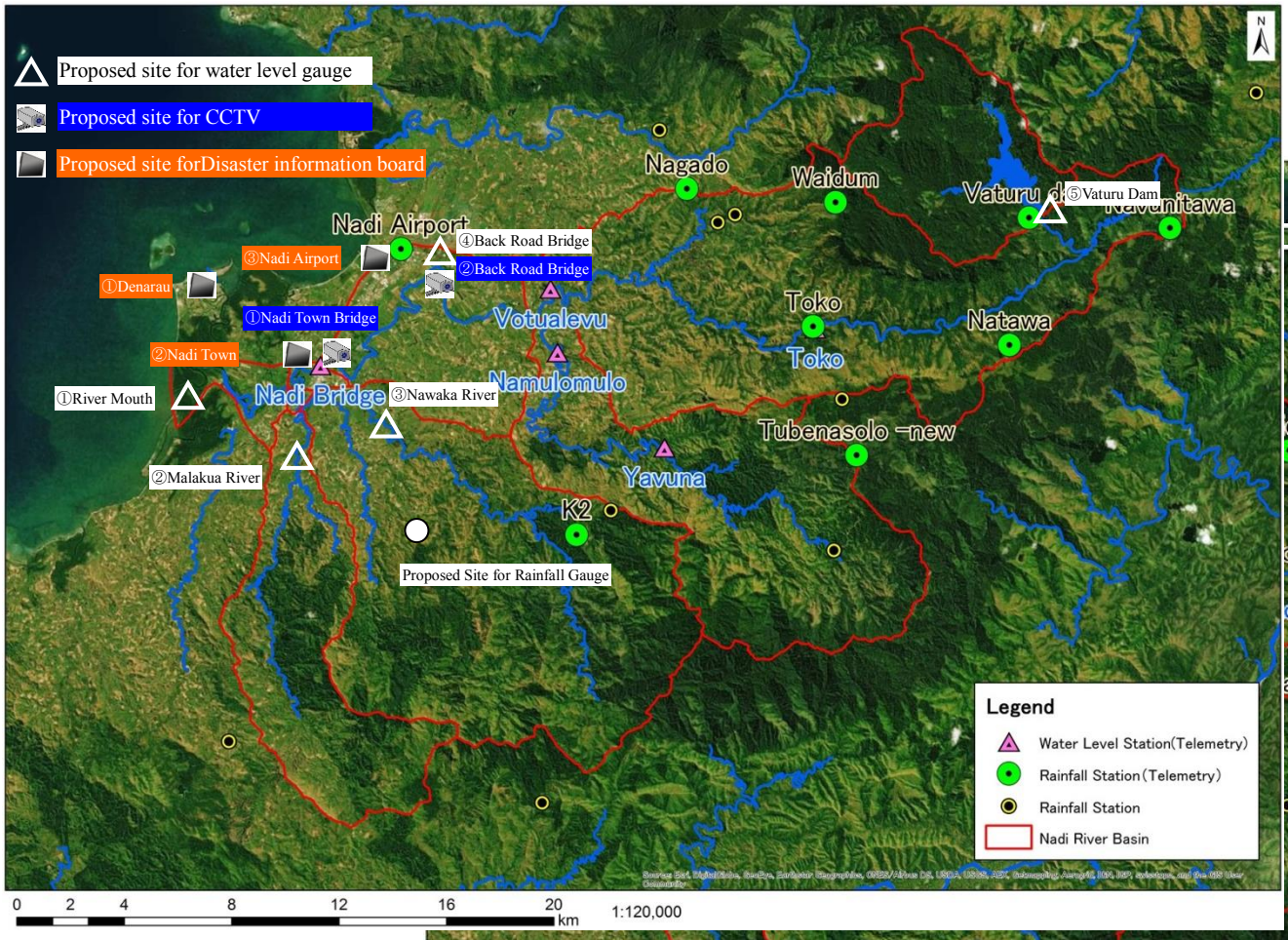
As mentioned above, protection of human lives, understanding of disaster risks and evacuation are considered as a top priority, under condition that the progress of structural measures project will be at initial phase.

Therefore, activities accompanied with development and disclosure of hazard maps and development of hydrological devices for awareness of flood risks will be implemented. In addition, in order to evaluate the effect of non-structural measures in the past or priority projects, and in order to connect to "Better disaster prevention", evaluation and feedback system on the past projects will be designed and built up.

Table 15-2 Contents of the Priority Project (Non-Structural Measures)

	Phase	Measures
Non-structural Measures	i) Priority Project (Short-term Measures)	・Understanding disaster risk and risk avoidance A) Strengthening of understanding flood risk with flood hazard map B) Strengthening flood forecasting technology, such as expansion of rainfall gauge, water level gauge and introduction of real-time monitoring camera ・ Better Disaster Prevention G) Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback

Proposed Meteor- Hydrological Observation Equipment are as shown in Figure15-3 and Table15-3. They are proposed considering change by structural measures of the Priority Project, location of important river facilities such as retarding basin and Vaturu dam and area where observation is lack.



※Disaster information board will be installed in l
Source: JICA Study Team

Figure 15-3 Draft Plan to

Table 15-3 Number of Proposed Meteor- Hydrological Observation Equipment

Development of Meteor-Hydrological Observation Network				
Equipment	Automatic precipitation gauge	Nos	1	To establish in Nawaka river basin,
	Automatic water gauge	Nos	7	To establish 4 equepments in river and 2 in retarding basin, 1 in dam
	CCTV	Nos	5	To establish 4 equepments in river and 2 in
communication equipment	Base unit for Meteor-Hydrological Observation Network	Nos	0	Use Existing system
Head Office	Base unit for CCTV	Nos	1	FMS
Disaster imformation Board	—	Nos	3	Nadi town, Denarau, Nadi Air port

※Disaster information board will be installed in long-term project ,Not include in the priority project

15.4 Suggested Implementation Schedule of the Priority Project

Suggested implementation schedule of the Priority Project is shown in Table 15-4.

Table 15-4 Suggested implementation schedule of the Priority Project

Work Item		費用	20XX-20XX	20XX-20XX				
				1	2	3	4	5
	Study on M/P							
	Detailed Design							
I. Structural Measures								
I-A. Priority Project (Short Term Measures)								
1	**River channel widening works in midstream section**							
1)	River channel widening works in midstream section, L=13km							
2	**Retarding basin works in upstream section**							
1)	Retarding basin (A) works in right bank side in Nadi River, A=35ha							
2)	Retarding basin (B) works in left bank side in Nadi River, A=178ha							
3	**Ring dike**							
1)	Ring dike, L=1.8km							
4	**Shortcut in tributaries / Surrounding dike works in Nadi River**							
1)	Shortcut in tributaries, L=0.5km							
2)	Surrounding dike, L=4.5km							
II. Non-structural Measures								
1	**Understanding disaster risk and risk avoidance**							
1-1)	Strengthening of understanding flood risk with flood hazard map							
1-2)	Strengthening flood forecasting technology							
2	**Enhancing disaster preparedness for effective response**							
2-1)	Strengthening disaster management system							
3	**Disaster risk management, risk avoidance**							
3-1)	Land use regulations							
3-2)	Strengthening river basin management							
5	**Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback**							
5-1)	Establishing a system of evaluation of Pre-disaster activity / existing measures and feedback							

Note: *including loan agreement, EIA, land acquisition, procurement of consultant (D/D, C/S), detailed design, preparation of PQ and tender document and so on.

15.5 Project Cost for the Priority Project (tentative)

(1) Structural Measures

The project cost (tentative) for structural measures is estimated as shown in Table 15-5.
This project cost includes only base cost of structural measures and does not include amount of price escalation, contingency, construction interest and so on. Detailed cost will be reviewed and estimated at the F/S stage.

Table 15-5 Project Cost for the Priority Project

(Tentative as of summarization of Interim Report)

Rough Project Cost for Priority Project

Item				Rough Project Cost for Priority Project[1] FJD (million)	Rough Project Cost for Priority Project JPY(million)	Rough Project Cost for Priority Project JPY(million)
Construction	Construction Cost (1)	Direct Construction Cost(A)	Permanent Works(a)	100	5,900	—
			General Works(b)	20	900	
		In-direct Construction Cost (B)=(a+b)×30%		40	2,000	
		Sub Todal (A+B)		150	8,700	
	Construction Administrative Cost (2)=(1)×20%			30	1,800	
	Sub Total (1)+(2)			180	10,300	
Land Acquisiton and Compensation	Land Acquisiton Cost (3)[2]			20	700	—
	Compensation Cost (4)[3]			10	100	
	Administrative Cost (5)=((3)+(4))×20%			10	200	
	Sub Total (3)+(4)+(5)			20	1,000	
Consultant Fee[4]	PMU(Project Management Unit) (6)			5	309	3% of Construction Cost.
	Ordinary Consulting Services (7)			18	1,030	10% of Construction Cost.
	Sub Total (6)+(7)			23	1,340	
Total (1)+(2)+(3)+(4)+(5)+(6)+(7)				223	12,640	

1) Rate: 1FJD=JPY60
2) Unit Price of Land Acquisiton Cost at surburban area is estimated as a harf of that at town area. It shall be reviewed by Department of Land in the feasibility study stage.
3) Unit Price Source: The Study on Watershed Management and Flood Control for the Four Major Viti Levu Rivers in the Republic of Fiji Islands (October, 1998/ Yachiyo Engineering Co., Ltd)
4) Consultant fee is roughly estimated as 3%(PMU) and 10%(Ordinary Consulting Services) of Construction Cost.

(2) Non-Structural Measures

The project cost (tentative) for non-structural measures is estimated as follows..
This project cost includes only base cost of non-structural measures and does not include amount of price escalation, contingency, construction interest and so on. Detailed cost will be reviewed and estimated at the F/S stage.

Table 15-6 Project Cost for the Priority Project

(Tentative as of summarization of Interim Report)

Meteor- Hydrological Observation Equipment		Unit	Quantity	Cost		Remark
				(JPY)	(FJD)	
Equipment	Automatic rainfall Gauge	Set	1	14,400,000	264,220	Nawaka River Basin 1,
	Automatic Water Level gauge	Set	1	100,800,000	1,849,541	River 4, Retarding Basin 2, Dam 1
	CCTV	Set	1	72,000,000	1,321,101	River 4, Retarding Basin 2, Dam 1
Communication Equipment	Base unit for Meteor-Hydrological Observation Equipment	-	-	-	-	Current System
Head Office	Base unit for CCTV	Set	1	1,200,000	22,018	FMS
Construction Cost				188,400,000	3,456,881	

*) Rate (2016.1 JICA Rate)
1 FJD= 54.5

Source: JICA Study Team

15.6 Evaluation of the Priority Project

15.6.1 Estimation of the effects of the Priority Project

(1) Location and Quantity of Structural Measures

Number of work sites and lengths of structural measures are shown in Figure 15-2 and

Table **15-1**.

Comprehensive flood management measure has not been implemented in Nadi River Basin yet. Reduction of severe flood damage especially in the flood protection prioritized area is expected by implementation of proposed structural measures in the Priority Project.

(2) Flood Damage Reduction Area

Design scale of the Priority Project is set as excess probability of 1/50. Elimination of flood inundation in the flood protection prioritized area is set as the goal (Estimated inundation area / flood damage area by the flood simulation analysis equals zero). Damage reduction area by the priority project is estimated as shown in Table 15-7. As the effect of the proposed project, flood disaster of estimated area in the flood protection prioritized area can be eliminated.

Table 15-7 Estimated Flood Damage Reduction Area

Stage	Flood Damage Area (ha) (Before)	Flood Damage Area (ha) (After)[1)]	Damage Reduction Area (ha)
Priority Project [2)]	5,129 330	3,158 0	1,971 (-38%) 330 (-100%)

[1)] Inundation area in the proposed retarding basin is excluded.
[2)] Upper figure is inundation area in whole Nadi River Basin while lower figure is that of the priority area

15.6.2 Economic Evaluation

Economic internal rate of return (EIRR), economic net present value (ENPV) and benefit/cost ratio (B/C) of the Priority Project are summarized in Table 15-8. EIRRs exceed 10%, which is estimated as opportunity cost for investment in Fiji, while ENPVs and B/Cs also exceed 0 and 1, respectively. It is evaluated that the proposed priority project and master plans are economically feasible. Detailed economic evaluation will be implemented at the F/S stage.

Table 15-8 Results of Economic Evaluation

(Tentative as of summarization of Interim Report)

Stage	EIRR	ENPV	B/C
Priority Project	16.9%	JPY 79 billion	1.91

15.7 Assistance for Formulation of the Abbreviated Resettlement Action Plan (Drat)

The Abbreviated Resettlement Action Plan will be formulated through F/S stage by Fiji Government. The outline, items to be examined and field survey are summarized in this chapter.

15.7.1 Estimation of the effects of the Priority Project

The reason of resettlement by the Priority Project and its number is shown in Table 15-9

Table 15-9 Outline of Resettlement by the Priority Project

Item	Outline
Reason of resettlement	Land acquisition for river widening, development of retarding basin and construction of dike by the Priority Project.
Number of affected household※	Inside the project area: approximate 32 households (this number is approximate estimation at the timing of interim report submission). Besides, there is possibility of 17 out of 32 households will be compensated instead of relocation.

***** Result of preliminary count by areal phot taken in 2013.

15.7.2 Formulation of the Abbreviated Resettlement Action Plan (Drat)

The contents, implementation plan for related survey and important points of the Resettlement Action Plan (RAP) are shown in Table 15-10.

Table 15-10 Abbreviated Resettlement Action Plan (Drat)

Item	Outline		
Contents of RAP	Duration of formulation	From September, 2015 to February, 2016 (Plan)	
	Contents	(1) Institutional framework for resettlement and land acquisition, (2) Necessity of relocation, (3) Socioeconomic survey, (4) compensation of loss and measures for restoring of living (5) plan of the land for relocation, (6) mechanism of grievance redress, (7) Implementation framework, (8) Implementation schedule (9) Cost and fund source, (10) Monitoring framework by implementer, (11) Public consultations	
Contents of the task for resettlement and land acquisition	Duration of formulation	From November, 2015 to January, 2016 (Plan)	
	Contents	Field Survey	(1) Social and Economic Survey, (2) Needs survey for restoring of living, (3) Survey of replacement cost
		Public Consultation	Two times for target group (affected persons)
	Implementation structure	These activities will be conducted by the team of JICA study team and its sub-contracting	
	Management structure	The expert of Environmental and Social Consideration	

15.7.3 Formulation of Abbreviated Resettlement Action Plan and Items to be examined

The table of contents of RAP is shown in Table 15-11. The contents will be finalized after the confirmation of Fiji government side. Main C/Ps related RAP are DOL and MOA. DOL has responsibility for land acquisition of public works. MOA has responsibility for river and firm land management. MOA is also assumed implementation body for the Project.

Table 15-11 is the outline of RAP which formulation is assisted by the project. The table also shows the progress of examination. In F/S stage, the RAP will be finalized by DOL, MOA and other related organizations.

Table 15-11 Outline of Abbreviated Resettlement Action Plan

Chapter	Chapter / Contents	Items already done	Items will be done in F/S stage
1	Needs of Land Acquisition and Resettlement	—	—
1.1	Project component and affected area ➢ This chapter shows the outline of components of the Priority Project and expected affected area.	X	
1.2	Alternatives to avoid and minimize the influence of the project ➢ This chapter shows alternatives which examined at the progress of the Priority Project formulation.	X	
1.3	Method for minimize the resettlement ➢ This chapter shows countermeasures to minimize the relocation.	X	
2	Regal Framework for Land Acquisition and Resettlement	—	—
2.1	Fiji Laws on Lands and Ownership ➢ This chapter shows acts and regulations for land and its owning.	X	

2.2	Fiji Laws on Land Acquisition and Compensation ➢ This chapter shows acts and regulations for land acquisition and compensations.	X	
3	JICA's policy for Resettlement ➢ This chapter shows JICA's guideline of resettlement	X	
4	Gaps between JICA Guideline and Fiji's legal Frameworks ➢ This chapter shows the gap between JICA guidelines and Fiji regulations, measures for filling the gaps.		X
5	Policy for Land Acquisition and Resettlement for the Project ➢ This chapter shows policy of land acquisition and resettlement for the Project.		X
6	Scope of Resettlement Impact		
6.1	Population senses ➢ This section shows result of social and economic survey (Population).		X
6.2	Land and Asset ➢ This section shows result of social and economic survey (Lands and Assets).		X
6.3	Living and lifestyle survey ➢ This section shows result of social and economic survey (Living and lifestyle).		X
7	Concrete Measures for Compensation and Support		
7.1	Impact and Compensations by the Project ➢ This section shows impacts of the project and methodology of compensations.		X
7.2	Compensation for Loss of Assets ➢ This section shows loss of assets by the Project and measures of compensations.		X
7.3	Assistance on Entitlements for land acquisition and resettlement ➢ This section shows assistance on entitlements.		X
7.4	Countermeasures for Restoring of Living ➢ This section shows countermeasures for restoring of living when required.		X
7.5	Relocation Land ➢ This section shows countermeasures for relocation land preparation when required.		X
7.6	Entitlement Matrix ➢ This section shows method of compensation in the type of loss basis.		X
7.7	Responsible Institutions of Land Acquisition and Resettlement ➢ This section shows responsible institution of land acquisition and resettlement		X
7.8	Land Acquisition Procedures ➢ This section shows procedure of land acquisition		X
7.9	Responsible Institutions and Mechanism of Grievance Redress ➢ This section shows responsible institutions of land acquisition and resettlement and mechanism of grievance redress		X
7.10	Resettlement Implementation Schedule ➢ This section shows the schedule of resettlement after the payment of compensation.		X
7.11	Cost and Fund Source of Land Acquisition and Resettlement ➢ This section shows cost and fund source of land acquisition and		X

	resettlement.		
7.12	Monitoring Framework by Implementation Institutions ➢ This section shows monitoring framework of land acquisition and resettlement.		X
7.13	Public Consultations and Stake Holders Meetings ➢ This section shows result of public consultations for land acquisition and resettlement.		X
8	Draft of Monitoring Form		X
9	Environmental Check List		X
10	List of Stake Holders		X

15.7.4 Field survey for Abbreviated Resettlement Action Plan

The items to be confirmed by social and economic field survey are shows in Table 15-12.

Table 15-12 Items of social and economic survey

Survey Items	Nos of location	Methodology	Items for analysis
Population	All of Project Area	Interview survey	Households (including type of house) and Populations (including affected land owner who don't live in the affected area)
Lands and Assets	All of Project Area	Field inspections and Paper survey (Official Documents)	Situation of land owing and using, Buildings, crops and cattle etc.
Living and Lifestyle	All of Project Area	Interview survey	Means of obtaining income, Cultural back ground etc.
Valuable Groups	All of Project Area	Interview survey	Category and population

CHAPTER 16 Major Meetings in Fiji

16.1 Schedule of Meetings in Fiji

The meetings held or to be held in the Project is summarized as follows. TORs and members of TWG and JCC are attached in Appendix-6.

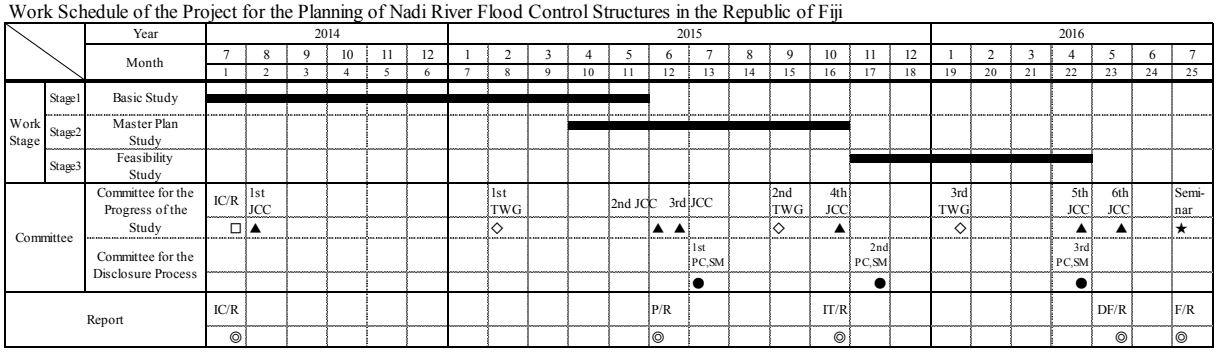
Table 16-1 Meetings in the Project

Types of Meetings						Date	Objective, Summary
No	MOA	JCC	TWG	PC&SM	Seminar		
1	1st	—	—	—	—	Aug. 22, 2014	<Objective> ・ Approval for IC/R by Counterpart, MOA <Summary> ・ IC/R is explained and approved by MOA
2	—	1st	—	—	—	Sep. 2, 2014	<Objective> ・ Approval for IC/R by Counterpart, JCC <Summary> ・ IC/R is explained and approved by JCC
3	—	—	1st	—	—	Feb. 4, 2015	<Objective> ・ Progress Reporting, Information Sharing <Summary> ・ Progress of survey and its findings are reported to TWG. ・ Technical transfer is done through technical discussion on issues on hydraulic analysis and formation of flood control plan.
4	2nd	—	—	—	—	May 26, 2015	<Objective> ・ Approval for P/R by MOA <Summary> ・ Results of Basic Study results in Stage-1 are reported, and P/R is approved by MOA with comments through the intensive discussion.
5	—	2nd	—	—	—	Jun. 3, 2015	<Objective> ・ Approval for P/R by JCC <Summary> ・ Results of Basic Study results in Stage-1 are reported, and P/R is approved by JCC with comments through the intensive discussion.
6		3rd				Jun. 30, 2015	<Objective> ・ Approval for the basic concepts of the Master Plan and the Priority Project by JCC <Summary> ・ Approval for the basic concepts of the Master Plan and the Priority Project by JCC
7	—	—	—	1st	—	Jul. 2, 2015	<Objective> ・ Dissemination of the Project ・ Hearing from Residents and Stakeholders
8	—	—	2nd	—	—	Sep. 1, 2015	<Objective> ・ Progress Reporting ・ Results of the 3rd JCC Meeting
9	3rd	—	—	—	—	Oct. 30, 2015	<Objective> ・ Report of Study Results in Stage-2 ・ Approval for M/P and Priority Projects by MOA ・ Approval for IT/R by MOA
10	—	4th	—	—	—	Nov. 2, 2015	<Objective> ・ Report of Study Results in Stage-2 ・ Approval for M/P and Priority Projects by JCC ・ Approval for IT/R by JCC
11	—	—	—	2nd	—	Dec 9, 2015	<Objective> ・ Dissemination of M/P and Priority Projects ・ Hearing from Residents and Stakeholders
12	—	—	3rd	—	—	End of Jan., 2016	<Objective> ・ Progress Reporting ・ Hearing on F/S from Related Agencies

Types of Meetings						Date	Objective, Summary
No	MOA	JCC	TWG	PC&SM	Seminar		
13	4th		—	—	—	April 25, 2016	<Objective> ・ Progress Reporting of Feasibility Study except economic evaluation ・ Approval for Contents of Presentation in PC&SM by MOA
14	—	5th	—	—	—	End of Feb., 2016	<Objective> ・ Progress Reporting of Feasibility Study except economic evaluation ・ Approval for Contents of Presentation in PC&SM by JCC
15	—	—	—	3rd	—	End of Mar., 2016	<Objective> ・ Dissemination of F/S Results ・ Hearing from Residents and Stakeholders
16	5th	—	—	—	—	End of Apr., 2016	<Objective> ・ Reporting of Study Results ・ Approval for DF/R by MOA
17	—	6th	—	—	—	End of Apr., 2016	<Objective> ・ Reporting of Study Results ・ Approval for DF/R by JCC
18	—	—	—	—	1st	July 13, 14, 2016	<Objective> ・ Technical Transfer through Seminar

IC/R: Inception Report Meeting,
JCC: Joint Coordination Committee,
TWG: Technical Working Group
PC&SM: Public Consultation and Stakeholder Meeting,
Seminar: Seminar in Fiji

Work Schedule of the Project for the Planning of Nadi River Flood Control Structures in the Republic of Fiji



(*)This TWG will be held if necessary after discussions about situation and necessity with MOA

[Meetings]
IC/R : Inception Report Meeting
JCC : Joint Coordination Committee
TWG : Technical Working Group
PC : Public Consultation
SM : Stakeholder Meeting

[Report]
IC/R : Inception Report
P/R : Progress Report
IT/R : Interim Report
DF/R : Draft Final Report
F/R : Final Report

Figure 16-1 Schedule of Meetings in Fiji

16.2 Inception Report Meeting

The inception report meeting was held with the objective to obtain approval for Inception Report by the Counterpart of the Project, MOA. The JICA Study Team explained the IC/R and it was approved through intensive discussion as shown in the following photos. MM and attendant list of the meeting is attached in Appendix-7.

Photo 16-1 Inception Report Meeting

16.3 1st JCC Meeting

The 1st JCC Meeting was held with the objective to obtain approval by the JCC. Through the explanation by the JICA Study Team and discussion, it was approved. MM and attendant list of the meeting is attached in Appendix-7.

Photo 16-2 1st JCC Meeting

16.4 1st TWG Meeting

The 1st TWG Meeting was held with the objectives to share information related to the Project such as obtained findings through the survey and analysis and issues, as well as technical transfer. The JICA Study Team explained to the TWG members and discussed. MM and attendant list of the meeting is attached in Appendix-7.

Photo 16-3 1st TWG Meeting

16.5 2nd JCC Meeting

The 2nd JCC meeting was held with the objectives to report the study results in Stage-1 including draft of flood control plan and to obtain approval for the Progress Report by JCC. Through the explanation by the JICA Study Team and discussion, it was approved. MM and attendant list of the meeting is attached in Appendix-7.

Photo 16-4 Progress Report Meeting

16.6 3rd JCC Meeting

The 3rd JCC meeting was held with the objectives to obtain an approval from the JCC for the basic concepts of the Master Plan (flood control) and the Priority Projects. Through the explanation by the JICA Study Team and the discussion, river widening of the Nadi River was approved for the concepts of the flood control in the Nadi River basin.

Photo 16-5 2nd JCC Meeting

16.7 2nd TWG Meeting

The 2nd TWG Meeting was held with the objectives to share the progress of the Study, the results of the JCC meeting and the issues regarding implementation of the Project. The JICA Study Team explained to the TWG members and discussed.

Photo 16-6 2nd TWG Meeting

16.8 4th JCC Meeting

The 4th JCC meeting was held with the objectives to introduce review results of the Master Plan (flood control) and basic concept of the Priority Project which was approved by JCC at previous JCC and to obtain an approval for the Interim report from JCC. Through the explanation by the JICA Study Team and the discussion, review result of the Master Plan (flood control) and basic concept of the Priority Project, and Interim Report were approved by JCC.

Photo 16-7 4th JCC Meeting

16.9 3rd TWG Meeting

The 3rd TWG Meeting was held with the objectives to share the progress of the Study, the results of the JCC meeting and the issues regarding preliminary design, and social and environmental issues of the Project. The JICA Study Team explained to the TWG members and discussed.

Photo 16-8 3rd TWG Meeting

16.10 5th JCC Meeting

The 5th JCC meeting was held with the objectives to obtain an approval from the JCC for the result of the feasibility study of the Priority Projects except result of economic evaluation. Through the explanation by the JICA Study Team and the discussion, the result of the feasibility study of the Priority Projects except result of economic evaluation was approved for the concepts of the flood control in the Nadi River basin.

16.11 6th JCC Meeting

The 6th JCC meeting was held with the objectives to obtain an approval from the JCC for the result of the feasibility study and Draft Final Report. Through the explanation by the JICA Study Team and the discussion, the result of the feasibility study and whole study was approved for the concepts of the flood control in the Nadi River basin.

Photo 16-9 6th JCC Meeting

16.12 Technical Seminar in Fiji

Technical Seminar was held with the objectives to introduce Japanese Technology in disaster management and to realize adaptive river management and flood control in Fiji.

The outline of seminar is as shown following page. Lectures by 4 (four) Japanese side presenters and presentations by 3 (three) Fiji side were conducted. Details are as shown in seminar report.

Photo 16-10 Technical Seminar

Technical Seminar for Nadi Flood Control Project in Fiji
Outline

1. Objective

To introduce Japanese Technology in disaster management and to realize adaptive river management and flood control in Fiji.

2. Date

July 13 and 14, 2016

3. Venue

Tanoa International Hotel at Nadi

4. Programs

＜Fiji Side＞

④ *NATIONAL DISASTER MANAGEMENT OFFICE*
Mr. Sunia Raatulevu, National Disaster Management Office

⑤ *Integrated Water Resources Management Nadi Basin Demo Project (GEF funded Pacific IWRM project)*
Mr. Vinesh, Previous Principal Agricultural Officer, MOA

⑥ *Outline of counterpart training in japan and Future RIVER MANAGEMENT in Nadi River Basin*
Mr. Josefa Nawai, Mr. Colin Simons, LWRM, MOA

＜Japanese Side＞

⑥ *Seminar for Nadi River Flood Control Project (Outline of the Study)*
Mr. Yoshio Nakagawa, Team Leader, JICA STUDY TEAM

⑦ *The Preventive Approach to Disaster Reduction & Ways to Ensure the Sustainability of National Disaster Reduction Efforts Hints from the Japanese Experience*
Mr. Satoru NISHIKAWA Ph.D, Executive Director of Research, JCADR

⑧ *River Engineering for River Management*
Mr. Hiroshi TAKEBAYASHI, Assoc. prof.
Disaster Prevention Research Institute, Kyoto University

⑨ *Rivers in Japan and Outline of River Governance*
Mr. Motoo FUJIYOSHI, Fellow, Japan Civil Engineers Society
Executive Standing Advisor, Yachiyo Engineering Co., Ltd.

⑩ *River Administrator's Response at the Time of Flood River Administrator's Response at the Time of Flood*
Mr. Hideki Meguro River Information Policy Planning Office,
River Planning Division, Water and Disaster Management Bureau
Ministry of Land, Infrastructure, Transport and Tourism (MLIT),