CHAPTER 4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Introduction

4.1.1 Objectives

The objectives of the environmental impact assessment (EIA) for the priority project are as below:

1) To describe the environmental setting in the project area

2) To analyze the impacts from the project implementation on the environment

3) To recommend measures for mitigation of any adverse impact from the project

4) To formulate an environmental management and monitoring plan

5) To consider measures for environmental mediation

4.1.2 Environmental Guidelines

The EIA shall follow the following guidelines:

1) Environmental Guidelines V. for River and Sabo Engineering (JICA, 1992)

2) Fiji's Sustainable Development Bill, Part III – Environmental Impact Assessment (Ministry of Urban Development, Housing and Environment, 1996)

4.1.3 Scope of Work

(1) Project Activities

The priority project includes Nadi diversion channel and shortcut channel. The EIA shall consider all the activities in the construction and operation of these two channels.

The diversion channel shall divert a flood flow up to 1,500 m^3/sec (1/20 probability flood) from the right bank of Nadi river at 14.6 km upstream from river mouth. It shall pass along the Enamanu road and discharge the flood to the Nadi Bay. The maximum dimension (corresponding to a 1/20 probability flood) of the channel is shown in Table-J4.1

The shortcut channel shall discharge the river flow from the 9.0 km point straight forward to the 7.5 km point upstream from river mouth. Its dimension is shown in Table-J4.1.

Along with the construction of the diversion channel, other facilities shall also be constructed. These include a bridge at the crossing of the channel with the Queens road, a bridge for sugarcane tram, roads along the two banks of the channel and replacement of some sections of sugarcane tramline, water supply and sewage pipe lines, electricity and telephone cables.

Table-J4.1 Dimensions of Diversion Channel and Shortcut Channel

Diversion Channel*			
Total Length	Approx. 3,300 m	Bed Width	60 m
Top Width**	100 m	Land Acquisition Area***	108.8 ha
Shortcut Channel			
Total Length	Approx. 250 m	Bed Width	30 m
Top Width**	60 m	Land Acquisition Area	2.4 ha

* corresponding to 1/20 probability of design flood

** average width

*** including an area of 49 ha for disposal of the excavated materials

(2) Environmental Elements

The environmental elements to be studied shall basically be those specified in the JICA Environmental Guidelines (JICA, 1992) with consideration of the suggestion of the Dept. of Environment. Based on the results of the initial environmental examination (IEE) conducted for the Master Plan (refer to Chapter 2), some of the environmental elements have been considered not to be possibly under any impact from the project. They shall therefore not be included in the checklist for the EIA. Table-J4.2 shows all the environmental elements to be reviewed in the following paragraphs.

Table-J4.2 Environmental Elements for the EIA

Social Environment	Natural Environment	Environmental Hazard
Resettlement	Topography & geology	Water pollution
Community separation	Groundwater	Noise & vibration
Economic activity	Coastal area	Soil pollution
Traffic facilities	Flora & fauna	
Fishing right*	Landscape	
Public health		
Solid waste		

* The term, "Water Right/Right of Common", includes water right and fishing right, but there exists no problem of water right for the diversion channel and shortcut channel.

4.2 Environmental Settings

4.2.1 Social Environment

Nadi is renowned for its valuable contribution to the national economy due to its revenue generating potential from tourism and being the gateway of Fiji Islands. Nadi sub region has a multiracial and multicultural population totaling 30,791 according to the 1996 census for the urban and suburb areas – consisting of 38.5 % Fijians, 55.7 % Indians and 5.8 % other races.

Due to the mountainous terrain of the region and the opportunities of employment, more than 80 % of the population live in the lower and fertile floodplains. While the mean population density is about 40 per km^2, on the average 10 to 20 people per km^2 or less live in the mountainous uplands.

The project area for the diversion channel is within the Namaka/Wailoaloa district and that for the shortcut channel within the Nadi Town district. In addition to tourism industry, small scale manufacturing and sugarcane farming are the main economic activities.

Four major resorts are located along the Nadi bay shores. The Denarau Island Resort, Vulani Island Resort and Club Fiji Resort have been fully developed while the Fantasy Resort at Wailoaloa shorefront is under development. The Wailoaloa beachfront is currently a recreational spot for local people and tourists – mostly for picnics, sailing and water boating. There is also a crematorium yard at the beachfront for post cremation rituals especially for the Hindu community in Nadi area.

The Nadi International Airport is a major landmark near the project area. Civil Aviation Authority of Fiji is implementing the project for runway extension to cater for the increasing demand.

The Queens Road is another major infrastructure in the project area for traffic accesses between Nadi and Lautoka areas. Also within the project area there is the McDonald's restaurant which is the first of this kind in Fiji and the only one in the Nadi district. For transporting sugarcanes to the sugar mill in Lautoka, several tramlines lie in the project area.

The Nadi area is served by a very good water supply system with almost 100 % population using tap water for domestic purpose. There is a sewage system collecting waste water from most of the town area. Nadi sewage treatment center has a capacity to serve about half of the total population. The Nadi Town has an organized solid waste collection and disposal system managed by the Nadi Town Council. An average of 20 trucks load of garbage and refuse are collected per day. Unfortunately up to now there is no specific site for dumping of solid waste. Instead the Nadi Town Council carries most solid waste and dumps it at Lautoka. There is only a small dumping site near Wailoaloa beach used by local residents.

4.2.2 Natural Environment

The Nadi river catchment is dominated by steep mountainous area deeply incised by small creeks and streams which contribute to the Nadi river flow. To the lower reach of the river where Nadi Town is located, flood plain stretches from the mountain foot to the coast of the Nadi Bay.

The Nadi Bay is known as a good breeding area for various marine life including the endangered turtles partly because of its isolation from possible hazardous contaminants. Several studies (Raj and Seeto, 1986; Harrison Grierson Consultants Ltd., 1989; Barrett Fuller and Partners, 1990) have confirmed the existence of many species of mullets, garfishes, ponyfishes, grunters, snappers, mud skippers and crabs in the river channel and mouth area.

To the northeast and southwest sides of the project area, i.e., Vulani and Denarau areas, mangrove strips provide a good buffer zone for the inter-tidal marine species and the adjoining residential and agricultural lands. The total area of mangrove within the Nadi sub district is 3,614 ha, of which 546 ha has been reclaimed, leaving 3,068 ha undisturbed (Dept of Town & Country Planning, 1996). Most of the mangroves on the seaward side

are Tiri Alliance and Stunted Tiri Alliance with Selala Alliance being dominant to the landward side. These mangrove forests were classified as resource reserve and traditional use zones except those developed for Denarau and Vulani resort area (Watling, 1987).

A great variety of soil types exist within the Nadi area – most are highly weathered humic latosols with varying contents of clay, silt and sand. Except during excessive rainfalls, the erosion resistance of these soils is fairly high due to their cementing agents. However, many agricultural soils are eroded and degraded because of careless tillage methods and other unwise land use practices.

In Nadi and Sabeto flood plain, there are groundwater aquifers with limited potential within the gravel and alluvial deposits. Present groundwater use is for gardening and sometimes for domestic use in emergency.

4.2.3 Environmental Hazard

Flooding is by all means the heaviest hazard in the Nadi area since it frequently occurs during the wet season and affect both the inner township area as well as the Namaka-Nadi and Sigatoka-Nadi approaches to the town which lies adjacent to or within the lower terrace of the Nadi river. The condition of flood damage has been fully described in Supporting Report Part E.

Soil and coastal erosion is another issue to be accounted for. The main types of erosion occurring are sheet, reel and coastal erosion. Sheet erosion mostly occurred on flat agricultural land where rich top soil are washed away during heavy rain fall; reel erosion occurred mostly along the Nadi river bank, coastal edges and at steep slope at the foot of the Sabeto Range; and coastal erosion is likely to arise in the reclaimed area around Denarau and Vulani Island under long term coastal drift of sand, or from waves and storm surge caused by short term events such as hurricanes. One of the main reasons for soil erosion is thought to be the increasing competition for flat land for residential, commercial, industrial and recreational purposes resulting in the shift of agricultural land to steeper marginal land where bad agricultural practices and frequent bush fire of the talasiga land has increased erosion five to nine times the rate of that of natural cover (Dept of Town & Country Planning, 1996).

Aircraft noise has impacts on the community around Nadi Airport. People complain about the noise especially as airplanes take off or land at light time. Loose restrictions on subsonic jet aircraft are thought to be the main reason.

Since the major industrial and residential centers in the Nadi area are built on low-lying ground, poorly or semi-consolidated predominantly shallow-marine to fluvial strata and close to major river systems or the coast, there lies the danger of landslide or ground subsidence especially during flooding.

As has been mentioned above, solid waste disposal is still a problem in Nadi area – transport of solid waste to Lautoka affects sanitary condition on roads and streets; garbage and refuse are sometimes dumped to rivers, coastal area or vacant land at some place; the temporary dumping site at Wailoaloa is not well managed.

Although water quality is thought to be good in Nadi area, there are some places where sewers discharge domestic wastes or effluent from septic tanks directly to river channels and result in water contamination.

4.3 Impact Analysis

4.3.1 Nadi Diversion Channel

Nadi diversion channel is planned as the main flood control structure for Nadi area. During a flooding up to a return period of 20 years, it will divert most of the flood flow to the Nadi Bay leaving a discharge of 300 m^3/sec in the existing river channel. The area downstream of the diverting point, where Nadi town and most of the tourist and commercial centers are located, will be effectively protected from inundation that has occurred almost every year. The positive impacts on the regional development are apparent.

Since the diversion channel is a large structure, its construction shall involve an excavation volume up to 2.3 million m^3, dike construction and supplementary works such as bridges, roads, and so on. With a length of 3.3 km and a width about 100 m (top width) with an additional area of 49 ha for disposal of excavated soil, land acquisition for its construction will associate with relocation of certain households. Completion of the diversion channel will also alter the landscape and more or less affect the natural environmental condition in the project area. Therefore, an assessment of all the possible impacts from the project becomes necessary. The following paragraphs will analyze item by item the extent of each of the envisaged impacts and at the same time give considerations on the countermeasures to mitigate the adverse impacts.

(1) Social Impacts

1) Land Acquisition and Resettlement

Figure-J4.1 shows the area where the diversion channel will go through and land acquisition will take place. As can be seen from the colored area, most of the lands are currently for agricultural use, with three smaller pieces for residential use. Just in front of the Nadi bay, there is the Wailoaloa beach area for recreation use. Some lands behind the beach are vacant at present time.

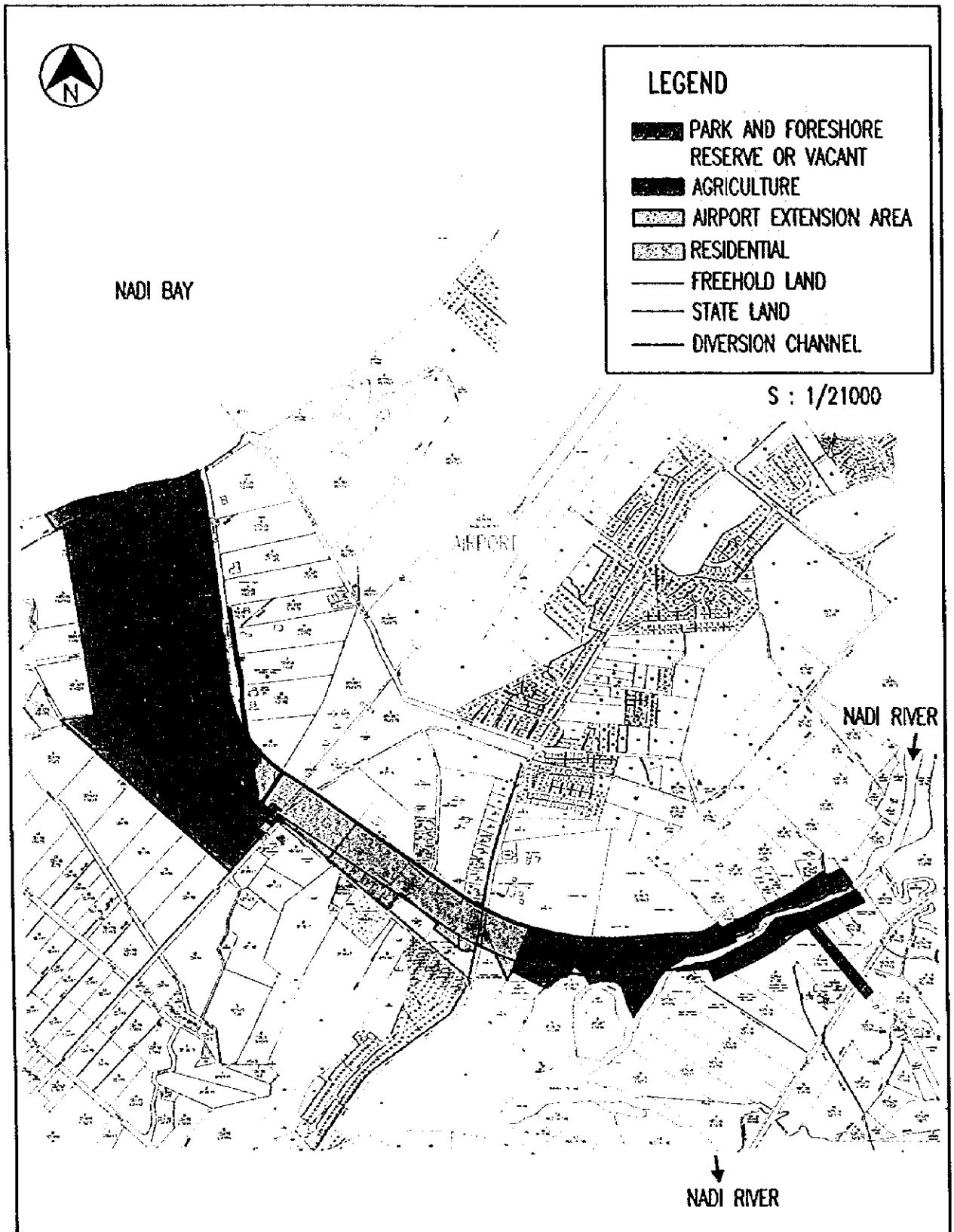

Figure-J4.1 Land Acquisition Area for the Diversion Channel

Within this area, 36 households will possibly be involved in a resettlement program when the diversion channel is to be constructed. Table-J4.3 shows the general condition of these households according to the results of an interview survey for this study. The number of households has been counted for all the houses that may more or less affected by the project and are thought to be the maximum. It is seen from the table that about 20% of the households are farmers who depend mainly on sugarcane farming near their houses. The others include government/company/hotel employees, people running small scale business themselves and some without permanent occupation. Two third of these households are Indian. From their housing condition, it has been judged that most of these households belong to middle to lower class in Nadi area. More than half of the families reported their per capita annual income lower than F$ 2,000, some even as low as F$ 100.

Asked about their opinion on the diversion channel construction, most people showed their understanding of the importance of flood control since they had suffered from flood damage year by year. They would not object to resettlement when the government decides to build the diversion channel but want to be given good care as they move to a new place and also reasonable compensation on the lose of their properties.

Table-J4.3 General Condition of the Households to be Possibly Involved in the Resettlement Program

Number of Households	36	Average Building Area	190.9 m^2
Average Family Member	5.7	Average Building Value	F$ 73,060
Family Annual Income (per person)		Building Type (% in Building Area)	
> F$ 10,000	3.0 %	Concrete	38.4 %
F$ 5,000 – 10,000	9.1 %	Timber	33.3 %
F$ 2,000 – 5,000	18.2 %	Corrugated Iron	28.3 %
< F$ 2,000	63.6 %	Land Status (for house and land)	
Unknown	6.1 %	State Land (Leased)	54.5 %
Race		Freehold	45.5 %
Fijian	24.2 %	Crop Type (for farmers)	
Indian	72.8 %	Sugarcane	73.3 %
Others	3.0 %	Vegetable	20.0 %
		Rice	6.7 %
Occupation			
Farmer	30.2 %	Self Employed	9.1 %
Employee	45.5 %	Others	15.2 %

Note: (1) Number of households for resettlement is counted for all the houses that are within the area for diversion channel construction and excavated soil disposal or adjacent to the channel.
(2) All the figures in the table are based on the questionnaire sheets answered by the interviewed families.

For almost all farmers, resettlement may affect their means of living. Their farming lands are located near the project site. Therefore, they will be reluctant to move to a place far away. As for the employees and business men, they are willing to live near their working place as well. Therefore, land acquisition and resettlement are very sensitive problems and need good arrangement and organization from the pre-construction stage. All these should be under government's well planned program for the project.

2) Community Separation

Although the project will not cause community separation, people living near Enamanu road may feel inconvenient during and after the diversion channel construction since it is difficult to provide more foot bridges across the channel for easy access between the two banks. For some farmers, their farming land will be separated from their houses and longer time will be spent to reach their working place. However this study has considered using the two banks of the channel as roads for local people. The condition of access to the direction of Queens Road will certainly be improved. The bridge planned for sugarcane tram line and another across the channel near the coast can also provide access in between the two sides.

3) Economic Activity

To those people involved in the resettlement program, certain adverse impacts are anticipated on their business or economic activities. Since the McDonald's food center is near the crossing point of the diversion channel with the Queens Road where a new bridge will be built, its business will be affected during the project construction. However, to the whole area, positive impacts will compensate or even overwhelm the minus factors. Firstly, the construction work will provide employment opportunity to many people and this will in turn require provision of living utilities, foods and other services, which will certainly stimulate development of the related businesses. Secondly, the project is to be implemented side by side with other developments such as resorts and hotels, recreation centers, green parks, etc., which will activate the economy in this area. Thirdly, as a result of flood control, the probability of flood damage will be remarkably reduced and steadier development in the whole Nadi sub region is expectant.

4) Traffic in the Related Roads

The diversion channel will cross the Queens Road and go parallel with the Enamanu Road. In order to understand the traffic condition on these two roads, the Study Team conducted a survey on traffic volume at the crossing of Queens Road and Enamanu Road near McDonald's on a weekday from 6:00 a.m. to 8:00 p.m. (see Figure-J3.2 for the location of survey points). Figure-J4.2 shows the hourly traffic volume distribution. As for the traffic volume by vehicle type, passenger car takes 53 % and then does small truck (21.5 %), microbus/minivan (16.9 %), large bus (5.3 %) and heavy truck (3.3 %) at section I shown in Figure-J3.2. The results show that traffic volume is almost evenly distributed in the day time from 7:00 a.m. to 6:00 p.m. at Queens Road with an average traffic volume of about 820 vehicles per hour. The maximum volume is 1,214 vehicles per hour.

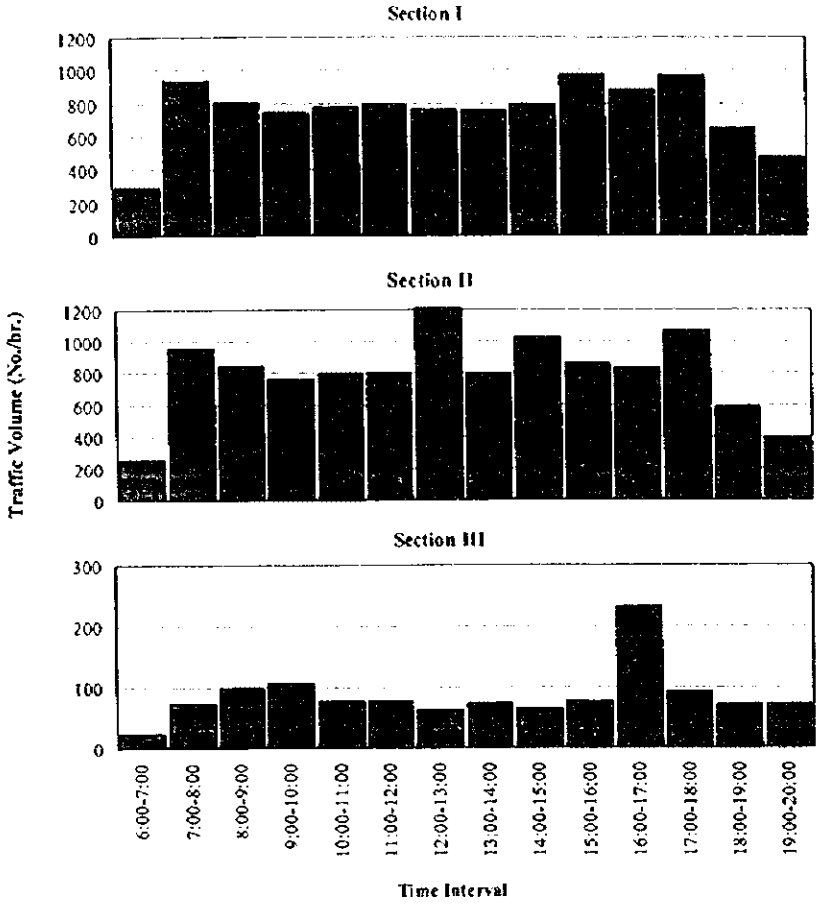

Figure-J4.2 Hourly Traffic Volume Distribution

During project construction, a bridge shall be constructed on the Queens Road at its crossing with the diversion channel. This will inevitably result in a temporary stop of the existing road. At that time, a by-pass road shall have to be provided with the same width and quality as the existing road for keeping traffic conditions unaffected. Similar measures shall have to be taken for the Enamanu Road during the construction work, because the diversion channel will go side by side with this road. However, since this road will be the main access to the project site, it will be broadened before the construction work. Therefore, no blockage on traffic to the Nadi Bay direction is anticipated.

Vehicles shall be employed for transporting machinery, construction materials, excavated soils and labors to the project site. This will include vehicles travelling through the Queens Road and at the project site. The former are mainly for machinery and construction materials and the later mainly for transporting excavated soils since the disposal site is near the construction site. Therefore, the increase of traffic volume on Queens Road will not be so significant.

5) Fishing Right

Figure-J4.3 is the map showing the customary fishing right of river mouth and ocean area near the project site. The area can be divided into the following four regions according to the demarcation of fishing right:

- Yavasa VA: in front of Wailoaloa beach toward Nadi Bay
- Vanua Sabeto: Saveto river mouth area
- Nakovacake: off Nadi Bay area including the mangrove forests to the south west of the project area
- Vanua Nadi: Nadi river mouth area including Denarau Island

Although not clearly shown in the map, the customary fishing right of Nadi River belongs to Vanua Nadi.

Since the outlet of the diversion channel is at Nadi Bay, the fishing right problem has to be taken into account before project construction. Consulting with Yavasa VA and Nakovacake will be necessary through the Dept. of Lands, Native Lands and Fisheries Commission.

6) Public Health Problem with the Diversion Channel

The diversion channel will work only when flood discharges exceed the design capacity (e.g. 300 m^3/sec) of the existing Nadi river. In normal times, it will just have a periodical flow under the tidal influence if there is no flood gate at the outlet, or have no flow at all if a flood gate is installed to stop the tides. In the later case, some stagnant water may be kept in the channel as has been experienced in many places in Fiji. The direct results may be mosquito breeding, emitting of unpleasant smell or odor, and unwanted growth of vegetation in the channel. This problem has been pointed out by many specialists and thought to be hazardous to public health in the surrounding area. Therefore, it is not recommendable from an environmental viewpoint that flood gates should be provided to stop tidal flow into the channel although this is a common practice in Fiji as a measure for preventing sea water intrusion (see 3) Groundwater of (2) Impacts on Natural Environment and 3) Soil Pollution of (3) Hazard Related Issues below for groundwater and soil pollution).

7) Solid Wastes

The construction work will result in generation of large quantity of soils from excavation. Most of the excavated soils will be used for the channel embankment, and the residuals will be used for land reclamation in the disposal area. Therefore, no soils will have to be transported to other places for final disposal except for bulky construction wastes which should be disposed according to Fiji's solid waste management regulations.

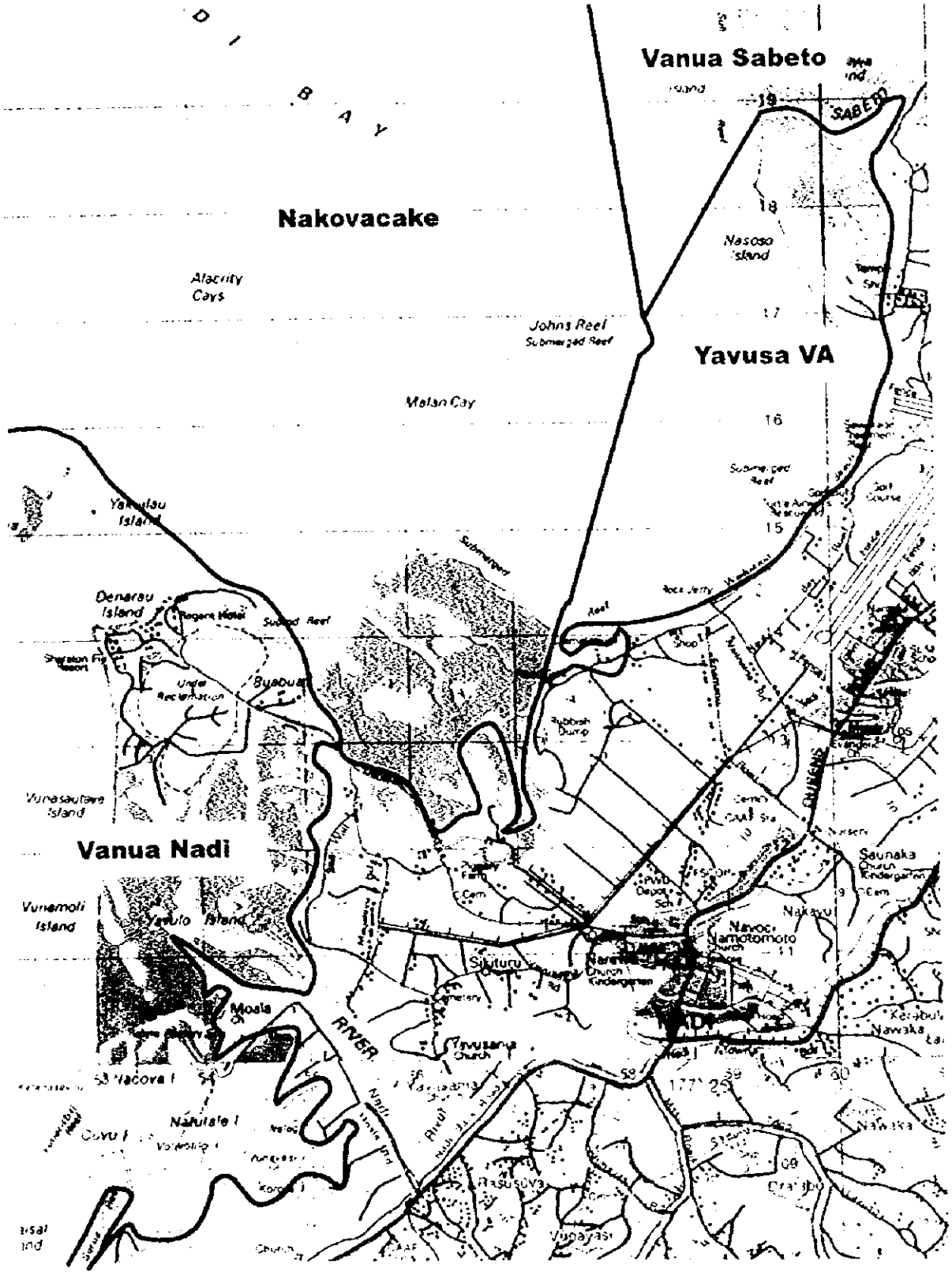

Figure-J4.3 Customary Fishing Right in the Project Area

(2) Impacts on Natural Environment

1) Topography and Geology

Generally speaking, the diversion channel construction will change the topographic condition in this area. The upper half of the channel will go through a gently hilly area where deep excavation up to 8 ~ 13 meters will be required at some locations for channel construction, while the lower half of the channel will go through a low-lying flat plain where the channel embankment will be elevated up to 5 meters above the ground.

Geologically, semi-consolidated clayey sand, gravely sand and sandy clay form the sound layer are distributed along the whole route of the diversion channel. The sound layer is overlaid by alluvial deposits composed of unconsolidated sandy gravel and clay, which is further overlaid by a very loose and soft sandy silt layer at the downstream area of the channel. Such a characteristic geological condition has to be taken into consideration in the design of the diversion channel, especially for its downstream half where the embankment is elevated.

2) Coastal Area

The effect of diversion on coastal area has been discussed in Supporting Report Part I, Coastal Investigation. No significant erosion or deposition in Nadi Bay is anticipated from the diversion channel construction.

In front of the Wailoaloa beach area, there are no coral reefs in existence. The existing coral reefs nearest to the diversion outlet are those at Malan Cay which is about 3.5 km away. Other well grown coral reefs are distributed around Alacrity Cays (5.0 km away) and Yakuilau Island (6.0 km away). The Institute of Applied Sciences, USP carried out a continuous monitoring of coral reefs at these locations regarding the impacts from Denarau marina development (Lovell, E. R. et al 1991; Lovell, E. R. et al 1993; Tamata, B. R. et al 1994). They pointed out the mortality of some coral species such as *Acropora* at Alacrity Cay, Malan Cay and Yakuilau Island from July 1992 to October 1993, and considered that Cyclone Kina would be the main reason of the damage on corals. At Malan Cay, coral development was poor as compared to the other offshore sites.

After the diversion channel construction, sediments carried to Nadi Bay may have impacts on coral reefs in this area, especially those at Malan Cay. However, since the bottom of the diversion channel at its inlet is higher than that of the existing river channel, this may result in sedimentation of most of the bed load and suspended solids in the existing river channel. Therefore only a limited amount of suspended sediments will be carried through the diversion channel to Nadi Bay. It should also be pointed out that at present time Nadi Bay is already a receiver of flooding discharge from the flood plain because the existing Nadi river has a too small capacity to discharge a flood flow.

The mangrove forests at southwest side of the project area will not be affected by the diversion. Contrarily, with the diversion channel conveying flood flow at upstream side, the channels within the mangrove area will no longer function as flood ways as they do at present time. This will benefit mangrove conservation in this area.

Seagrass beds are poorly developed along the foreshore of the Wailoaloa beach according to the Study Team's investigation.

3) Groundwater

In normal times, seawater intrusion may be a problem due to inward tidal flow through the diversion channel. This may result in an increase of salinity of groundwater in the surrounding area. To understand the groundwater quality, electric conductivity (EC) measurement was conducted for the 12 boreholes drilled along the planned diversion route during the geological survey for this study. Table-J4.4 shows the E-C measurement results.

Table-J4.4 EC-Measurement of Borehole Water

Borehole No	Depth (m)	EC (μS/cm)	Description
B-1	5.0	1080	Nadi River side
B-2	6.0	411	-
B-3	7.0	115	-
B-4	4.5	120	-
B-5	5.0	161	-
B-6	5.0	205	-
B-7	3.0	580	-
B-8	2.0	1000	-
B-9	1.5	2700	-
B-10	1.5	5600	Near a drainage channel
B-11	2.0	10000	Near a drainage channel
B-12	1.0	4000	Sea side

Most of the borehole waters are fresh (No.2 – No.7) with No.1 at Nadi River side and No.8 – No.12 near the beach showing a tendency of salinity increase. The two with salinity higher than 5000 μS/cm (No.10 and No.11) are thought to be affected by drainage channels near the boreholes.

The Study Team also investigated the present condition of groundwater usage in the surrounding area. As a result, only 4 wells are found from the right bank of Nadi river to beach front. Among them, 3 are already dry and the only one with water is not used anymore. Therefore, there is almost no groundwater usage in this area.

Although no direct impacts on groundwater usage are anticipated, groundwater resource protection as well as soil pollution control (see 3) Soil Pollution of (3) Hazard Related Issues below) should be put into consideration. It is recommendable that the channel bottom and side walls should be firmly compacted to minimize infiltration of salty water and any plantation inside the channel should be strictly forbidden, except grass covering for bank protection.

4) Flora & Fauna

In the project area, mangrove is the most important flora which has been mentioned above in 2) Coastal Area of (2) Impacts on Natural Environment. On Wailoaloa beach, there are remnants of littoral forests and beach vegetation which has already been much altered by the influence of regional development. Coconut plantations, though not extensive, cover part of the area. The diversion channel construction may inevitably need clearance of some plantation area or cutting some trees. It is recommendable that

new plantation area be created to maintain or even increase green coverage in this area. This has already been considered in the land use plan for this project (see Supporting Report Part G, Land Use and Regional Development).

Wading birds utilize the mangrove and intertidal areas for feeding and roosting. They are the main fauna in this area. The main species include mangrove herons (*Egretta sacra*), wild ducks (*Anas superciliosa*), jungle mynah (*Acridotheres sp*) and crested terns (*Sterna bergii*) (Harrison Grierson Consultants Ltd., 1989). Since the route of the diversion channel is through the flood plain area, no impacts are anticipated on these birds.

5) Landscape

After the project, a new water way will appear in this area resulting in a change of the landscape. Since its outlet is at Wailoaloa beach and not far from several existing and planned resorts, the appearance of the diversion channel will be very important to the tourist development in this area. If it appears as only a bare channel, it would obstacle the view of tourists, but if aesthetic factors are taken into consideration in the engineering design, the impacts may become positive. For this reason, hotel, park and housing development has been woven into the scheme of planning (see Supporting Report Part G, Land Use and Regional Developments).

(3) Hazard Related Issues

1) Water Pollution

During project construction, pollutant load may increase due to employment of machinery, labors and result in water pollution of Nadi River and Nadi Bay, such as an increase of suspended solids, oil and grease, organic matters. Measures should therefore be taken to minimize water pollution. Excavation should be carried out in a way not to cause large quantity of soils entering river flow or being washed into the bay. Machinery should be well maintained and operation well organized that leakage of oil or lubricant can be prevented. Temporary toilets with waste disposal tanks should be provided sufficiently for workers at the job site. Disposal of any kind of rubbish or wastes should follow regional regulations.

In the operation phase, since no pollutant source would be added to the river or ocean, water pollution will not be a problem. For the Nadi River downstream of the diversion, a base flow of 300 m^3/sec will be kept when the diversion channel is working. Therefore, the problem discussed in the IEE of this study (see Chapter 2) would not be encountered.

As mentioned in 6) Public Health Problem with the Diversion Channel of (1) Social Impacts, it is not recommendable to use flood gates to stop tidal flow into the diversion channel under a consideration of the problem of water stagnation which may bring about unwanted growth of weeds and aquatic plants, odor etc. With the influence of tidal flow, seawater intrusion may more or less occur and the direct result may be an increase of salinity of groundwater and soil pollution. Therefore, it is recommended that the channel bottom and side walls should be firmly compacted to minimize salty water infiltration. Groundwater salinity and water level monitoring is also recommended. However, the impact of seawater intrusion may not be significant since the area of

agricultural land in the vicinity of the diversion channel will decrease according to the regional development plan.

2) Noise and Vibration

The machinery to be employed for the diversion channel construction will include crawler crane, truck crane, excavator, bulldozer and dump trucks. The noise level of a bulldozer at working is about 90 dB within a distance of 2 m, and that of the other machinery is about the same or lower. If 4-6 machines are working simultaneously at the same location, the resultant noise level is estimated to be 96-98 dB. The noise level may decay to less than 85 dB at a distance of 10 m. There is no regulation in Fiji on construction work regarding noise level yet. Referring to the regulation in Japan, a construction work with a noise level higher than 85 dB is only permitted in day time (Kajima Corporation, 1993).

Along the route of the diversion channel and in its surrounding area, there are few densely populated areas. Generally speaking, the impacts of noise and vibration from project construction may not be very significant, but the construction work should be carried out only in day time.

3) Soil Pollution

As has been mentioned in 3) of (2) above for groundwater, under the influence of inward tidal flow in the diversion channel in normal times, seawater intrusion may result in an increase of groundwater salinity. This may also cause a build-up of soil salinity. In the project area, most of the agricultural lands are for sugarcane farming. Although sugarcane is not a crop sensitive to soil salinity (Ayers R. S. and Westcot D. W., 1985), soil pollution protection should still be considered. The countermeasures are the same as those proposed for groundwater protection.

4.3.2 Nadi Shortcut Channel

(1) Social Impacts

The area where the Nadi shortcut channel is planned is a rural area with half of the land vacant and half for agriculture. There are no houses built in this area and therefore no problem of resettlement will be encountered for the channel construction. The only problem is that part of the land is Native Reserve. According to Fiji's law, the Native Reserve is originally assigned as the reserved area for the subsistence of the native Fijians, i.e., it can only be leased to Fijians. For this reason, direct use of these lands for the channel construction is impossible. A recommendation is to find some vacant State Land near this area and exchange the status of that land with the Native Reserve. There has been such kind of practice in Fiji for some governmental projects.

The shortcut channel construction may more or less affect agricultural activity in the project area. But after the construction, flooding water from the upstream Nadi river will flow through the shortcut channel directly to the downstream side and the existing river channel will only discharge the flow from the Nawaka river. As a result, water can flow through these channels smoothly without overflow to the flood plain as that often happens at present time. This will surely benefit agricultural development in this area.

At the shortcut channel construction site, there are only some unpaved access roads for local residents. No significant impacts on traffic facilities are anticipated. Disposal of the excavated soil should be taken into consideration. There are vacant lands that can be used for soil disposal and then be reclaimed for agricultural or other developments.

(2) Impacts on Natural Environment

Comparing with the diversion channel, the shortcut channel will be more similar to a natural river course and will not much alter the natural condition in this area. No significant impacts on the natural environment are anticipated.

(3) Hazard Issues

The shortcut channel will not bring any contaminants to the river or surrounding area. The construction work will be completed within a very short period of time. Therefore, noise and vibration will not become a big problem during the construction.

4.4 Environmental Management and Monitoring Plans

4.4.1 Environmental Management Plan

Environmental management is important from the pre-construction stage to the post-construction stage. This includes not only the management of environmental issues related to the project, but also those related to environmental improvement in the whole project area. Recommendations can be given as followings.

(1) Organization for Environmental Management

Under the project office which is supposed to be organized by the government, there should be a branch with at least one acting officer in charge of environmental management. The environment branch shall make plans for environmental protection and improvement, and manage all activities related to the environment. A good coordination among the project office, local government and environment agencies are also very important.

(2) Management of Resettlement and Land Acquisition

Resettlement and land acquisition are very sensitive to social impacts and have to be well managed. Totally 36 households will possibly be involved in the resettlement program. Careful inventory of their houses, lands and properties, hearing on their opinion and desire are indispensable. In addition to compensation, provision of locations for them to get new residential houses are also very important.

(3) Environmental Surveillance of Construction Work

Construction work should follow environmental regulations. This needs a well organization of the work and also surveillance during the work. Dispute may occur with local residents on environment related issues, or complaints may come to the project office or local government. These issues need to be resolved on the basis of environmental laws and regulations.

(4) Safety Management of the Diversion Channel

The diversion channel shall only be used as flood control structure but not for other purpose. Its safety management includes the channel's structural safety and the safety of people who operate the channel or live near the channel as well as tourists entering the channel area.

To keep the channel's structural safety, the Government should put forward regulations on all issues related to its management and usage. Arbitrary plantation in the channel area or on its two banks should be strictly prohibited. Discharge of sewage, wastewater or dumping garbage and refuse into the channel should be forbidden.

Even when there is no flow in the channel, free entrance to the channel or using it as access roads are very dangerous. The Government has to educate local residents and notice tourists the importance to keep the diversion channel as a protected area.

(5) River and Coastal Environment Management

As one of the non-structure measures, river environment management has been proposed in the flood control master plan and has to be considered after the project construction. This includes restriction on industrial wastewater and reduction of pollutants from domestic discharge.

The environmental condition of the Nadi Bay area is thought to be good at present time. However, to create a more beautiful coastal area should always be the objective of the watershed management. Measures should also be taken on further improvement of the coastal environment.

(6) Environmental Education

For an effective environment management, environmental and sanitary education is indispensable for raising public awareness of the importance of environment protection as well as the protection of the diversion channel and shortcut channel as has been mentioned above.

4.4.2 Environmental Monitoring

Environmental monitoring is important for understanding the environmental conditions before, during and after the project. At the pre-construction stage, environmental monitoring aims to an understanding of the environmental settings as what has been done in the IEE and EIA for this project; during project construction, monitoring is for controlling the impacts on the environment; and after the project, for good maintenance of facilities and expanding the positive effect of the project. The followings are the main monitoring items.

(1) Traffic Volume Monitoring

At the pre-construction stage, the traffic volume of the main roads should be monitored for making a reasonable transportation plan for the project, and during the construction monitoring is still necessary to check the project impacts and raise working efficiency.

(2) Noise and Vibration

Noise and vibration levels should be monitored during the project construction especially at the locations where people complain about the impact. Following monitoring results, work plan should be modified and countermeasures be taken.

(3) Groundwater Monitoring

EC and water level of groundwater should be monitored for several numbers of boreholes distributed around the diversion channel to assess the effect of seawater intrusion and water level change. With the monitoring, countermeasures can be taken timely, if necessary.

(4) Coastal Environment Monitoring

At the feasibility study stage, due to limitation of available information and field investigation, many issues related to the coastal environment of the Nadi Bay area were not fully clarified. It is recommendable that a comprehensive study should be conducted at the pre-construction stage, including some important parameters related to rational engineering design, such as tidal movement, coastal erosion etc, and factors related to environmental planning and future impact prediction, such as oceanic flora and fauna. After the diversion channel construction, continuous coastal environmental monitoring is still necessary for understanding the impacts from the project and then taking effective countermeasures.

Another factor important to coastal environment is quantitative estimation of sediments to be discharged into the Nadi Bay through the diversion channel. Soil erosion has been thought to be serious in the upper stream mountain area, but due to lack of information, quantitative calculation is yet impossible. Comprehensive study on this factor is necessary in the pre-construction stage.

(5) Post Resettlement Survey

As has been mentioned above, resettlement is a sensitive issue related to social impacts. The impacts will not only be significant until people relocate to a new place but also continue for long period of time. Whether people are satisfied with their new living condition, what kind of problem they are facing and what do they want the government to do for them should be understood. It is recommendable that post resettlement survey shall be conducted to investigate these people's condition after the resettlement and hear on their opinion and requests. The information should be reported to the related governmental organization.

4.3 Consideration on Environmental Mediation

According to the guidelines specified in the 'Fiji's Draft Sustainable Development Bill' (Ministry of Urban Development, Housing and Environment, 1996), environmental mediation will be a required stage of the EIA, if the Environmental Assessment Administrator determines that it is necessary or appropriate. For the diversion channel and shortcut channel construction, the most probable issues which may need a mediation are land acquisition and resettlement or some dispute related to the customary fishing rights.

Mediation, at least for this project, means talking with people to understand their opinion and request, to explain the governmental decision and policy, to negotiate, if appropriate, on compensation issues, to achieve agreement or mutual understanding and finally solve the problem or dispute.

During the social environmental survey conducted in this study, many interviewees showed different ideas or opinions toward the diversion channel construction. Some of them estimated the cost of their houses and properties totally differently from the information from the governmental agencies. This is not uncommon but shows that a mediation process may be necessary at the pre-construction stage.

Fortunately, the above mentioned 'Fiji's Draft Sustainable Development Bill' has given clearly the procedures of environmental mediation. In addition to the Dept of Environment, there are other governmental agencies in charge of lands, fishing rights and native issues etc. Since this project will be implemented and managed by the government, it would not be difficult to solve all the possible disputes and problems after an appropriate mediation process.

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SUPPORTING REPORT

PART K

INSTITUTION

THE STUDY ON WATERSHED MANAGEMENT AND FLOOD CONTROL
FOR THE FOUR MAJOR VITI LEVU RIVERS
IN THE REPUBLIC OF FIJI ISLANDS

SUPPORTING REPORT
PART K, INSTITUTION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

B/C	: Benefit Cost Ratio
BOD	: Biological Oxygen Demand
COD	: Chemical Oxygen Demand
D&I	: Drainage and Irrigation Division, MAFF
DO	: Dissolved Oxygen
DOE	: Department of Environment, MUDHE
DOF	: Department of Forest, MAFF
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
FAO	: Food and Agriculture Organization of the United Nations
FEA	: Fiji Electricity Authority
FMS	: Fiji Meteorological Service, MTCA
FSC	: Fiji Sugar Corporation
GDP	: Gross Domestic Product
GIS	: Geographical Information System
IEE	: Initial Environmental Examination
INR	: Institute of Natural Resources
JICA	: Japan International Cooperation Agency
MAFFA	: Ministry of Agriculture, Fisheries, Forests and ALTA
MAFF	: Ministry of Agriculture, Fisheries, and Forests
MPWIT	: Ministry of Public Works, Infrastructure and Transport
MRD	: Mineral Resources Department
MTCA	: Ministry of Tourism and Civil Aviation
MUDHE	: Ministry of Urban Development, Housing and Environment
NLTB	: Native Land Trust Board
NPV	: Net Present Value
PWD	: Public Works Department, MPWIT
SOPAC	: South Pacific Applied Geoscience Commission
SPC	: South Pacific Commission
SS	: Suspended Solids
TH	: Total Hardness
TN	: Total Nitrogen
TOR	: Terms of Reference
TP	: Total Phosphorus
UNDP	: United Nation Development Programme
USP	: University of the South Pacific
WHO	: World Health Organization

CHAPTER 1 MASTER PLAN STUDY

1.1 Objectives of Institutional Study

The objectives of the institutional study consist of the following two parts:

1) to formulate recommendations which may facilitate improvements for effective and efficient performance of the organizations relevant to watershed management and flood control
2) to plan and recommend organizational strengthening or restructuring and legal arrangement, if necessary, for smooth implementation, operation and maintenance of the projects and programs proposed by the Study

1.2 Scope of Institutional Study

In this Study, institution means laws/regulations, including the customary laws of native communities, organization of relevant authorities, and all that is associated. Relevant statutory legislation of the Republic, as well as the native customary laws of the Study Area is to be inquired. However, the customary laws, especially on land tenure and water rights, were studied only through reports and documents. Responsibilities or job allocation related to watershed management and flood control among the executive branch of the Government, and organization structure, staffing and financing to the relevant government bodies were also studied.

Watershed management includes management of lands and water resources of a drainage system area as a unit of the management, with a linkage of upland productivity and the environmental conditions with motivations of downstream impacts on control of floods and sedimentation. The scope of the institutional study includes institutions for water resources management and land management, including forest and forestry management.

1.3 Relevant Institution

Relevant institution (laws/regulations and organizations) of the Government of Fiji to watershed management and flood control is described below.

1.3.1 Water Resources Management

(1) Meteorological and Hydrological Data Collection and Analysis

Department of Meteorological Services in the Ministry of Tourism and Transport is in charge of Meteorology, including data collection and forecasting services, while hydrological data collection and analysis are carried out by the Hydrological Section of the Water and Sewerage Division in Ministry of Communication, Works, and Energy.

(2) Water Rights Allocation and Management

The Department of Lands and Surveys in the Ministry of Lands and Mineral Resources is in charge of licensing for diversion of water from rivers according to the Rivers and Streams Act (Cap. 136). For public projects, such as domestic water supply or irrigation schemes, such authorization from the Department to derive water from rivers or streams is not

included in the due process of the implementation of such schemes. There are only several water rights granted by the Department all over the country.

(3) Water Use Management

1) Water Supply

The Water and Sewerage Division in the Ministry of Communication, Works, and Energy carries out water supply in accordance with Water Supply Act (Cap. 144). The Government intends to corporatize the Division. There is no public water supply scheme for industrial use only or other specific use than that for domestic or agricultural purpose in the country.

2) Irrigation

Irrigation schemes are managed by the Land and Water Resources Management Division (LWRMD) of the Ministry of Agriculture, Fisheries and Forests (MAFF) under Irrigation Act (Cap. 144A).

(4) Excess Water Management

1) Flood Control and Drainage

The LWRMD of the MAFF carries out dredging in river mouths of the Rewa and the Ba rivers. No major works for flood control have been constructed in the country. The Division has River Engineering Section which is in charge of technical matters for river works construction for flood control.

2) Disaster Management

National Disaster Management Plan has been formulated and published in 1995, which has replaced the Manual prepared by the Emergencies Services Committee in 1979. This plan shall be enforced by the National Controller, the Permanent Secretary of the Ministry of Regional Development and Multi-Ethnic Affairs, through Divisional Commissioners and District Officers, on behalf of the Cabinet.

The National Disaster Act is under drafting. "Standing Operating Procedure", which will provide organization of the National Emergency Operation Center (NEOC) set up upon emergency, contents of emergency operation, duties of the members of NEOC and the process of emergency communication, is on the way of drafting by the National Disaster Management Office. "Disaster Management Plan for Other Agencies" is yet to be prepared by relevant authorities.

(5) Water Resources Conservation

1) Water Quality Monitoring and Assessment

The Department of Environment in the Ministry of Local Government, Housing and Environment is in charge of the environment conservation, including that of water resources. There is no comprehensive environmental legislation in Fiji. A bill named "Fiji's Sustainable Development" has been drafted.

There is no regular water quality monitoring except that of supplied water. The water quality test laboratory belongs to the Water and Sewerage Division in the Ministry of Communication, Works and Energy for quality monitoring and analysis of water to be supplied.

2) Sewerage

The Water and Sewerage Division, as its name shows, discharges the responsibility under the Sewerage Act (Cap. 128).

3) Control of Industrial Wastewater

Although the Sustainable Development Bill covers control of industrial wastewater, no major control measure seems to be enforced at present.

1.3.2 Land Management

(1) Land Registration and Dealing Management

Lands in Fiji, in terms of the ownership, are classified into Native Lands, including Native Reserve, State Lands and freehold lands. Native Lands are owned by Fijian communities with customary tenure. State Lands and freehold lands are owned by the State and individuals, respectively, with similar ownership and administration system to other countries, while the Native Lands are managed with a unique manner. The distribution and land use of the three types of lands are described in Section 5.2 of Main Report.

Native Lands are administered by the Native Land Commission and Native Land Trust Board in the Ministry of Fijian Affairs and ALTA in accordance with the Native Lands Act (Cap. 133) and Native Land Trust Act (Cap. 134, NLTA). The Commission is in charge of titles and boundaries of the lands, while the Board controls the land use, including leasing.

State Lands are managed by the Department of Lands and Surveys in the Ministry of Lands and Mineral Resources as a custodian according to the State Lands Act (Cap. 132). Titles and dealings of freehold lands are also registered in the Department. The Department is the center of information on land holdings and dealings of all lands within the territory of the Republic including Native Lands.

Leasing of agricultural lands is controlled under Agricultural Landlord and Tenant Act (ALTA, Cap. 270). Since many of agricultural leases based on the ALTA will expire in near future, the ALTA Research Unit in the Ministry of Fijian Affairs and ALTA (recently shifted from the MAFF) is reviewing the ALTA in close consultation with the Native Land Trust Board and the Department of Lands and Surveys. Inclusion of the act into the Native Land Trust Act (Cap. 134) is discussed.

(2) Land Use Planning and Regulation

1) Town Planning and Regulation

The town planning is discharged by the Department of Town and Country Planning in the Ministry of Local Government, Housing and Environment under the Town Planning Act (Cap. 139) and Subdivision of Land Act (Cap. 140).

2) Promotion and Enforcement of Good Land Husbandry

The MAFF is in charge of land conservation and control of land husbandry in agricultural lands under Land Conservation and Improvement Act (Cap. 141), Land Development Act (Cap. 142). The Land Conservation Board in the Ministry has been established under Land Conservation and Improvement Act (Cap. 141). The Land Use Section in the Research Division of the MAFF is engaged in researches for the most suitable land husbandry practices.

(3) Forest and Forestry Management

Forest management is conducted under the Forests Act (Cap. 150). The Department of Forests, or the Conservator of Forests, in the MAFF is responsible for forest administration in the forest reserve and for forestry administration. Forests in Native Lands are controlled by the Native Land Trust Board, while Department of Forest controls the protected forests.

As shown above the Ministry of Agriculture, Fisheries and Forests plays the primary role in watershed management and flood control whose organization structure as of May 1995 (before the ALTA Unit was shifted to the Ministry of Fijian Affairs and ALTA) illustrated below (ALTA Unit is shot included in the chart):

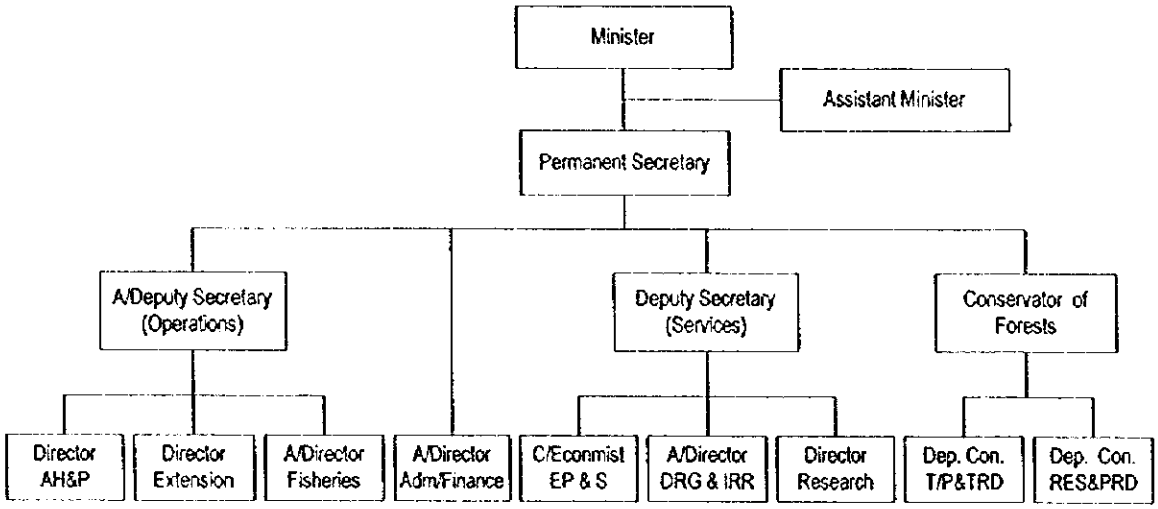

Figure-K1.1 Organization Chart of the Ministry of Agriculture, Fisheries and Forests (MAFF)

1.4 Current Institutional Framework on Major Issues

1.4.1 Major Issues

Fiji is blessed with abundant volume of water resources potential of good quality in almost all areas in the country except some small islands out of the Study Area. Although the sector of water resources development, i.e., utilization of the plentiful potential for the human well being, has things to be done, the water rights allocation or management is not a controversial issue. The water supply and sewerage sector has a plan to be corporatized for the efficient services by the sector. The direction of the sector improvement has already determined.

The water resources in Fiji have not been deteriorated much, except certain places in the middle reach in Ba watershed. Although wastewater treatment from some industries has to be guided properly, water resource conservation seems not to have serious problems. The enactment and enforcement of the Sustainable Development Bill and the strengthening of the Department of Environment would contribute to the enhancement of monitoring activities and effective control of water quality discussed in Section 5.4 of Main Report.

Despite frequent occurrences of huge damages by floods, the damage mitigation activities seem not to reach to sufficient solutions. Currently, flood control measures are conducted or discussed, giving an emphasis on non-structural measures except dredging some river mouths. These measures have limited effects on flood damage mitigation. To obtain sufficient solutions, some structural measures should be employed. Institutional study should also give emphases on the arrangement which may effectively and efficiently facilitate structural measures.

Serious degradation in land productivity and large volume of sedimentation into watercourses prevails in wide areas of the watersheds. Measures for land conservation seem not to attain the sufficient level.

Major issues for watershed management in Fiji can be summarized as the following points. The analysis of current institutional framework, and subsequent problem/constraint/ necessity identification and analysis, as well as formulation of the institutional recommendations should focus on these points listed below.

- hydrological measurement and analysis
- flood control and damage mitigation
- land conservation
- forest and forestry management

In the discussion below, flood control and damage mitigation is divided to; i) flood control by structural measures, ii) land use regulation in flood prone areas, iii) disaster management. The following six issues are discussed below.

1) hydrological measurement and analysis
2) flood control by structural measures
3) land use regulation in flood prone areas (non-structural measures)
4) disaster management (non-structural measures)
5) land conservation
6) forest and forestry management

1.4.2 Institutional Framework

(1) Hydrological Measurement and Analysis

The Hydrological Section in the Water and Sewerage Division is responsible for the duties. The Section has 15 established staff as shown in the table below, while Water and Sewerage Division has 237 members of established staff. Staff of the Hydrological Section is

allocated at three Division (regional) offices, namely, Central/Eastern, Western and Northern Divisions. The head of the Section in Central/Eastern Division manages the whole territory of the country.

As a part of the corporatization plan of the water supply and sewerage sector, the Hydrological Section is planned to be placed out of the sector.

Table-K1.1 Staff of Hydrological Section

Rank	Number
Senior Hydrologist	1
Hydrologist	3
Technical Officer	1
Senior Hydrological Technician	5
Hydrological Technician	5
Sub Total	15
Unestablished Staff	50
Total	65

Source: Management Service Division, 1996

(2) Flood Control by Structural Measures (Drainage)

1) Relevant Legislation and Organization

The word "drainage" in the legislation and administration in Fiji means not only draining of land but also preventing and mitigating floods or erosion. The Central and Western Drainage Boards were established according to the Drainage Act (Cap. 143) after "drainage areas" were declared, whose chairman and members were appointed by the Minister of Agriculture, Fisheries, Forests (MAFF), and are responsible for drainage of the areas. The member shall include a land conservation officer, a drainage engineer, and not less than 2 landowners in the drainage area. The land conservation officer shall be the secretary for the Board.

The Land Conservation Board, to be constituted under the Land Conservation and Improvement Act (Cap. 141), is referred as the "Controlling Authority" in the Drainage Act. Most of important activities by a Drainage Board, such as entering into a contract of large amount, shall be approved and supervised by the Land Conservation Board. The designation of a drainage area, which leads to the establishment of a Drainage Board, shall be initiated by the Land Conservation Board.

The functions of a Drainage Board are (Drainage Act, Sec. 8);

1) to maintain and improve the drainage of all land of within the drainage area,
2) to carry out works and to issue orders necessary for the implementation of the above i), according to the approval or consent required under the Drainage Act.

Every Board shall, within its own drainage area, have the power to do all things to carry out its function, including the followings (Sec. 9):

a) to construct, maintain and improve drainage works

b) to enter into contracts in connection with drainage works, with the prior consent of the Land Conservation Board (in case a contract amount is more F$ 10,000) or without the consent (in case the amount is F$ 10,000 or less)

c) to enter at any time by any member, officer, servant or agent, any land to prepare, to carry out, to secure its functions

d) to hold title to the land and to acquire such land, with the prior consent to the Land Conservation Board in connection with its functions

e) to make, assess and levy rates required to cover the costs of improving, constructing and maintaining drainage works, of carrying out any drainage measures and the operating costs of the Board

f) to make necessary by-laws, subject to the approval of the Minister

g) to borrow money for improvement or construction of drainage works and to charge or mortgage its property as security, with prior consent of the Land Conservation Board

The land acquisition by a Drainage Board, as described in the above d), may be by purchase, lease, or exchange of any land situate within the boundary of the drainage area. In case a Drainage Board is unable to acquire a land by agreement with reasonable terms, the Board may compulsorily acquire the land, when the conditions provided in the Act are satisfied, subject to the provisions of the Constitution and the Crown (State) Acquisitions of Lands Act (Cap. 135).

According to the annual report of the MAFFA of 1994, three Drainage Boards are in operation, namely, Western Division Drainage Board, Labasa Drainage Board and Central Division Drainage Board. Their major activities comprise of ordinary operation and maintenance of drainage works and the cyclone Kina rehabilitation works.

The Land and Water Resources Management Division (LWRMD, recently renamed from Drainage and Irrigation Division) takes the primary role in technical matters in the field of "drainage". The division is engaged in three Activities of three Programs of the government expenditure account number:

* 30-1-5; policy and administration for drainage and irrigation
* 30-2-5; crop-irrigation services
* 30-6-1; land, drainage and flood protection

The number of the staff has been slightly decreasing, and the division had 84 established staff and 134 unestablished staff in 1996. The organization structure of the Section is given below:

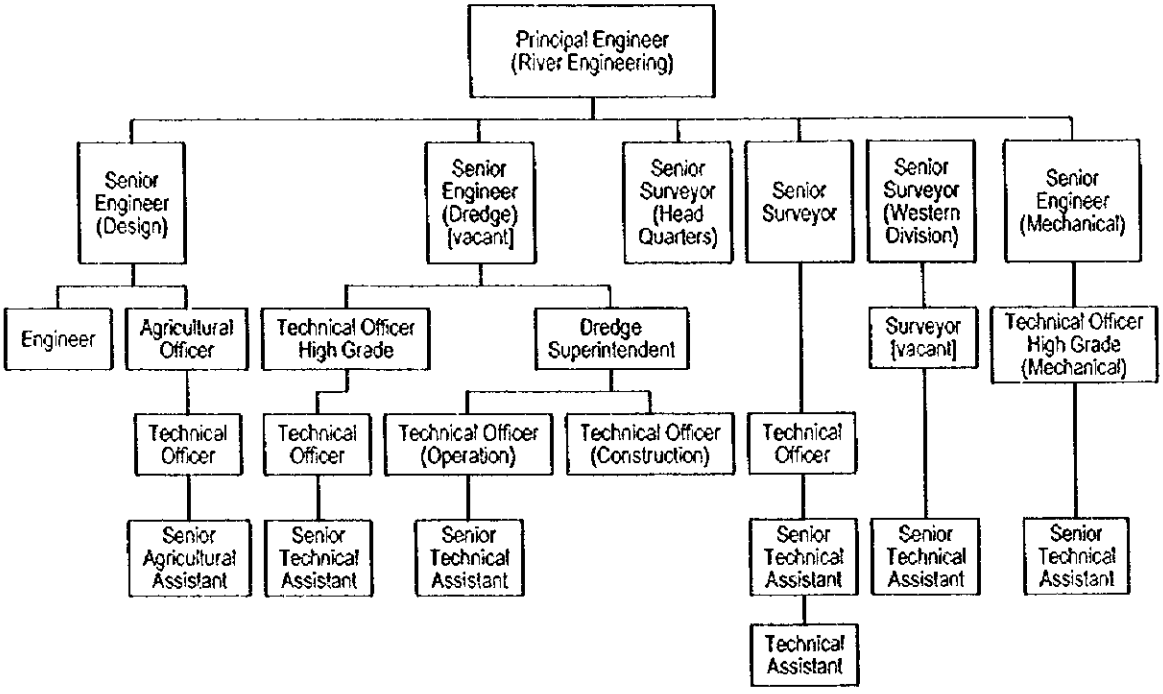

Figure-K1.2 Organization Structure of the River Engineering Section

The Division was renamed recently, having an objective to manage the agricultural lands and water resources in order to attain optimum use of the resources in an environmentally sustainable manner, giving an emphasis on strengthening land conservation activities. The new name might show the intention for consolidated management of land and water, and to cover the all domain of the Land Conservation and Improvement Act and the Drainage Act.

2) Land Acquisition

Three types of land tenure prevail in Fiji, namely Native Lands, State Lands and freehold lands. Dominant portion of the land in Fiji is Native Land, accounting 84% of the land area. In Native Lands, customary land rights are vested in the land owning units, of which the 'mataqali' is the most common. Other units include the 'yavusa' (an ancestral group of one or more 'mataqali'), and 'tokatoka' (family unit) and even individuals and their agnate descendants through marriage by virtue of their traditional status. Holders of the rights are not issued with a document of title, and the units are not legal entities. They do not hold the legal right of disposal or to deal in Native Land.

One third of the Native Lands have been designated as Native Reserve for the exclusive use of the indigenous Fijians to sustain their lives, and can not be leased to other than Fijians. State acquisition of some parts of the Native Reserve, however, can happen according to the legal procedure.

Lands for permanent use of public interests are to be converted to State Lands. The procedure for state land acquisition is stipulated in the State (Crown) Acquisition of Lands Act (Cap. 135). Normal procedures for the acquisition are as follows:

From Freehold Lands

- The executing entity proposing a project shall submit the plan of the project including maps of the project site to the Department of Lands and Surveys.
- The Department may start to negotiate with the titleholder for conditions of the dealing or compensation.
- In case that the conditions are not agreed, the Supreme Court determines the conditions.

From Native Lands, including Native Reserve

- The executing entity proposing a project shall submit the plan of the project including maps of the project site to the Department of Lands and Surveys.
- The Department will submit the intention, often with the executing entity, to the Native Land Trust Board (NLTB).
- The Board consults with the Native Land Commission for the inquiry of the titleholder (Mataqali).
- The Board, often with the Department and the executing entity, may start to negotiate with the mataqali for conditions of the compensation.
- In case that the conditions are not agreed, the Supreme Court determines the conditions.

During the colonial period, some Native Lands were acquired for the essential national development purposes, such as parts of Nausori Airport and Nadi Airport, using State powers provided in the State (Crown) Land Acquisition Act, Cap 135. The powers have not been used since the independence in 1970, when all acquisitions of Native Lands for national roads and Monasavu Hydro-electricity Project were effected through negotiations by the NLTB on behalf of the native owners regarding the area, price and other terms and conditions of the transfer.

(3) Land Use Regulation in Flood Plains

Town Planning Act (Cap. 139) and Subdivision of Land Act (Cap. 140) are the primary legislation for restriction of land development in and around cities and towns. These laws control land use when a parcel of land is to be developed or re-developed, or when land use is to be changed.

A town planning area is constituted by an order of the Minister of Local Government, Housing and Environment upon an application by the Director of Town and Country Planning or a local authority, where any development of land shall be permitted by the local authority (Town Planning Act, Sec. 6, 7). The local authority shall not grant or refuse the permission without prior consent of the Director.

A town planning scheme will be made according to the provisions of the Act with the general object as follows (Sec. 16);

a) of controlling the development of the area,

b) of securing suitable traffic, transportation, disposition of commercial, residential and industrial area, proper sanitary conditions, amenities and convenience, parks, gardens and reserves,

c) of making suitable provisions for the use of the land, or

d) as more particularly set out in the Schedule.

The scheme shall contain a scheme plan with provisions for prohibiting or regulating the land development of the area (Sec. 17). Local authority shall prepare a town planning scheme of the town planning area, and submit to the Director. The Director may provisionally approve the submitted scheme with or without modification (Sect. 18). The provisionally approved scheme shall be publicly notified by the local authority and a copy of all maps, plans and other particulars comprised in the scheme shall be deposited in the office of the local authority for public inspection. After hearing of objections and the director's determination of objections, the scheme may be finally approved by the Director, with modification or dismissal of objections (Sec. 19-24).

The Act regulate land and building developments and the existing use of a land or a building can not be controlled by the Act since occupiers can enjoy the present use as assured by the Act.

Subdivision of Land Act is applied in the areas except i) State (Crown) Land, ii) those included within the boundaries of any city or town where Local Government Act (Cap. 125) is applied, and iii) Native Reserve. Prior approval by the Director shall be granted before the subdivision of the area other than the area i) where no land is situated in any town or within three miles of the boundaries of a town and ii) where the land is subdivided into lots not less than five acres (around 2 ha.).

Schedule G of General Provisions approved by the Director (1980) under Town Planning Act (Cap. 139) stipulates that in flood prone areas no building shall have the floor level of any habitable room lower than the height, relative to the Mean Sea Level, as specified as follows (towns only in Study Area are listed below);

- Ba 5.0 meters
- Sigatoka 2.5 meters
- Nadi 6.0 meters
- Nausori 7.6 meters
- or any other relative height applicable to any town, township or settlement areas, as determined from time to time by the Director.

For land use control in rural or agricultural areas, Land Conservation and Improvement Act (Cap. 141) and Forest Act (Cap. 150) or lease control through Agricultural Landlord and Tenant Act (Cap. 279), Native Land Trust Act (Cap. 134) are applicable.

(4) Disaster Management

The National Disaster Management Plan states the national policy for the management, being collaborated with participation of various ministries through coordinating efforts by the National Disaster Management Council (NDMC) under the leadership of the Prime Minister. It covers prevention, mitigation, preparedness, emergency operations, relief and rehabilitation, while the previous manual of National Emergency Service Committee gave emphasis on responding operations. The Plan also mentions much about warning, and the Public Works Department is assigned as the agency to originate flood warning.

National Disaster Act has been drafted and will be submitted to the Parliament in the near future. Under the Plan, operational plan, guidelines, instructions and manuals are to be prepared by each agency as assigned in the Plan.

(5) Land Conservation

1) Current Leasing of Agricultural Lands

The Native Land Trust Board (NLTB) was created based on the ordinance (now Act) to administer all native land "for the benefit of Fijian owners". The NLTB has the sole power to grant leases or licenses over Native Lands, on the condition that the Board is satisfied that the land is neither beneficially occupied nor during the currency of the lease or license by the Fijian owner for their use, maintenance or support (Sec. 9 of Native Land Trust Act, Cap. 134).

Although Agricultural Landlord and Tenant Act (Cap. 270) contemplate that all agricultural tenancy shall be written in the prescribed form (Sec. 8), and shall be registered under Land Transfer Act (Cap. 131) or Registration Act (Cap. 224), the NLTB grants leaseholds in agricultural land under several types of documents in the following proportion (Clerk, 1986):

- duly executed leases registered under Land Transfer Act; 24 %
- instruments of tenancy registered under the Registration Act; 1 %
- unregistered tenancy at will; 5 %
- unregistered provisional approval notice; 70 %

A provisional approval notice is in the form of a letter, advising that an application for a lease has been approved. It sets out details of the land, the annual rental and the estimated survey fee. The legal status of these arrangement may have quite complicated implications with regard to watershed management, especially to land conservation practices.

Until recently, there was no provision in native leases to enable the landlord to re-enter a lease for the purpose of re-development for a higher use with compensation provisions in favor of the tenant. Recent amendments to Native Land (Leases and Licenses) Regulations 1984 give the opportunity in the future for re-entry for the purpose of re-development (Kamikamica, 1987).

2) Land Conservation Practices

The Land Conservation and Improvement Act (Cap. 141) is the primary legislation on conservation of land and water resources. Under the Act, the Land Conservation Board is established, whose members are as follows (Sec. 3):

a) Director of Agriculture - Chairman

b) Permanent Secretary for Public Works

c) Director of Lands and Surveyor-General

d) Conservator of Forests

e) other members, holding any of the Government Office, appointed by the Minister of the MAFF

The functions of the Board are (Sec. 5);

a) to exercise general supervision over land and water resources,

b) to stimulate, by propaganda and other means, public interest in conservation and improvement of land and water resources,

c) to recommend necessary legislation to the Minister,

d) to make general or particular conservation orders necessary for conservation of land and water resources.

The Minister, currently delegated to the Permanent Secretary of the MAFF, may appoint, by notice in the Gazette, Conservation Committees for the area designated in the notice, to give advice to the Board on matters related to the conservation of land and water resources of the area (Sec. 6). The Minister may also appoint Conservation Officers to assist the Board (Sec. 13) in supervising land and water resources and encouraging their conservation and improvement.

A conservation order by the Board may;

a) prohibit, regulate and control the breaking up or clearing of land for cultivation or any purposes,

b) prohibit, regulate and control the grazing and watering livestock,

c) prohibit or restrict the cultivation of specific crops,

d) regulate the method of cultivation of land,

e) require the uprooting or destruction, without payment of any compensation, of any crop in case of contravention of a conservation order,

f) prohibit, regulate and control the use of sledges,

g) prohibit, regulate and control the lighting of fires and burning of vegetation.

A conservation order may be;

a) general, published in the Gazette and specific to some area, or particular, in writing addressed to the owner or occupier.

The Board may issue a "closing order", when any land is being or has become despoiled, by publishing in the Gazette, specifying the area, which prohibits;

a) occupation of the land,

b) cultivation of land,

c) depasturing of cattle,

d) cutting down of vegetation,

e) destruction of vegetation.

(6) Forest and Forestry Management

Forest Act (Cap. 150) is the primary legislation on the administration of forests. A Conservator of Forests and the Deputy Conservator is directly responsible to the Minister of the MAFF. The Forestry Board is established by the Act, which is chaired by the Conservator, and whose six members are appointed by the Minister as follows, in order to give advice to the Minister (Sec. 4):

a) one, appointed on the recommendation of the NLTB to represent the NLTB,

b) not less than 4, holding any of the Government Office,

c) at least one shall be a Fijian.

The Minister may also appoint Forestry Committees, as regional entities, to advise the Forestry Board on matters related to forestry in the region (Sec. 5).

In unalienated State (Crown) Lands or lands leased to the State (Crown), the Minister may declare (Sec. 6,7);

"reserved forest" and therein,

- "nature reserve" or
- "silvicultural area" may be declared.

In native land, not being "reserved forest" or alienated land, the Minister may declare with prior consent of the NLTB (Sec. 8);

- "protected forest" and therein,
  "silvicultural areas".

Any person is or does the followings without a license, grant or contract lawfully made, shall be guilty (Sec. 12):

1) in "silvicultural areas" or "nature reserve",
   to be or remain except between hours of 6 a.m. and 9 p.m.

2) in "reserve forest" or "silvicultural area",

   a) to depasture livestock or to permit livestock to be therein,

   b) to cut, collect, fell, girdle, mark, lop, injure, tap, burn or remove any forest, produce,

c) to cause any damage by negligence in felling any tree or cutting or extracting or removing any forest produce,

d) to erect any building or livestock enclosure,

e) to set fire or to assist any person to set fire to any grass, undergrowth or any forest produce,

f) to kindle, carry or throw down any fire, match or other lighted material,

g) to clean, cultivate or dig up land for cultivation or for any other purpose,

h) to construct or obstruct any road, path or waterways,

i) to set or be in possession of any trap, snare or net, or to use or be in possession of any gun, poison, or explosive substance,

j) to enter any part thereof closed by regulations made under this Act,

k) to destroy or to damage in any way forest property,

l) to damage, alter, shift, remove or interfere in any way whatsoever with any beacon, boundary mark or fence, notice, or notice board,

m) to hunt or fish.

3) on state land, not being "reserved forest" or alienated land,
to cut, collect, convert, fell, girdle, mark, lop, injure, tap, burn, take or remove any forest produce.

4) within 400 yards of a "reserved forest",
to light any fire or to throw down any match or any lighted material in such manner as to subject the "reserved forest" to the risk of fire.

5) in "protected forest",
   a) to cut, collect, convert, fell, girdle, mark, lop, injure, tap, burn, take or remove any forest produce,
   b) to clean, cultivate or dig up land for cultivation or for any other purpose.

6) on native land, not being alienated land, "reserved forest" or "protected forest",
to cut, collect, convert, fell, girdle, mark, lop, injure, tap, burn, take or remove any forest produce.

7) from alienated land,
to remove.

The Department of Forests of the MAFF is in charge of the administration of forests and forestry. The Department is engaged in the four programs of the expenditure account number with a staff of some 420 persons and the budget of around F$ 10 million (Table-8.2).

Table-K1.2 Activities and Budget of Department of Forests

Program/Activity	Established Staff	Unestablished Staff	Estimated Budget in 1996 (F$1,000)
P.1. Administration and Support Services	113	71	4,007.0
A.1. General Administration	49	40	2,170.6
A.2. Forest Management Services	13	1	239.4
A.3. Training and Education	13	6	876.2
Aid-in Kind (for Logging Training School from EU)			(18,000.0)
A.4. Silviculture Research Administration	19	12	364.3
A.5. Silviculture Research (Pine)	0	0	0
A.6. Timber Utilization Research and Promotion	19	12	356.5
P.2. Forestry Department Plantations			
A.1. Plantation and Maintenance	45	104	3,135.1
P.3. Extension			
A.1. Planting (Assistance and Advice)	8	15	230.8
P.4. Natural Forest and Conservation	47	15	873.3
A.1. Harvesting	44	12	578.4
A.2. Forest Parks, Recreation and Nature Reserve	3	3	294.9
Total	213	205	8,246.2
(Aid-in-Kind)			(1,800.0)

Source: Ministry of Finance and Economic Development, 1996

Currently the Department follows "Strategy for Forestry Sector Development" worked out with FAO in 1988 as a sectorial master plan which contains following strategies as recommendations.

1) to adopt high quality export driven strategy
2) to make an immediate start on the institutional restructuring and reform, including;
   a) separation of commercial aspects from non-commercial (regulatory) aspects
   b) establishment of the Fiji Hardwood Corporation
   c) reconstitution of the Fiji Pine Commission to match above b)
   d) establishment of wholly governmental owned holding company for the two corporations
   e) strengthening the Forestry Department
   f) financial, legal, administrative instrument
3) to implement the following actions, corrections and improvement;
   a) to establish an emergency training program for the landowner logging company
   b) to strengthen and widen the scope and capacity of logging training school
   c) to strengthen timber production supervision
   d) establish an emergency, temporary management structure for an integrated operation of Tropik mill, the Fiji Pine Commission and relevant Forestry Department plantations

e) revise royalty (species classification and price)

f) to open domestic market to import

4) to start investigations, training and development program on;

a) market development of high quality and value added timbers

b) training operators, supervisors and managers in and to quality control

c) re-assessment of indigenous forests with emphasis on;

- area, state and status of protection forests
- area and general conditions of the remaining production forest
- identification, location and evaluation of areas of ecological, historical, cultural and landscape significance

d) to strengthen and re-direct research into yield control aspects of the management of indigenous forests for high quality timbers

e) to initiate a research program into ecological effects of hardwood reforestation

f) to start and develop a nation wide continuing program of public education at village and landowner level

g) to widen the scope of the Extension Division of the Forestry Department and strengthen its capacity

h) to identify and to locate local programs through the communication channels established under the above g)

5) to bring or keep the current (of 1988) program

a) hardwood plantation program

b) completion of trials in the development of production before the plantation hardwood become main force on export driven strategy

c) restrained expansion of total resource of the Fiji Pine Commission

d) feasibility study of converting from softwood chip exports to long fiber pulp exports

e) feasibility study of eucalyptus plantation development for hardwood chip production

f) retaining forest land in forest and giving legally valid protected status

g) declaration of all protection forests as Protected Forest, as an interim measure

h) designation, leasing forest land and allocation to permanent timber production under a national land use plan

i) strengthening Forest Board with participation and responsibility of landowners

1.5 Problems/Constraints/Necessities and Targets on Major Issues

1.5.1 Concept for Analysis of Problems/Constraints/Necessities and Target

Two ways of analyses of the current institutional conditions are adopted in the following discussion, because the proposals by the Study may include measures which the Government has some experiences, and those which should be introduced and the Government has few experiences. For the implementation of the former, improvement program of the current institution should be a target, and for the latter, a new type of administration should be introduced as a target to the relevant legislation and organization, referring successful models in other countries.

For the improvement approach, current institutional problems are analyzed and some institutional policies to solve the problems are formulated, while for the introduction approach, constraints and necessities of the relevant legislation and organization are assessed and subsequently some directions for the introduction are recommended. In addition, when a new type of administration, as well as major shift of the staff are recommended, training or re-training of the staff should accompany.

1.5.2 Problems/Constraints/Necessities and Targets in Each Sector

(1) Hydrological Measurement and Analysis

Current hydrological measurement and analysis are insufficient regarding stable data collection, data storage and analysis. The installation and maintenance of hydrological stations are inadequate allocation and manners, concentrating in the Rewa watershed and being scarce in other watersheds. Lack of data often occurs caused by discontinuous operation, resulting in unreliable analyses. The reasons seem to be insufficient staff with high level of knowledge and skills and financial resources.

Flood analysis is the fundamental element for formulation of a flood control plan, whether structural or non-structural. Analyses on sedimentation are the base for planning land conservation and sediment control programs. Without reliable hydrological analysis, watershed management cannot be planned or properly implemented, and the results of the management cannot be monitored. Thus, "insufficient hydrological analysis" seems to be the core problem to be resolved.

The Section is the central agency to issue flood forecasts the efforts for that purpose account a large portion of the tasks of the Section. Although timely flood warning can be done with comparatively cheap costs and very important, the damage mitigation by it is limited. The Section should also cover the flood analyses for effective flood control measures and for the enhancement of preparedness to floods, whether structural measures or non-structural measures for sediment control through land conservation activities, forest preservation and land use control.

The role of the Section in flood control and damage mitigation is very important not only for flood forecasts but also for promotion of preparedness against flood. Preparation of flood hazard maps is inevitable for effective land use regulation in flood plain and formulation of evacuation and relief program, as discussed above.

"To achieve effective and efficient flood analysis for flood control, to issue timely flood warning, and to provide information for enhancement preparedness against floods by the Section" is the target.

(2) Flood Control by Structural Measures

Currently major activities for flood control by structural measures are limited to dredging river mouths of large rivers, while floods occur and cause huge damages. Since the Master Plan proposed in the Study contains other types of projects, such as construction of a diversion channel, it would be necessary to formulate institutional plan for smooth construction, operation, maintenance and monitoring the performance of the project implementation.

Current capacity of the LWRMD or the River Engineering Section is quite limited in data collection, analysis, project planning and project evaluation for effective and efficient watershed management and flood control. Although measures for watershed management and flood control are discussed, the discussions seem to remain at master plan level, showing only an ideal status to be attained. Numerical forecast of the frameworks, estimated benefits and costs and project evaluation at feasibility study level should be promoted to achieve improvements of actual conditions.

"To strengthen the capability of implementing entity responsible for proposed projects in the Mater Plan" is the target.

As for land acquisition, some type of disputes has allegedly occurred in other governmental projects. The occurrence of such disputes may be the core problem for land acquisition. Investigations on social and cultural conditions to avoid social risks resulted by the implementation of projects should be carried out in each feasibility study as made in the Feasibility Study for Nadi Diversion Channel. The target in land acquisition for the watershed management is "to find a way to avoid unreasonable disputes by detailed investigation in feasibility studies".

(3) Land Use Regulation in Flood Plains

Although the lowest floor levels of habitable rooms are provided in the General Provisions under Town and Country Planning Act (Cap. 139), adequacy of the levels is unknown. The provision appears to be applied for all of each town area, while flood level may differs area by area. Although the coverage of the provision is limited to habitable rooms, some important facilities or equipment installation may also have to be regulated.

Proper provisions can be stipulated after preparation of adequate flood hazard maps and necessary information and close consultations with the Hydrological Section after its strengthening. The institution for land use regulation (the Department of Town and Country Planning and relevant laws/regulations) appears to be well organized basically and has enough capability. Recommended institutional arrangement will be discussed in the part of the Hydrological Section.

(4) Disaster Management

As discussed above, the National Disaster Management Plan well covers wide range of disaster management including that in the occurrence of floods. As emphasized in the Plan, preparedness and early warning, rather than responding disaster relief after the occurrence, is the key to the effective and efficient disaster management. The Hydrological Section should meet with the requirement of the Plan.

Enhancing preparedness will be promoted by the provision of flood hazard maps and related information, while early warning will be realized after the establishment and operation of flood forecasting and alarming system as discussed in Section 6.10 of Main Report. These two parts will also be discussed in the same part as the Hydrological Section.

Some over reactions, such as excessive emergency food supplies to the areas of minor damage, allegedly occurred in the past flood. Damages occurred in the past floods seem not to be well investigated, evaluated and filed. Immediate damage evaluation will be the base for proper disaster relief activities, while post damage evaluation will be the start for flood control planning, including that through structural and non-structural measures, as well as for enhancement of the preparedness.

The framework of immediate damage evaluation is well covered in the Plan, while no major description for the post damage investigation and information accumulation has yet to be given in the Plan. Some post damage evaluation should be carried out after all major relief/rehabilitation activities.

The target of this sector should be;

- institutionalizing post damage evaluation.
- immediate preparation of "Disaster Management Plan for Other Agencies"

(5) Land Conservation

Current stage of land conservation activities seems to remain at the phases of research and development, and pilot farming, besides serious land degradation has progressed. Promotion of the activities identified most effective and efficient by the research and pilot farming will be issues from now on.

Implication of the land tenure in land conservation is discussed in the following three aspects.

1) Because of insecure status of leasehold of the land, the leaseholder may hesitate to have long term view in soil management, or the investment for soil conservation. Therefore, land use may tend to be exhaustive, resulting losses in productivity in long term.
2) Insecure tenure fails to provide collateral in a commercial credit for farm development, including that for soil conservation.
3) Because of unwillingness of tenant farmers as well as of stagnated training activities for skill development of soil conservation techniques, dissemination of soil conservation practices may be hampered.

Various types of tenancy or interests prevail, whose legal base may be different, and may be complicated for the practitioners of land conservation activities, such as landowners, tenants or extension officers. Farmers as well as field officers may not know which laws, regulations or standards are the legal base of their activity. Current terms and conditions on land conservation attached to the tenancy agreement seems not to be well regulated or standardized.

The recommendations given in the report of "Review of Watershed Management Legislation, Watershed Management Study (Clerk, 1986) are well formulated and needs to be followed.

"To establish institutional arrangement to spread land conservation practices found suitable by the research and the studies" is the target.

(6) Forest and Forestry Management

Forest and forestry management in watershed management is discussed, highlighting the following functions of forests:

- to retain rain so as to reduce peak discharge and to increase normal discharge of rivers
- to reduce soil loss in lands and sediment in rivers so as to maintain water cross section of rivers

Wide areas of land have been deforested without any contribution to production. Although tree plantation is carried out by the Department of Forests and Fiji Pine Limited, there still remain wide areas of waste lands. Exhaustive logging practices allegedly prevail without replanting logged out areas and account for large portion of deforestation. Wide areas of forests, especially in Western Division, have been observed to be burnt by the extension of fire.

The current problems are; i) insufficient afforestation, ii) unsustainable logging practices, and iii) habit of burning vegetation and accidental fire. To solve these problems is the target.

Research and pilot farming on agro-forestry have been carried out by Agro-forestry Unit in Extension Division of the Department of Agriculture. Some of measures were found feasible. Although researches should also be continued, spreading the measures found suitable in each agro-ecological area should also be a target.

1.6 Recommended Institutional Arrangement

1.6.1 Principle Applied for Recommendation

Principles applied for the formulation of the Institutional Master Plan are as follows:

(1) Efficient Use of Current Institutional Resources

The Government of Fiji has a policy to reduce the size of the government administration, including decentralization of a part of its services. Because of the small size of the country with small population, the Government services may have to have some inefficiency without

economy of scale. Even in a small country, the numbers of functions and responsibilities are the same as or not much less than a large country, while available resources, such as financial resource, are limited. In this study, institutional recommendations should be made to promote efficiency in line with the Government policy.

Form this principal, the following sub-principal will be deduced:

1) to avoid duplication of the functions by different sections of the government, and to concentrate them into one unit
2) to encourage coordinated and synchronized implementation of related functions, programs or projects

Many divisions and sections seem to have enough or too many number of staff including those unestablished, while suffering lack of skilled staff with sufficient knowledge. Training and re-training through on-the-job-training (OJT) and off-the-job-training (OFF-JT), will solve the problems. In some case, streamlining will be necessary, giving incentives, such as higher salaries, to the proficient staff.

(2) Functioning of Regulatory, Operational and Deliberative Entities

The operational functions include;

- data collection, processing and dissemination,
- design,
- construction and supervision,
- operation and maintenance, including collection of charges, fees or tariff,
- extension services including education and training of residents,
- recording and registration.

These functions are conducted by governmental line agencies at various levels as well as by decentralized, semi- or non-governmental entities, such as public corporations, especially in operation and maintenance phases with authorization invoked by the legislative branch. To secure adequacy, effectiveness and efficiency in the operational function is often difficult because the operating agencies for public services tend to monopolize the services in the field. Therefore, operational function should be placed under proper control by regulatory function.

The regulatory area constitutes;

- policy and strategy formulation,
- overall planning, and project planning, monitoring and evaluation
- coordination with other sectors,
- guiding program actions,
- measuring the results of performance of the operational bodies in conformity with specified objectives (standards),

- monitoring activities and conditions and enforcement of established laws and regulations,
- financial aspect of operational entities,
- review of cost recovery schemes, policies for charging and financing operations.

The regulatory function is normally led by a politician and in democratic government, finally and theoretically, by the nation.

Deliberative functions are set in shapes of a board or a committee to advise to the final decision making by ministers or other authorities. A deliberative entity can normally be named as a board when it also has operational functions for the sector, or as a committee when it has only deliberative functions. Deliberative entities hold meetings before the final approval of policies, strategies and plans proposed by regulatory entities, representing from and coordinating among various stakeholders and sectors of the residents and government offices.

Appropriate separation and functioning of the above three areas is inevitable for a proper management.

(3) Beneficiary-to-Pay

Even for the government projects, beneficiary-to-pay principle should be pursued as far as possible. If a project is funded with the general budget, the people without any benefit by the project pay some part of the cost through payment of taxes. The application of this principle should be limited only when; i) beneficiaries cannot be easily identified or almost all the nation, such as construction of government office, ii) fee collection cannot be done properly or efficiently, such as construction and maintenance of rural roads.

(4) Financial Adjustment between Beneficiaries and Implementers

Beneficiaries and implementers are not always same. Even though some project is economically feasible, the implementers are not always willing to carry out the project, because the implementers sometimes can not take the benefits born by the implementation. In land conservation project, for example, if a lease to a farmer will expire in near future, the farmer would not be willing to implement the project because he would not receive the benefits of long term productivity of the land and intend to use the land exhaustively, while the owner of the land would receive that benefits in long term.

Some financial adjustment is required to promote that type of projects. The Government should be a intermediator between the beneficiaries and the implementers. The Government should give incentives to the implementers whose costs can be collected from the beneficiaries. The principle should be considered especially for non-structural measures.

1.6.2. Recommended Institutional Arrangement

(1) Defining Watershed Management Entities and Administrative Units

1) Organization Set-up

The following responsibility allocation is recommendable.

Deliberative Functions: The Land Conservation Board can take the responsibility, according to the current legal framework.
Watershed management committees should be established, as stipulated by the Land Conservation and Improvement Act, by a watershed or by administrative unit as described below.
Drainage Boards can be placed under the committees.

Regulatory Functions: Re-organized Land and Water Resources Management Division and the Sections of Hydrology, River Engineering, and Land Use should take the functions after their strengthening, and should work as a secretarial organizations to the Land Conservation Board.
Regional branches of the above Division and Sections should carry out secretarial works to the committees proposed above.

Operational Functions: A Project office should be established for a large-scale project.
Operational parts of Drainage Boards can take a part of functions.
Regional branches of the Division, Extension Division and the above Sections for the matters where decentralized organizations for operation can not be efficiently set up.

Re-vitalizing of the Land Conservation Board should be inevitable for proper watershed management. Legally the Board has strong power, including control of "drainage" activities. The re-vitalization could be achieved through strengthening the regulatory entities as described above.

2) Administrative Unit

An administrative unit for watershed management and flood control should be set by each watershed in principle. The two divisions in the Study Area, however, are recommendable similar to the Central and Western Divisions of the general administrative unit, grouping watersheds, because of the size of the area, limited human and financial resources and large differences in geographical and climatological characteristics. Two Watershed Management Committees (or Land Conservation Committee) could cover the whole area of Viti Levu island. Central Committee should cover Rewa watershed (and Navua watershed), while Western Committee should cover Ba, Nadi and Sigatoka watersheds. Small watersheds in Viti Levu island may be covered by the two Committees of similar characteristics of the watersheds or the one near each watershed.

(2) Shift of the Hydrological Section and its Strengthening for Expanded Role

The strategies would be;

- to concentrate hydrological engineers and technicians into one section, and to promote human resource development,
- to institutionalize re-organization of hydrological measurement network and configuration of the facilities and equipment for data collection, communication, storage and analysis,
- to establish financial arrangement to fund the activities paid by the resource users.

1) Shift of the Hydrological Section

Institutional resources for technical matters of watershed management should be concentrated to the Land and Water Resources Management Division (LWRMD). The staff and budget of Hydrological Section would better to be transferred to the LWRMD. The Division intends to carry out an integrated watershed management not only related to agriculture, as the new name shows. The transfer would also contribute to close tie-up of the Hydrological Section with River Engineering Section and to grade up of the River Engineering Section, especially on structural measures for flood control. Close cooperation with Fiji Meteorological Services (FMS), World Meteorological Organization (WMO) and meteorological institutes of foreign governments for flood forecasting can continue even after the shift as well done at present.

After the shift, the Section should re-organize hydrological networks, including those for flood forecasting and alarming with installation of modernized facilities or equipment as discussed in Section 6.10 of Main Report. Adequate budget should be allotted. Data collection can be carried out by using Division branches after establishment of a data communication system, while data storage, analysis can be made in the headquarters. Data storage system for the analysis would be of keen necessity to be improved.

The transfer to the Division accompanied with the improvement of the network including data transfer with telecommunication system may help efficient use of unestablished staff in the Section. Substantial number of unestablished staff of the Section could be reduced when tasks of staff in the Division branches or other field staff of the MAFF are efficiently organized. Operation manual for staff in charge of hydrological measurement and data collection/transfer should be prepared or revised. Training programs should be promoted for the person to remain in the Section, including those for persons who have possibility to promote to established staff, as well as for the persons to move to other sections.

2) Strengthening for Expansion of the Role

Training for level-up of established staff for the review of the effective and efficient installation and management of the hydrological network is necessary. In order to expand its role in watershed management and flood control, several to ten core persons should have high level of knowledge and techniques of hydrological analysis. Technical transfer by dispatched experts or advisors with sufficient experiences for hydrological analysis, preferably for a long term, from abroad might be recommendable.

An application for Project Type Technical Cooperation of JICA, a combination of dispatch of long- and short-term experts, equipment provision and counterpart training in Japan, could be one of the good options for the establishment or restructuring of the flood forecast system and hydrological measurement network.

Before the application for the project, the MAFF should clarify the objectives of the project, arrange the organization of the counterpart and other preparation, as well as policies for sustainable operation, in order for the Government of Japan to understand the intention of the Government Fiji and for smooth preparation and implementation of the technical cooperation.

A task force for preparation of flood hazard maps of major flood prone areas should be established with the initiative by the Section and with necessary budgeting in cooperation with the National Disaster Management Office, the Department of Town and Country Planning and the Department of Lands and Surveys.

In addition, a unit for sedimentation analysis would preferably added with participation of the River Engineering Section. Transfer of the Hydrogeological Section from the Division of Mineral Development and Mines of the Ministry Lands and Mineral Resources of should also be examined. Water right management, currently conducted by the Department of Lands and Surveys, is preferably to be shifted to the Section of the LWRMD, if possible.

3) Financial Arrangement

As the role and responsibility of the Section expand, budget allocation should accompany. Reliable hydrological analysis may enable effective and efficient flood control. Hydrological analysis of good quality might increase the benefits as well as decrease the costs. Increase in benefits and/or decrease in costs might be fairly enough to cover the increased costs of for the hydrological analysis. Allocation of budget to the Section should be increased.

The fee for water right application, assessment and authorization, in case water right management is transferred, may be chargeable to the resource user directly or through to water supply corporation, Fiji Electricity Authority (FEA) or irrigation facility operators.

(3) Facilitating Flood Control by Structural Measures

Major strategies for institutional arrangement set at present are;

- to establish and strengthen the implementing organization,
- to strengthen the River Engineering Section by encouraging training and technical transfer and information exchange, from foreign governments and international institutes, and within the Government, especially with the PWD,
- to search some financial arrangements to cover construction, operation and maintenance of the structures paid by the beneficiaries,
- to carry out smooth land acquisition for the projects.

1) Organization Set-up

A project advisory committee (special committee) as a task force for preparation and supervision of the design and construction of structures for flood control should be recommended. The relevant departments and divisions of the Government, such as the PWD, the Department of Lands and Surveys, the NLTB, the Ministry of Planning, and Local Government should participate in the preparation and supervision. The committee, after the construction, would be a committee for advice of further structural flood control projects or programs.

Project offices under the supervision of the Land and Water Resources Management Division (LWRMD) should be established up to the completion of a diversion channel or dikes in case of a large scale. Before the detail design, core persons should be trained, preferably in foreign country with experiences of similar projects. Human resources development should be promoted by the LWRMD before the establishment of the project offices.

Operation and maintenance, including monitoring conditions of the structures could be carried out by relevant Drainage Boards when some additional staff are assigned. Staff for operation and maintenance should also be trained with operation manuals prepared by core persons of the Division before the completion of the structure.

2) Grade-up of Technical Capability of the River Engineering Section

For the planning of effective measures for flood control, which is the most important issue in watershed management in the Study Area, the capacity of the River Engineering Section should be strengthened. The Section should have the capability to assess the result of the hydrological analysis, to identify effective measures, to examine technical feasibility and to carry out cost benefit analyses. For strengthening, training of staff would be indispensable. The training by foreign long-term experts with abundant experiences of engineering practices would be inevitable.

3) Examining Cost Recovery Program

Cost recovery, at least costs for maintenance, through payment by the beneficiaries of the structures should be sought. The Central Drainage Board collects F$ 11.52/ha/year as drainage rates for the maintenance of drainage schemes, although the collection faces difficulty, especially from subsistence and semi-subsistence farmers. The Western Drainage Board currently manages 39 drainage scheme, consisting of seawall, floodgates and drains. The drainage rates varies depending on the scheme, raging from F$ 9.84/ha/year to F$ 49.42/ha/year. The Western Drainage Board is not suffered with difficulty in rate collection because almost all the farmers in the drainage areas produce sugarcane and the Fiji Sugar Corporation collects the rate on behalf of the Board upon purchase of sugarcane from the farmers. For the schemes completed after 1992, all investment costs were covered by the Government contribution.

However, establishing cost recovery program for the projects planned in the Master Plan would have some difficulties, theoretically and technically. In general, beneficiaries are willing to pay when he wants to take the benefits. One have to ask the prospective beneficiaries whether he wants the benefits or not before the investment, as currently done by the Drainage Boards to farmers before the implementation of draining projects or seawall construction projects, unless beneficiaries can choose to take or not occasionally

after the investment, as water supply projects, where demand projection determines the scale of investment. Direct charging to beneficiaries might be very difficult.

Application of earmarked tax should be examined. There is an example of a similar case of earmarked tax in Fiji. Suva City Council collects property taxes, 2.0427 %/year of UCV (unimproved capital value) in total, 0.8745 %/year as General Rates (to cover the general services, such as maintenance of parks, etc.), 0.1375 %/year as Stipulated Rate (to maintain street lights) and 1.0307 %/year as Loan Rate (to cover the reimbursement of large scaled loan projects).

Some types of rate collection should be introduced. The example by Suva City Council would be examined in case of town areas. Some additional rate to tenant in flood prone area by the NLTB and the State should also be considered.

Earmarked tax is charged on prospective beneficiaries and a kind of system to apply "beneficiary-to-pay" principle. Introduction of rate collection can be made after the identification of the beneficiaries and estimation of the amount and distribution of the damages saved by the structural measure. In the present conditions, however, the identification and estimation might be technically difficult. Drawing flood hazard maps, and collection and evaluation of past flood damages and costs for relief/rehabilitation activities will help the identification and estimation of rates.

With flood hazard maps and result of the evaluation, the rates should be examine by area, preferably by ward in case of the town area, according to the level of the damage saved by the structure. Estimated value of saved damage by each area might not be directly applied to the rate to be collected, but the rate could be determined in proportion to the value of the benefits, including indirect benefits in the area. Collected rate in total should cover operation and maintenance cost. Some portion of investment costs, such as interest payment, should also be examined.

The LWRMD should examine the possibility of introduction of the cost recovery program through discussion in the Project Advisory Committee or with the relevant authorities such as Town Councils, the NLTB and the Ministry of Planning. In case cost recovery programs are not established, the Government has to pay additional operating costs to the relevant Drainage Board or other operating entity.

There may be another possibility. The structural measures may raise the price of land, increase in crop production, sales by business activities or prices of land (UCV) in specific areas. If these figures can be estimated, the gap in tax revenue or other levies is payable to the managing or implementing bodies. Even in case that the figures can be counted roughly, some financial arrangement could be carried out.

4) Smooth Land Acquisition

Regarding site selection, although some residences can not be avoidable, native villages should be reserved because of their traditional and strong ties to their lands. Archeological site, as well as places of worship should also be avoided. Land acquisition plan should be formulated not to remain the small pieces of fragmented land, where current use would not able to continue.

For the land acquisition in the State Land, payment will be necessary only for the compensation to the current tenants. In case some governmental establishments (building or facility) are located, the cost for the relocation will be necessary to be paid. In case of the freehold land, the cost for purchase is to be paid to the land owner as well as compensation for the investment or improvement made by the tenant or the owner. In case of a State Land or a freehold land, the acquisition will be carried out in due process stipulated in the law.

In case that a project site for flood control proposed in the Mater Plan falls in a native land, there may be the following two alternatives:

1) Lease to the State for 99 years, at longest
2) Outright purchase by the State

Since the structures for flood control, such as diversion channels, are in almost permanent nature, land acquisition through the alternative ii) is recommendable. According to the discussions with the NLTB, however, the NLTB prefers lease for 99 years, taking a sense of ownership of the native owners, with conditions for the extension as follows:

* In case the works for flood control are still valid upon the expiry of the lease or the Government intends to use the works for the purpose, the extensions of the lease shall be made, considering the importance of the purpose of the works, and/or
* In case the extension will not be agreed, the landlords shall pay upon expiry the residual value of the investment and improvement by the Government.

The acquisition by leases would be permissible, considering smooth implementation of the Projects and virtually minor differences between the above two conditions.

In case of the lease by the NLTB, payment of the rent would be made in upfront (payment at once initially), following the policy of the NLTB. Even in case of the upfront payment to the NLTB, the owning units (mataqali) will receive the rents every year from the return of investment made by the NLTB. The continuous payment might help to avoid problems which often occurs in land acquisition. Besides the rent payment, compensation to the current tenant will be necessary for the residual value of the investments or improvements made by the tenants.

In case that a project site falls in Native Reserve, some swap operation of the land with a State Land could be an option, if a certain land for equivalent use is available. Originally, the Native Reserve was designated destined to exclusive use for subsistence of the local community.

Before the land acquisition, socio-economic survey and subsequent assessment should be carried out to avoid negative social impacts and to reduce social risk caused by the land acquisition and resettlement as much as possible, as done in the Feasibility Study for Nadi diversion channel and short cut. General terms of reference for the survey could be as follows. Consultations with School of Social and Economic Development in the University of the South Pacific would be helpful.

Terms of Reference for Socio-Economic Survey

The following should be studied at least before the implementation of the project in rural areas. The survey should be conducted in the place from and to where people are to be resettled.

1) Population Distribution
   a) by Sex
   b) by Age Group
   c) Density
   d) Number of Families (or Households)

2) Income
   a) Occupation
   b) Average Income
   c) Income Distribution
   d) Will the resettlement negatively affect their income ?
      - by losing resources for income generation (e.g. farm or grazing field, fishing place, forest, etc.)
      - by decreasing accessibility to the above resources or employment opportunity (e.g. distance, access to markets)
      - by negatively affecting their legal or customary rights (e.g. land use, water right, fishery right, right of common)
   e) Are people sufficiently skilled or educated for income generation under the new conditions ?
   f) Do they have opportunity to be sufficiently skilled or educated ?

3) Impacts on Other Living Conditions
   a) Housing Conditions
   b) Accessibility to Medical or Health Care
   c) Accessibility to Water
   d) Accessibility to Primary Education
   e) Accessibility to Electricity
   f) Accessibility to Transportation
   g) Sanitation

4) Community Spilt
   a) Will the resettlement incur a community spit ?
   b) Will accessibility to relatives and other community members be decreased ?

5) Religious or Cultural Effects

a) Are some archeological or historical monuments situated in the site ?

b) Are there some religious, holy or symbolic monuments in the site ?

c) Will the resettlement reduce the accessibility to the above monuments ?

d) Will the project deteriorates aesthetic conditions ?

(4) Enhancing Preparedness in Disaster Management

1) Facilitating Post Damage Evaluation

The framework for post damage evaluation would have a similar structure to that of immediate damage evaluation with a wider scope, including hampered commercial activities. The National Disaster Management Office should formulate a framework for post damage evaluation in consultation with relevant organizations included in immediate damage survey and assessment. For the preparation of the framework, existing records on types, amount and mechanism of damages caused by the past large disasters, as well as the type, timing and amount of relief activities and their effects should be collected as much as possible in cooperation with relevant organizations. Establishment of a task force for past records collection/analysis as well as for preparation of post damage evaluation would be recommendable.

Results of post damage evaluation, as well as the costs for disaster relief and rehabilitation, should be disseminated and filed. Accumulation of the evaluation would further improve the level of the evaluation. The records can be used not only in flood control planning and promotion of preparedness but also in establishing rational cost recovery program with payment by beneficiaries.

2) Promotion of the Preparation of "Disaster Management Plan for Other Agencies"

"Disaster Management Plan for Other Agencies" should immediately be prepared, including manuals for immediate damage evaluation and be made effective soon after the enactment of the "National Disaster Management Bill". The results of the analysis on collected information on past damages and review of past relief and rehabilitation activities should be reported to the other agencies. Kick-off meeting with explanation of the result of analysis on past records and major agenda to be included in the respective "Disaster Management Plan" for each of the agency, made through the evaluation of the past records by the above task force, may help quick preparation.

(5) Strengthening for Extension of Land Conservation

The strategies institutional enhancement which enable;

- to prepare applicable standards and guidelines to be provided in the tenant agreement,
- to promote duly executed leases,
- to strengthen the organization in order to enhance inspection, extension and training services,
- to formulate plain manuals understandable for extension officers and farmers.
- to initiate 'train-the-trainer' courses, and to train field officers and farmers

- to give incentives and penalties to farmers

1) Preparation of Standards and Guidelines for Provisions in the Tenant Agreement and Promotion of Duly Executed Leases

Review of ALTA should be promptly finalized to give security to tenants whose leasehold may expire in near future. The lessee would not be willing to carry out good land husbandry practices at present, worrying their future means of living.

Provisions currently given in the ALTA or NLTA and in lease agreement documents are much generalized and tenant farmers might not understand what to do. After the ALTA review is finalized, a regulation should be drafted, preferably by the present ALTA review unit with additional staff, to give framework for provisions to be attached to tenant agreements. Subsequently, standards and guidelines for drafting attached conditions to each tenant document should be prepared in consultation with the Land Use Section of the MAFF. As recommended in Clerk, 1986, the provisions should be understandable to field officers and farmers.

Duly executed leases are delayed due to the costs for the survey required before the registration and long time taken for the approval. Since the costs of survey may be expensive for tenants and they may need to investment for cultivation when they start leaseholding, some financial assistance might be preferable, despite some improvement in Native Land Trust (Leases and Licences) Regulation 1984. To lend the survey cost by NLTB to the lessee, when other conditions for tenancy are agreeable to the NLTB, would be recommendable. The repayment, including interest, by a lessee could be added to the rent.

When legal status of the tenant become rigid, the tenant farmer may be willing to cultivate with good land husbandry practices so that the productivity of the land will be maintained in the long term. The benefits for the landlord may also increase. This arrangement would be worth for consideration by NLTB, on behalf of the land owners. Normally in Torrens system, survey costs for registration are born by the person who claim the title, and a lease will be granted by the titleholder. Allocation of the survey fee to the landlord might preferably be considered.

A task force in the Department of Lands and Surveys would be necessary for the checking surveys and documents in the near future, when new applications concentrate after expiry.

2) Organization Strengthening for Extension Services

The Land Use Section of the Research Division in the MAFF should be strengthened with more skilled staff and increased budget, as a regulatory organization, to identify the most promising land conservation practices, to plan projects and programs by region and by types of crop cultivation, to manage demonstration farming, and to start training of the key persons and field officers. The Section should increase its capacity to discharge secretarial function, as core section, to the Land Conservation Board. Shift of the Section to the Land and Water Resources Management Division, or Extension Division of the Department of Agriculture should also be considered.

The land conservation activities should reach the extension stage. Promotion and diffusion of the identified land conservation practices should involve the Extension

Division of the Department of Agriculture. The Division has the strongest capacity or potential in the Ministry with its extension network over the country. Involvement of the extension system of Fiji Sugar Corporation (FSC) is indispensable in the Western Division. The strategy for the extension phase would better be formulated with the participation of the Division and managers of the extension system of the FSC, preferably with the advise of the foreign experts with similar experiences in similar conditions.

Some institutional arrangement will be necessary to add duties for the diffusion and promotion of land conservation practices to the job description of the staff of the Extension Division. Evaluation of their achievement will also be necessary to be changed their concern from short-term land productivity to long-term or sustainable productivity.

3) Implementing Training Programs

The extension stage should start with the training of the core personnel of the Extension Division and Field Officers of FSC. The Section should prepare and conduct the training courses for extension officers ('train-the-trainer course'). Senior Agricultural Officers of the Division and District Field Staff of FSC might be the target trainee of this level of the training. Planning, guiding, supervising, monitoring and evaluating extension scheme, as well as training and education methods to field officers should be included in the curricula.

The training for Agricultural Technical Officers of the Division (around 30 persons) and leaders of Extension Support Group of FSC should follow. The main curricula would be the methodology of the guidance and education to the field staff and farmers. The training of Senior Agricultural Assistants (around 100 persons) of the Division and extension officers of each sector (38 sectors in total) of the FSC should subsequently be conducted for the method of education to the farmers and for other extension services for good land husbandry practices. Subsequently, the Section should prepare the training courses of farmers with cooperation with the Division.

Training manuals and materials, including brochure to farmers, should also be prepared, preferably with the technical transfer from the foreign experts dispatched. The training of the core personnel can start smoothly after participation in the training courses provided by foreign development assistance agencies, such as JICA. JICA has a suitable training course on "Farming Technology in Sloping Areas for Environmental Conservation", of which duration extends around two months.

Project Type Technical Cooperation of JICA, including dispatch of experts for training of the trainers, development of training and education materials, provision of equipment for education and management of demonstration farms, and counterpart training in Japan, would also recommendable. For the preparation of the Project Type Technical Cooperation and for the programming of the training scheme, application to dispatch of long-term expert would be recommendable.

Demonstration farms, three of which are managed by the Section at present, should be increased in order to cover all major type of crops, conservation practices, regions, topographic and climate conditions. The demonstration farms can be the best

instruments for the training of officers of the Division and training of farmers by those officers.

4) Incentives and Penalties

Another recommendable measure for the promotion and dissemination of land conservation is to establish some awarding by the Minister, such as "Best Land Husband of the Year", for farmers as well as for field officers. The awarding may not only give incentives to farmers or officers but also help disseminating the policy of the Government or showing how the good land husbandry can be practiced.

After clear and plain provisions are attached to the tenant agreement, farmers can know what their responsibilities are. Periodic, such as once in three or five years, or at least near the end of the term, inspection and evaluation should be carried out by the extension officers and officers from the NLTB. In case the farmer fully follow the agreement or engage good land husbandry, some certificate or recommendation could be issued for extension of leases or other incentives, while if the farmer does not, the farmer could be charged penalties, such as fine, increased rent or termination of the lease.

(6) Afforestation

Major strategies would be;

- to initiate afforestation program along rivers by the River Engineering Section, Department of Forests and the NLTB,
- to control logging practices,
- to regulate and inspect burning,
- to promote agro-forestry, or community forestry.

1) Afforestation in Critical Areas

Although afforestation as recommended in Section 5.5 of Main Report is not so feasible as to be discussed as a priority project in the Feasibility Study, some critical parts of the slopes along rivers, such as those close to the rivers with steep slopes, can be selected with high priority. Afforestation should be promoted gradually by River Engineering Section, the Department of Forests and the Department of Lands and Surveys, under the current legislation and administration.

First, critical areas, especially bands of areas along the river banks, should be selected according to collected data and analysis, preferably by the sedimentation unit in the Hydrological Section as proposed above. The areas could be designated as forest reserve, and afforestation should follow by the Department of Forest. Some concept of "river areas", not only simply a breadth of 20 feet as currently enacted but also determined for normal functioning of water courses, whose destination should be determined or granted by the entity who manages rivers and streams under the Act, should be considered after a study by a task force consisted of the River Engineering Section, the Hydrological Section, the Department of Forest, the Department of Lands and Surveys and the NLTB.

Financial arrangements from payments of the downstream beneficiaries, such as a part of property taxes in towns in the lower reach to the implementing entities of afforestation is

preferable, especially in case of the plantation by Fiji Pine Limited, which is decentralized entity and whose activities are determined mainly from commercial view-points.

2) Stricter Control of Logging Practices

Replanting of logged out areas should be included all of the logging licenses with provisions on type of trees and manners of replanting at least. Inspection should be made before the termination of the licensing, and before the leave of the loggers in case of foreign companies. In case the loggers do not follow the provisions, strict penalties, at least no more licensing in Fiji and more fines than the costs for replanting by the Department of Forest or Fiji Pine Limited.

3) Regulating Burning

Some measures for controlling vegetation burning, such as that described as follows, should be examine for establishing, especially in Western Division:

- Burning of vegetation, all or that with a larger scale than prescribed, for farming or grazing purposes should be notified to the nearest office under Extension Division of the Department of Agriculture, Department of Forest or the Land Conservation Board or Committee, prior to lighting.
- The notice should include time, place, area and means against unnecessary expansion.
- In case land conservation or forest management entities are not satisfied with the conditions, they could order to modify or to stop the burning.
- In case the scale is larger than a certain area or the site is located in a critical area, some officer could accompany for inspection.
- If unnotified burning is found, the person who causes the fire should be strictly punished.

A task force should be established to examine the system for control.

4) Spreading Agro-forestry

Agro-forestry in Fiji should also reach to extension phase. The agro-forestry unit should enhance its capacity to continue identification of suitable programs as well as to extend the lessons acquired in previous researches. Promotion with participation of local communities is recommendable. Participation of communities enables expansion with sustainable manner, utilizing local knowledge held by the communities.

Participation of communities should be required not only in operation and maintenance of the identified scheme but also in every stage, from the planning to monitoring and evaluation stage. The involvement of the NLTB should be encouraged, if necessary.

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CHAPTER 2 INSTITUTION AND TRAINING FOR THE IMPLEMENTATION OF PRIORITY PROJECT

2.1 Organization in Charge of Implementation of the Project

It is recommended that the Government of Fiji will hire a consulting engineering firm to assist the proposed organization to implement the detail design and construction supervision, and a contractor for the construction. The following entities should check, supervise and authorize the works by the contractor with the consultant. In order to promote technical transfer from the consultant and to save the engineering cost, the initiative should be held by the entities discussed below.

The discussion below does not contain the institution for the development of hotel and residential lots at the disposal site of the soil excavated for the construction of the diversion channel. The institution for the development at implementing stage should be examined separately from the institution for the diversion construction or operation/maintenance.

Since the Project will be related to many fields of the government administration, some advisory committee should be organized, whose members should represent various departments/divisions of the Government not only within the Ministry of Agriculture, Fisheries and Forests (MAFF) but also from those in other ministries.

Because of the large scale and importance of the Project, some project office should be established separately from the current section under the Director of the Land and Water Resource Management Division (LWRMD). The composition of the Project Office should change according to the phases of the Project implementation; detail design phase, construction phase and operation/maintenance phase.

The River Engineering Section and the Drainage and Irrigation Section in the LWRMD in the MAFF, as head quarter organizations, should back-up the establishment and operation of the Project Office. Some of the staff of the Sections could move to the Office in order to realize a smooth start of the Office, to minimize the increase in the number of staff of the Division or the Ministry in total, and to enhance the efficiency of performance. The Sections should give technical support to the Office.

The relation of the Project implementation entities to the current organizations are illustrated below:

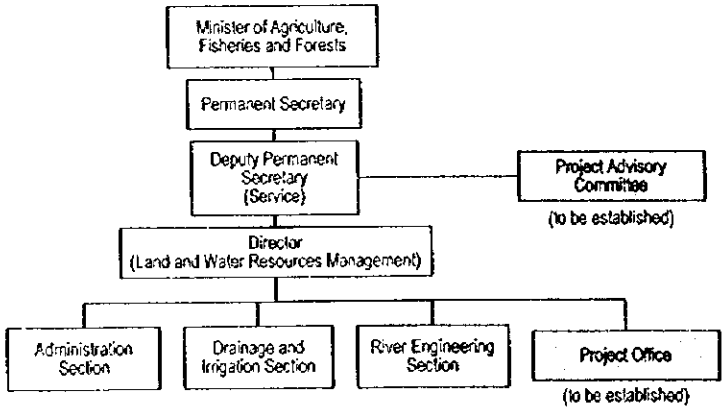

Figure-K2.1 Proposed Set-up for Project Implementation

(1) Project Advisory Committee

The members of the Project Advisory Committee could be comprised of officers, preferably director level from departments/divisions of other ministries or statutory bodies related to the detail design and construction of the Project, such as Public Works Department, Department of Lands and Surveys, Native Land Trust Board or Civil Aviation Authority, for example. The members of the Committee should not only represent the interests of the respective organizations but also coordinate support from the organizations for the Project implementation.

(2) Organization of the Project Office at Detail Design Phase

A model of the project site office at detail design stage is shown below. The personnel could be moved from other sections of the LWRMD or divisions of the MAFF or from departments or divisions of other ministries. Strong support and close cooperation of the Department of Lands and Surveys and Public Works Department would be inevitable.

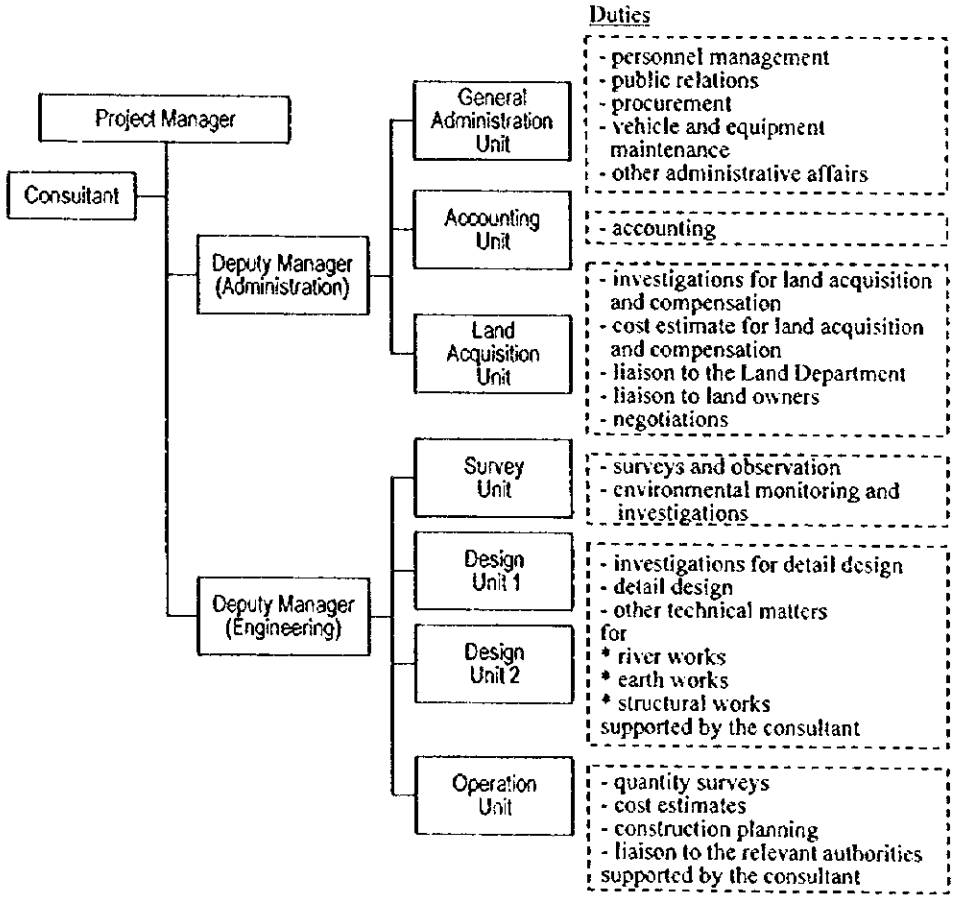

Figure-K2.2 Proposed Project Office at Detail Design Stage

(3) Organization in Charge of the Construction Supervision

Proposed organization of the Project Office at construction stage is illustrated below. The Land Acquisition Unit, the Survey Unit and the Design Unit should remain in the construction phase although the size could be reduced.

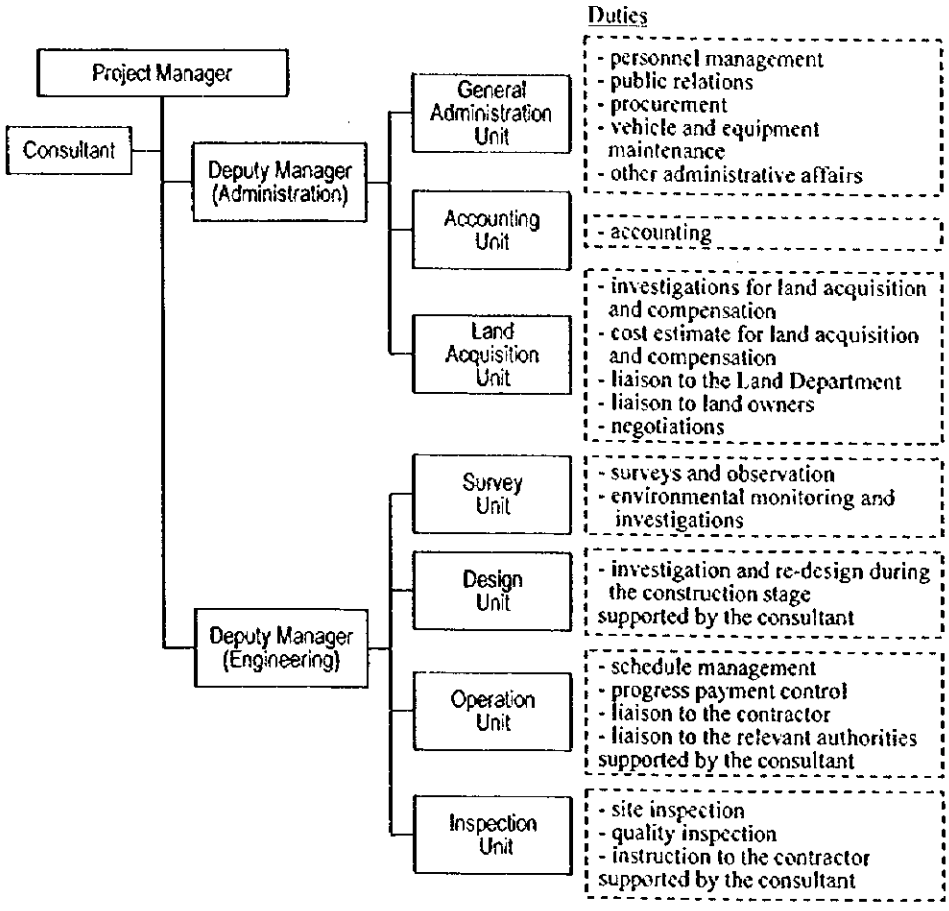

Figure-K2.3 Proposed Project Office at Construction Stage

(4) Organization in Charge of Operation and Maintenance

The diversion channel and the shortcut channel can be handed over to the Drainage Board for maintenance after the completion of construction. The Board currently maintains drainage schemes with a total length of 271 km with the organization. In case any special operation and maintenance other than those for drainage channels is not necessary, the Board can maintain the channel and the shortcut with the current techniques. Additional assignment of one of the established staff in the Board specialized for the operation/ maintenance of the diversion channel and the shortcut could be enough.

In case some rate collection for cost recovery is not approved, the costs for operation/maintenance of the diversion channel and the shortcut should be paid from the Government budget to the Board. In case of rate collection, such as that from additional property tax in town area or additional lease fee in State Land and Native Land, an additional clerical officer might be necessary.

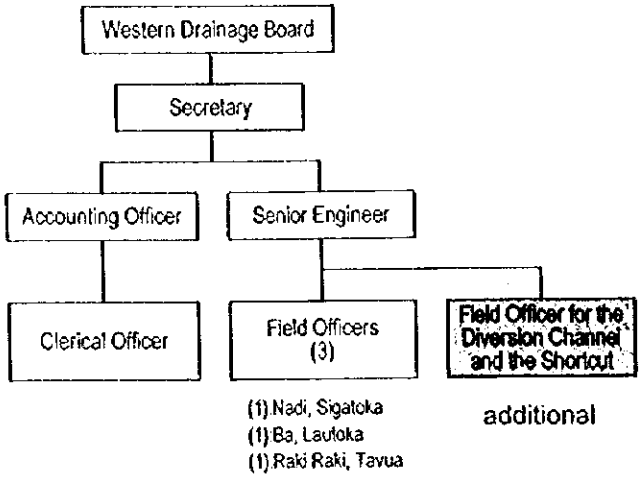

Figure-K2.4 Organization of the Western Drainage Board

2.2 Required Training for Project Implementation

Since the Government of Fiji has no experience for construction of diversion channel in the scale of the Project, some training for the implementation of the Project is necessary.

Some training to prospective staff of the Project Office at all phases, and the staff of the River Engineering Section and the Drainage and Irrigation Section is required before the implementation of the Project. The training can start with site observation of similar projects by a candidate for the manager of the Office and managers of these Sections, followed by joint case studies by the engineers and technical staff of the Sections on the model projects selected by the managers. Assistance of foreign experts with experience of similar projects would be quite helpful.

CHAPTER 3 LAND ACQUISITION AND COMPENSATION FOR THE PRIORITY PROJECT

3.1 Land Acquisition Plan

Proposed site for the diversion channel in Nadi is located in State Lands and freehold lands and the one for the short cut channel in Nadi is situated in Native Reserve. Since the Project will benefit the public, lands for the Project can be acquired by the Land Department on behalf of the State with the provisions of the State Land Acquisition Act (Cap. 135).

1) State Land

In case some parts of the site are situated in State Lands, no purchase of the land is necessary because the State has the ownership already. Some compensation, however, is necessary for the present use. The State, in case the land is leased, will have to compensate the remaining years of the leasehold.

2) Freehold Land

The process for the acquisition from freehold lands is as follows:

- The executing agency proposing a project shall submit the plan of the project including maps of the project site to the Department of Lands and Survey.
- The Department may start to negotiate with the title holder for conditions of the dealing or compensation
- In case that the conditions are not agreed, the Supreme Court determines the conditions.

For the acquisition of a freehold land, payment for land price (unimproved capital value, UCV) of the land is necessary. In case the land is leased, some portion of the UCV should be paid to the tenants and the rest to the owner of the land, depending on the remaining years of the lease.

3) Native Reserve

For land acquisition of the short cut channel in Nadi, de-reservation of the land is necessary. Originally, the Native Reserve was assigned as the reserved area required for the subsistence of the native Fijians. The Native Reserve can be leased only to Fijians. Although acquisition by the State may be carried out under the State Land Acquisition Act, re-reservation of some State Land in exchange to the State acquisition would be preferable, considering the purpose of the original reservation.

For the re-reservation, some area of the land for the equivalent use to the current one should be prepared for the exchange. If the Government can find some vacant State Land, that land can be assigned to a Native Reserve without paying any costs and compensation to the current occupier of the State Land. Some State Land with agricultural lease would be preferable; however, for the exchange because of its relatively low compensation costs. The field reconnaissance with the officers of the Department of Lands and Surveys and the NLTB showed possibility of availability of State Lands currently leased to the farmers near the village of owners of the Reserve in the proposed short cut channel.

Although some parts of the site for the short cut channel are bushes, total area for sugarcane farming is considered for the exchange in this cost estimation.

A public cemetery, an archeological site (a traditional sacred place on the north of the McDonald's), and a temple (near the crossing point of Enamanu Road with Tramline) were avoided, taking their cultural value into account.

For all types of the land tenure, the land area to be acquired was determined in order not to remain fragmentation of land in any lots and to avoid insolated portion, unless it occurs before the acquisition, considering continuation of the current use and convenient access as much as possible.

3.2 Compensation

Matters to be considered in determining compensation are stipulated in the Section 12 of the State Land Acquisition Act. Although valuation of each of properties should made one by one before the acquisition, estimations are made with the result of "Social Environmental Survey" by a local consulting firm and cooperation by the Department of Lands and Surveys.

(1) Buildings and Additional Investments by the Occupiers or Owners

Valuation of the buildings was made by measuring building areas on the site by local consultants. Even in the case that a small portion of a building or a garden is on the site, the whole building was counted for estimation of the compensation. The unit price of compensation for each type of the building, given by the Department of Lands and Surveys for concrete and timber buildings and by the Housing Authority for corrugated iron structures and Fijian traditional houses, was applied for the estimation. The amount of additional investment for electricity distribution, telecommunication, water supply and sewerage service, and other improvements on the lots were estimated with interview survey with each household by the local consultant.

(2) Crops

Although standing crops or trees at the time of the State acquisition can not be known at present, annual harvests were counted in the estimation. Since sugarcane farming is predominant in the farming lots of the site area, the maximum yield of sugarcane (30 ton/acre=74 ton/ha) in the interview survey was applied for all farming areas. Cultivated area on the farming lots was assumed as 90 % because some portions of the farming lots are used for residential or other purposes.

(3) Compensation Works

Construction of the diversion channel will cut some parts of road networks, telephone lines, electricity distribution lines, water pipes, sewers and tramlines. Compensation works were planed to secure the availability of those services after the construction as much as possible. Some compensation works may enhance those networks.

(4) Other Compensation to be Considered Later

The construction and operation of the diversion channel may cause sedimentation or other impact on fishing. Affected area even at the time of the flood once in 20 years is estimated less than two kilometers from the outlet at most with narrow angle of the sector. In the affected area, there are fishery rights held by a Fijian community (mataqali). They fish for their own consumption and professional fishermen fish far from the affected area, according to the information by Fishery Department. Although further investigation is necessary to be carried out at the detail design stage to evaluate the damage in fishery activities, the damage was not included in this estimation because of the small scale of probable damage by the channel construction.

There seems to be a small shop on the site (ND5121 Lot 4) according to the Map submitted by the local consultant. The compensation was not included in this estimation since the earning from the shop was not known (the household income is F$ 100,000/year, according to the result of the interview survey). The evaluation is necessary at detail design stage.

3.3 Quantity

(1) Land

Total land area to be acquired was estimated at 108.8 ha for the diversion channel, whose breakdown is given below, and 2.4 ha for the short cut channel. The river area to be filled after the construction of the short cut channel was not counted for this estimation, despite a possibility for exchange or selling. The land area of the original alignment for the diversion channel was 102.0 ha. Additional land of 6.8 ha is planned to be acquired to avoid fragmented remaining areas. The unit cost suggested by the Department of Lands and Surveys is as follows. The land cost for the short cut channel was estimated at F$ 89 thousand.

Table-K3.1 Lands for the Diversion Channel

Type of Lands		Area (ha)	Unit (F$/acre)	Cost (F$/ha)	Cost (F$ 1,000)
State Land (Leasehold)	Agriculture	72.7	7,500	18,532	1,347
Freehold	Residential	13.3	10,000	247,097	3,277
	Agriculture	15.6	15,000	37,064	578
	Airport Extension (alternative use agriculture)	7.2	15,000	37,064	266
Total		108.8			5,468

Note: by Classification of the Department of Lands and Surveys

(2) Buildings and Additional Investments by Occupiers or Owners

Building areas on the site for the diversion channel is shown below, while no building or no significant additional investments was found in the site for the short cut channel. The unit costs given by the Department and the Housing Authority are also listed below. There are three sets of buildings found in the Maps from the local consultant whose owners or residents could not attend the interview. The value of these buildings were assumed as F$ 50,000/set.

Table-K3.2 Buildings and Additional Improvements/Investments

Type of Structure	Area (m^2)	Unit Cost (F$/ m^2)	Cost (F$ 1,000)
Concrete	2,419	450	1,089
Timber	2,095	350	733
Corrugated Iron	1,786	300	536
Fijian Traditional Houses	0	250	0
Additional Improvements to Buildings			53
Subtotal	6,300		2,411
Additional Investment to the Property			335
3 Properties (not interviewed)			150
Total			2,896

Note: Unit Costs were given by the Department of Lands and Surveys and the Housing Authority

(3) Crops

Quantities for estimation of the compensations are calculated below.

Table-K3.3 Crop Value to be Compensated

	Diversion Channel	Re-reserved Area for Short Cut	Unit
- Farming Area	95.5	2.4	ha
- Cultivated Area	86.0	2.4	ha
- Yields (Sugarcane)	74.1	74.1	ton/ha
- Harvest (Sugarcane)	6,373	178	ton
- Unit Price (Sugarcane)	65	65	F$/ton
- Crop Value	414	12	F$ 1,000

3.4 Land Acquisition and Compensation Costs

Costs for land acquisition and compensation are summarized below.

Table-K3.4 Costs for Land Acquisition and Compensation

(Unit: F$ 1,000)

	Diversion Channel	Short Cut
(1) Land	5,468	89
(2) Buildings/Investment	2,896	---
(3) Crops	414	12
Total	8,778	101

Comparing to cost estimates in the Master Plan Study, the land acquisition and compensation costs for the diversion channel reach to more than the doubled. The major reasons are as follows:

- The land area estimated in the Master Plan Study was 72.1 ha, including that for land for surplus soil disposal while that for the Feasibility Study was 108.8 ha after examining available land for the filling, the boring tests in the site, as well as rough formulation of the land acquisition plan as described above.

- In the Master Plan Study, all site areas, except a large commercial lot, were assumed as farming areas whose unit cost in freehold lands was F$ 13,500/ha, while in the Feasibility Study, 12 % of the total area is assumed as residential areas in freehold lands, whose cost suggested by the Department of Land and Surveys after the site survey by the staff amount to almost F$ 250,000 ha. The portion the residential areas in the land cost shares almost 60 % of the total land cost in the Feasibility Study. Other unit prices of the land suggested by the Department also increased to near the doubled.
- Compensation costs for buildings were also doubled due to the detail investigation of the floor areas and costs suggested by the Department and the Housing Authority.