

Solomon Islands Emergency Assistance Project
Supplementary Appendix A

DAMAGE ASSESSMENT

A. Introduction

1. On 2 April 2007 a massive undersea earthquake triggered a tsunami that struck Western and Choiseul provinces. Several aftershocks, some as large as 6.4 on the Richter scale, continued in the weeks after the earthquake, reinforcing fear in the affected communities. Islands¹ in these two provinces suffered widespread damage to housing, infrastructure, schools, and medical facilities, and several villages were destroyed. An estimated 20,000 people of a total population of 90,000 in both provinces have been affected. About 5,000 people were displaced and 52 people died.

2. All islands in the provinces suffered widespread damage to housing, infrastructure (wharves, bridges), schools and clinics, while several villages were wiped out by a tsunami wave. Landslides caused damage to some gardens and roads. The force of the earthquake was such that it changed the physical environment of the islands and reefs, causing some parts to sink by several meters, while other parts were uplifted by several meters. These physical changes are likely to have an impact on coastal vulnerability, ground water levels, agriculture and livelihoods (fishing, tourism).

3. The majority of the population reacted to the events by abandoning their coastal villages and relocating to higher ground and setting up makeshift camps for fear of aftershocks and a possible second tsunami. The displaced life is creating additional risk of disease outbreak although the situation is stable for now. While some populations potentially could return to their villages, none seem willing at this point. A small group of villages have lost everything and will not be able to return. Land issues are already starting to be discussed but people could be displaced for some time until land issues are resolved.

4. Based on the damage assessments and discussions with the relevant ministries, the cost of damage to transport infrastructure and the water and sanitation sector is estimated at SI\$54,535,941 million or \$7,232,459 equivalent. The detailed assessment of the damages in the transport infrastructure is in Appendix 1.

5. The rehabilitation and reconstruction cost estimates are about SI\$300.56 million or \$40.07 million equivalent, at the current prevailing rate over the short to medium-term.

B. Methodology

6. An assessment team led by the Asian Development Bank (ADB) with participation from AusAID and NZAID conducted a rapid damage assessment of transport infrastructure in the affected areas. Given that the remoteness of the sites of the affected infrastructure and the need to assess the damages quickly, the assessment team adopted a methodology that were based on several assumptions applied both for the transport infrastructure and Gizo town water supply and sewerage system damage assessments. These assumptions included standard sizes of roads, bridges, culverts, wharves, jetties, protection works, sea walls, and intake sources for areas that the team could not visit and physically take measurements. In addition,

¹ Including the islands of Choiseul, Gizo, Kolombangara, Mono, New Georgia, Ranongga, Rendova, Shortlands, Simbo, and Vella Lavella

one of the key assumptions has been the unit rate. It has been assumed the unit rates used to calculate the damages at the time of construction averaged some 10 years back from the date of damage assessment including the depreciation of those assets. The assumptions for the damages are appended in Annexes 1 and 2 of Appendix 1.

7. The rehabilitation and reconstruction estimates take into account that the damaged assets need to be replaced with new ones, not only of equal value but, with upgrades to infrastructure in order to reduce the previous inherent vulnerability and future developments within the areas.

C. Road Network

8. Damage to land transport infrastructure has been extensive. In the worst affected areas, roads and surrounding coastal areas have been heavily scoured, covered with debris, logs, uprooted trees, and damaged houses. Roadside drains and most culverts are silted or blocked. A number of culverts have been damaged due to seismic and tsunami action. Many bridge abutments, which were not designed for seismic activities, have been completely destroyed. A few bridges appear to be in satisfactory condition but will require thorough investigation for seismic loading as the earthquake tremors have destabilized their foundations and they may no longer be sound. This is largely due to the fact that the roads and bridges are located on the coastal areas that had direct tsunami impact, and moreover, the structures were neither designed nor constructed to seismic loading. Moreover, the culverts and concrete abutments constructed were without any reinforcement.

9. As a result of earthquake and tsunami effects, the roads and bridges have been severely damaged on most of the islands in the Western and Choiseul provinces. About 70 kilometers (km) of roads, 48 bridges, 80 culverts, and 68 km of earth drains have been severely damaged. Most of the damages have been on the islands of Gizo and Choiseul. On Gizo, about 17km of road from Malakareva Village 3 to Segeraghi on the south coast was damaged by the earthquake and tsunami. Damages assessed include 11 bridges and 24 cross culverts destroyed completely with major scouring and wash out of road pavement materials. On Choiseul about 23 km of road in south Choiseul from Kolombangara to Ghoe has been affected with similar damages from tsunami. In addition, 24 bridges and 24 culverts were completely destroyed. Several sections of roads on the coastal edges both islands eroded heavily. On New Georgia island, 1 km of south road suffered major damages including landslides, one bridge was completely destroyed, and another 4.3 km suffered minor damage. On Kolombangara, one bridge was destroyed and a few isolated road sections suffered major damages. This road is used daily by Kolombangara Forestry Plantation Limited owning about 20 vehicles exporting round logs and milled timber.

10. The 2 km road on Simbo Island is overgrown with vegetation. The pavement materials are intact. However, the 50m foot bridge connecting the road from Simbo Island to Nusa Simbo Island has been completely destroyed. On Vella Lavella Island, while there has been no major damage to the road, two bridges have been completely destroyed. The road is overgrown with vegetation and pavement materials are generally intact. A few isolated section of road has eroded at the coastal edges. On Rendova Island, there has been no major damages to the roads.

11. On Shortlands while no damaged was caused by the Tsunami and earthquake on the road network from Nuhu to Maleai, major damage was done on the Korovou to Koliai. The Nuhu to Maleai road however is an important link to the wharf which was damaged by the Tsunami. Currently huge costs are incurred in transporting the commodities, especially copra

to the wharf.

12. The 12 km road at Mono is used especially for transporting Copra by the only tractor on the island. The road on the coastline was badly damaged with up to 80% of the carriage way washed away by the tsunami and tidal wave. The bridges are all washed away by the tsunami. The cost of damage assessment to the roads and bridges is estimated at SI\$17,232,831.00 (See Annexes 4 and 5 of Appendix 1).

D. Wharves and Jetties

13. Given the archipelagic nature of the country, the general dispersal of population throughout the country, a predominance of coastal settlement, and a terrain and climate that make roads difficult and expensive to construct and maintain, the Solomon Islands transport sector has been predominantly by sea. Due to the sparse road network, the main form of transport in rural areas is often by small boat around coastal areas and by coastal ships between provinces. However, earthquake tremors in the Western and Choiseul provinces have destabilized the substructure of many wharves and jetties and the tsunami has completely damaged or destroyed the superstructure, leaving them unserviceable and unsafe. Several wharves are completely destroyed, while some are repairable, albeit will require prior investigation for their sustainability. Shipping services have been disrupted as wharves are unsafe to berth interisland shipping vessels, thus losing connectivity of the affected islands.

14. A total of 19 wharves, 14 jetties, 52 causeways, two ramps, 691 meters (m) of protection works, and 716 m of seawalls have been damaged or destroyed in the earthquake and tsunami affected areas. In addition to providing passenger and cargo services, the wharves provide connectivity to these villages and settlements by sea, where roads are expensive to construct and maintain. As a result of the damages to the wharves and jetties, several villages are without shipping services. The farmers who rely mostly on ships to transport their copra and cocoa are no longer accessible to these services. In fact, they are forced to use outboard motor canoes to transport their copra and cocoa, which is expensive. These constraints will adversely affect economic development, poverty reduction and social services within the two the provinces.

15. In the Western Province, the island of Ranongga had its two wharves totally destroyed. There is no road on the island ships are the main mode of transport. Moreover, the earthquake has lifted the eastern part of the island by about two meters exposing the reef which provided the main source of sea food. The entire population on Ranongga Island has lost their fishing grounds, thus leading them more into poverty. On the other hand, Simbo Island has sunk by about 2 m. The wharf and the causeway at Leqani are under water during high tide and are barely exposed above sea level during low tide. The tidal effects make the wharf unserviceable by the interisland vessels, which at pre-tsunami were making calls once every month.

16. On New Georgia and Kolombangara islands, the two main wharves at Munda and Ringi are completely destroyed, whereas the jetty at Nusa Tupe island, which provides the main link and services for tourists to Gizo Island has been also been completely destroyed. Munda wharf which provided services to a large population on the south of New Georgia is no longer serviceable. Therefore people are now traveling about 17 km to Noro Port for the shipment of their goods. The main wharf on Gizo Island has no major damages but the retaining walls protecting the container storage area has subsided. The Ughele wharf on Rendova Island has been completely destroyed. On Vella Lavella Island, two main wharves servicing the north east populations at Lambulabu and Boro have also been completely destroyed. The wharf at Vonunu did not sustain any major damages but the concrete apron to

the deck and the protection works to the causeway and wharf sustained major damages. The other wharves destroyed had been the Falamae wharf and Maleai, Nila and Korovou wharves on Shortland and Mono Islands respectively. Three major wharves located in Choiseul have been totally destroyed. These include Taro, Katurasele and Posaare wharves. Taro wharf serves the main urban center in Choiseul. Most of these wharves were constructed to promote economic activities particularly, agriculture (Copra & Cocoa) and provide connectivity to the remote settlements. The damage assessment to the wharves, jetties, causeways, protection works and seawalls is estimated at SI\$28,336,910.00 (See Annexes 4 and 5 of Appendix 1).

E. Airports

17. Except for Ringi Airport on Kolombangara island, none of the airports have been subject to any major damages. Some of the low lying airstrips close to the coastal are have been covered by debris brought in by the tsunami. These have been cleared and airports are operational. However, the Ringi airport on Kolombangara is closed and Solomon Airlines has suspended operations indefinitely. There are major depressions and cracks on the runway making the aircrafts unsafe to land. About 8,000 square meters (m²) of the airstrip has been severely damaged and is estimated at SI\$7,552,500 (See Annexes 4 and 5 of Appendix 1).

F. Gizo Town Water Supply

18. In the main town of Gizo, the water supply is operational but damaged. The distribution main from the intake to the storage reservoir was broken in several locations and has received only temporary repairs. However, the water being supplied is contaminated and unsuitable for drinking. There have been landslides and damages at the intake sources and the earthquake shocks have destabilized the foundations of the reservoirs and storage tanks. Given the growing population of Gizo, the intake capacity will need improvement and the distribution main upgraded to meet the growing demand. Similarly, the water storage capacity will require upgrading and a new purification system put in place. Likewise, sanitation facilities also require attention and options for improvement are necessary.

19. Gizo town is located on the south eastern side of Gizo Island in the Western Province is the main population center and is the base of the provincial assembly headquarters. The town has an estimated population of over 3,000 people occupying over 400 dwellings and is the second largest commercial center outside Honiara. Gizo is also a major tourism destination of the country offering accommodation, and a variety of sports adventures. Western Province is also the county's major resource revenue provider. Gizo water supply suffered major damage both by the earthquake and tsunami. The earthquake caused ruptures and disconnected water pipes, destabilized foundations and walls of reservoirs, intakes, and storage tanks, blocked and damaged intake sources with landslides and boulders, and destabilized foundation of water pump house. The tsunami scoured the pipe trenches along the roads, eroding the beddings and broke the water pipes at several locations. It also damaged the electrical parts and cables of borehole submergible water pump. While several repairs have been undertaken to restore the supply of water, these repairs has been only temporary. Subsequent to the earthquake and tsunami, the Gizo water supply has been experiencing significant supply loss in the distribution pipes, storage tanks and in the reticulation system. The unaccounted water is significant and apparently due to the leakages in the damaged pipes and joints, and storage tanks. There are several sources of water supply in Gizo, however none of them are safe for drinking as there is no purification system.

20. Leoko Intake and Reservoir is one of the main sources of water supply for Gizo urban population. This small isolated flow provides good quality water with low turbidity and flows continuously during dry periods. The intake collection dam experienced landslides and

boulders from the earthquake. The 6.6 km distribution main from the intake collection dam at Leoko connects the sand filter reservoirs at Kariki. The distribution main which runs mainly alongside the coastal road was broken at several locations. Most sections of the main have been exposed due to road erosion and is exposed to vandalism. The concrete sand filter reservoir has three chambers and has a total holding capacity of 40 kiloliters (kl) and is located at 50 m above sea level. Each tank which is rectangular in shape is 11 m long, 4 m wide and 3 m deep. However, due to the earthquake, the entire reservoir has moved and is sitting on a destabilized earth foundation. Large cracks on the foundation are evident and the entire area is subject to slide once the ground gets saturated. The reservoir is built on a sloping site. In addition, the exterior wall of one of the rectangular tank has buckled and the reservoir is has become dry. The second tank is also empty while the third tank is only one third full. The velocity of water flow at the intake is 5 l/sec at Leoki and that at the reservoir at Kariki is 2.5 liters per second (l/sec). Water received at the reservoir is almost halved. Therefore, there are a lot of leakages over the 6.6 km of the distribution main accounting for the major supply loss. The filtered water is collected in another tank sitting next to the sand filter reservoir. This tank has also moved laterally and is sitting on a sloping site on destabilized foundation. As a result of the movement of the reservoir and the filtered water storage tank, the pipe connecting the two reservoirs was broken and has been temporarily repaired.

21. Mile 2 Main Source and Reservoir should be the main source of town water supplies but had been affected by major problems prior to the earthquake. The holding capacity is 50 milliliter (ml) at 25 m above sea level distributed by a 3 km distribution main. The water quality supplied from this source is very poor as it is de-oxygenated and regularly contaminated from runoff containing fine soil particles that contribute to suspended solids concentration, turbidity and needs to be thoroughly filtered and treated. The reservoir structure has deteriorated beyond feasible repair along with the outlet control valves have ceased to function, leaving this major source inoperative and unusable. While the impact of earthquake may not have an effect on this source and reservoir, it nevertheless the major potential source of supply for Gizo's future demands. The source and reservoir should be further investigated and re-commissioned.

22. TC Source Supply and Reservoir is general satisfactory. However, the impact of the earthquake has caused minor damages to the intake source and the dam is leaking. The dam is covered with debris. The foundation of the dam at the intake source is destabilized. However, the steel storage reservoir of holding capacity 5 kl at 20 m above sea level is old and the impact of earthquake has damaged some of the panels and also destabilized the foundation. Leakage from the reservoir is evident. A distribution pipe of 2 km length connects the reservoir to Malakerava districts. The pipe was damaged from tsunami effects. The supply loss is evident from 3 l/sec at the reservoir to 1 l/sec at the distribution end. This is attributed to loosened joints and cracks and ruptures to the fragile distribution pipe.

23. Ground Water Supply and Reservoir has not been affected by the earthquake and tsunami. The supply is at 10 l/sec at 2.5 m head provides a good quantity of reasonable quality water from a borehole at the existing pump house grounds. The water from this source is pumped to the sand filter reservoir (middle rectangular concrete tank currently empty). However, the tsunami damaged the electrical components and connecting cables of the submergible pump. The pump is not in operations and requires repairs to its electrical components. Ground water has a good potential to be a major contributor to meeting water supply demands and needs exploring further for development.

24. Malakerava Spring Source and Reservoir is the main source of water supply for Gizo hospital. The holding capacity is 8 kl at 8 m above sea level. The tsunami waves have

contaminated the source with salinity. The source is located at a cliff between Malakerava 1 and 2 villages. The source provides a small but good quality water supply to the hospital. It is dedicated for hospital reserves only but has been extended to hospital staff households in the medical compound and nearby villages. The retaining walls protecting the source are in sound condition. However, the roof of the reservoir has been damaged by falling boulders during the earthquake. A clean up of the intake storage reservoir will be necessary. Again there is evidence of supply losses 12 l/min from in the main distribution pipe and the reticulation system 10l/min due to damages from the earthquake and tsunami.

25. Due to the aging of the storage tanks and subsequent reductions in their storage capacity, the Government is in the process of procuring four storage tanks. These have already been paid and the shipment is underway to Honiara. The tanks will be required to be transshipped from Honiara to Gizo for installation. The total cost of water supply damage assessment is SI\$3,310,500 (See Annexes 3, 4 and 5 of Appendix 1).

G. Gizo Town Sanitation

26. Gizo has a small sewerage system which mainly serves Gizo Hotel, hospital, primary and secondary schools, hospital, medical compound and a few households. There are two collection pits, one at Gizo Hotel and the other at Gizo Hospital. The collection pit at Gizo Hotel receives effluent under gravity feed system and then is pumped to the collection pit at the hospital prior to discharging into the sea. There is no treatment process. The collection pit at Gizo Hotel is operated by two electrical pumps. One pump is to the Gizo hotel pit; the other is used to pump the waste directly into the sea close to Gizo Hotel.

27. The impacts of earthquake have cracked the concrete walls of the collection pits. There is evidence of infiltration of ground water into the pit and seepage of sewage. During the tsunami, this pit was underwater resulting in the overflow of sewerage from the pit, as it is neither air nor water tight. The whole system is very unhygienic and unhealthy. The impact of earthquake on the gravity fed pipes to the pit is unknown, so further investigation will be necessary to ensure their sustainability to meet the required health standards. Moreover, direct pumping of the waste from the collection pits into the sea without any prior treatment is environmentally unsound and negatively affects sea water pollution and the surrounding fishing grounds. The estimated the cost of damage to the sewerage system in Gizo town is SI\$103,200 (See Annexes 3, 4 and 5 of Appendix 1)

H. Summary of Damages

28. The earthquake and tsunami had a serious impact on Solomon Islands transport infrastructure. The total value of direct losses for transport infrastructure is SI\$51,122, 241 or \$6,816,299 equivalent and that of Gizo town water supply and sanitation is SI\$3,413,700.00 or \$416,160 equivalent (See Annexes 3, 4 and 5 of Appendix 1). These are summarized in the Table 1. The largest proportion of the damage is concentrated in the wharves and bridges. However, in the early recovery phase and to provide connectivity, the Ringi airport needs urgent attention for reconstruction or an alternate transport infrastructure, such as a wharf needs to be in place as quickly as possible.

I. Indirect Losses

29. Revenue, social and other indirect economic losses in infrastructure has been not been accounted for although there are evidence of difficulties in access to people and transportation of goods and other commodities. While this may have some added value to the damage assessment, it would be minimal and insignificant given the remoteness and scarce

developments in the affected areas.

Table 1: Summary of Damages and Losses

Transport Infrastructure						
Type of Infrastructure	Quantity Damaged measured at Assessment in units	Quantity Damaged in Whole Numbers	Total value of damaged and destroyed (SI\$)	Total Loses (SI\$)	Total damage and losses (SI\$)	Total damage and losses (USD)
Gravel Roads (km)	67.0	67 km	3,641,000.00		3,641,000.00	485,466.67
Sealed Roads (km)	3.1	3.1 km	1,364,000.00		1,364,000.00	181,866.67
Bridges (m ²)	2274.0	48 Nos.	6,396,000.00		6,396,000.00	852,800.00
Culverts (m)	606.0	80 Nos.	72,360.00		72,360.00	9,648.00
Earthen Drains (km)	97.6	67 km	3,751,071.00		3,751,071.00	500,142.80
Concrete Drains (km)	0.6	0.6 km	8,400.00		8,400.00	1,120.00
Wharves (m ²)	2599.0	19 Nos.	22,695,400.00		22,695,400.00	3,026,053.33
Jetties (m ²)	310.0	14 Nos	1,860,000.00		1,860,000.00	248,000.00
Anchorage (No.)	0.0	0.0	0.00		0.00	0.00
Ramps (m ²)	116.0	2 Nos	232,000.00		232,000.00	30,933.33
Causeways (m ³)	9395.0	52 Nos	2,395,810.00		2,395,810.00	319,441.33
Protection Works (m ³)	2708.0	691 m	657,750.00		657,750.00	87,700.00
Sea Walls (m ³)	1487.0	716 m	495,950.00		495,950.00	66,126.67
Airfield (m ²)	8000.0	1.0	7,552,500.00		7,552,500.00	1,007,000.00
Total					51,122,241.00	6,816,298.80
Gizo Town Water Supply and Sewerage						
Distribution Mains	3 km	3 km	195,000.0		195,000.0	26,000.00
Reticulation System	9 km	9 km	97,500.0		97,500.0	13,000.00
Connections and Fittings	200 Nos.	200 Nos.	10,000.0		10,000.0	1,333.33
Intake Sources	350(m ²)	350(m ²)	448,000.0		448,000.0	59,733.33
Treatment Reservoir	200(m ²)	200(m ²)	240,000.0		240,000.0	32,000.00
Storage Tanks	120 kl	4.0	1,500,000.0		1,500,000.0	200,000.00
Tank Foundations	576 (m ²)	4.0	720,000.0		720,000.0	96,000.00
Pumps	1 No.	1 No.	100,000.0		100,000.0	13,333.33
Pump House	1No.	1 No.	100,000.0		100,000.0	13,333.33
Collection Pits	4 (m ²)	1 No.	3,200.0		3,200.0	426.67
Sewerage Pipes	1 km	1 km	0.0		0.0	0.00
Outfall Pipes	0.5 km	0.5 km	0.0		0.0	0.00
Electrical Pumps	0 Nos.	0 Nos.	0.0		0.0	0.00
Total			3,413,700.0		3,413,700.0	416,160.00

J. Post- Tsunami Reconstruction Needs

30. Overall the rehabilitation and reconstruction are estimated at about SI\$300.56 million or \$40.07 million equivalent at the current prevailing rate over the short to medium-term. The estimates take into account that the damaged assets need to be replaced with new ones, not only of equal value but, with upgrades to infrastructure in order to reduce the previous inherent vulnerability and future developments within the areas.

31. The reconstruction costs for the transport sector is high due to the need to rebuild the damaged assets to higher standards to withstand against the disasters, and because the current construction and environmental standards are higher than when original facilities were

built. Moreover, the location and remoteness of the facilities are far away from the main capital and the local transportation and mobilization costs are high. Most of the reconstruction materials will be imported from overseas as local manufacturing is virtually non-existent. Many of these facilities will be designed and reconstructed by international consultants and contractors due to the limited domestic capacity.

32. The methodology adopted to derive the reconstruction estimates for major activities has been extracted from the unit rates for roads, bridges, culverts, drains, bituminous seals from the ongoing ADB/AusAID/NZAID financed PCERP contract. For the wharves, jetties, causeways, protection works and sea walls, the unit rates used are from the European Union financed ongoing contract. Both contract unit rates are from 2003 and 2005 contract prices and have been inflated by 20% to 2008 prices. It is assumed that the damaged assets will be reconstructed over a 5–10 year period, therefore a contingency of 35% has been assumed and added to the total reconstruction cost. The reconstruction cost estimate is summarized in Table 2.

Table 2: Estimated Reconstruction Costs

Major Activity	SI\$ (million)	USD (million)
Gravel Roads	28.215	3.762
Sealed roads	6.945	0.926
Bridges	34.171	4.556
Wharves	47.355	6.314
Jetties	25.935	3.458
Causeways	6.654	0.887
Protection Works	12.430	1.657
Seawalls	4.216	0.562
Water Supply	6.000	0.800
Airport	13.608	1.814
Subtotal (A)	185.528	24.737
Consulting Services	37.106	4.947
Subtotal (B)	222.633	29.684
Contingencies	77.922	10.390
TOTAL	300.555	40.074

Western and Choiseul Provinces Earthquake and Tsunami
Recovery and Reconstruction Phase
Supplementary Appendix B
Initial Recovery Strategy
SOLOMON ISLANDS GOVERNMENT

8th May 2007

1.0 INTRODUCTION

1.1 Objectives of the Paper

This Initial Recovery Strategy paper ('the paper') summarizes events to date based on existing documents, and provides an initial roadmap for the Solomon Islands Government (SIG) and its disaster recovery and rehabilitation partners that will allow the development of a coordinated framework of action to move forward.

The paper assures SIG that the disaster-relevant structures and systems it has put in place under the *National Disaster Act* (1989) and the *National Disaster Plan* (1987), and which have been operationalized to respond to the disaster, will be supported by its development partners. At the same time, it will inform stakeholders on the current situation and the next actions to be undertaken in the nation's response, to assist partners to work in a coordinated fashion. This will enhance the effectiveness of the overall response, and provide necessary information to partners for their own programming and planned activities.

The paper will require adjustment throughout this process and will lead to a long term reconstruction and rehabilitation strategy. Hence this document will be updated accordingly, as required.

Disaster response is a partnership between all stakeholders. SIG therefore invites stakeholders to provide feedback and comments on this paper, which will be taken into account in future updates.

1.2 The Disaster

On 2 April 2007 an undersea earthquake measuring M8.1 triggered a tsunami that struck the islands of Ghizo, Simbo, Ranongga, Shortlands, New Georgia, Mono, Vella Lavella and Kolomobangara in the Western Province and Choiseul Province of Solomon Islands. (The tsunami also reached Papua New Guinea, however with very limited damage and casualty resulting.) Numerous aftershocks also occurred, including one measuring M6.2. An estimated 20,000 people of a total population of 90,000 in both provinces have been affected. Over 5,000 people are estimated to be displaced. 52 people have been confirmed dead, mostly children. Outbreaks of diseases in the affected areas have been largely brought under control.

All islands in the affected provinces suffered widespread damage to housing, infrastructure, schools, and medical facilities. Several villages were completely destroyed by the combined effects of the earthquake and tsunami. The force of the quake was such that the physical

environment of the islands and reefs have changed, leaving a small number of islands and reefs tilted and causing concern about the impact on coastal vulnerability, ground water access and levels, agriculture and livelihoods.

Initial disaster response was provided in cooperation with national and international NGOs and the Red Cross, international partners, and the coordinating National Disaster Management Office (NDMO) under the National Disaster Council (NDC). The emergency phase is now transitioning to the recovery phase.

In most cases, the sudden loss suffered by disaster victims leaves most of them with little or no access to needed resources to quickly rebuild and reestablish their livelihoods. It is in the interest of the government and the donor community to assist such affected groups, both from general humanitarian concerns, as well as from a socio-political and economic perspective. In this instance, because the country has not had any event of such magnitude and nature, the authorities as well as the population were taken by surprise and were not well-prepared to deal with both the immediate post disaster as well as later needs. The remoteness and difficult access to the affected communities also contributed to the problem.

2.0 Disaster Response Framework

The national disaster response is guided by the *National Disaster Act* and the *National Disaster Plan*, in accordance with Cabinet Conclusion No. C21(87), dated 24th June 1987. The general concept for disaster action under the National Disaster Plan is based on effective utilization of the existing Government structure, complemented by a system to mobilize the rapid and cohesive response of other stakeholders and available resources.

The National Disaster Plan defines three phases in the disaster process:

- **The Emergency Phase:** This generally should be from 0–7 days and is the period where operations are undertaken to combat a disaster and to provide for the immediate relief to people affected by the disaster. When a declaration of disaster is made under the National Disaster Act (S.12), the National Disaster Council shall (S.13) “assume full and complete control of Solomon Islands as a whole, or in any part thereof ...” (see section 3.0 below for a description of the National Disaster Council).
- **The Recovery Phase:** This generally should be a period of a month and is the process by which a community is helped to return to its normal level of functioning after the disaster. While recovery activities typically commence during the emergency phase, the lifting of a state of emergency signifies a concentration of activities on recovery. The recovery phase establishes the longer-term planning within which the reconstruction and rehabilitation programs are carried out.
- **The Reconstruction or Rehabilitation Phase:** This generally should be a long term period which can take up to 5-years or beyond, depending on the nature of the damage and the capacity of the Government to undertake the reconstruction of damaged properties.

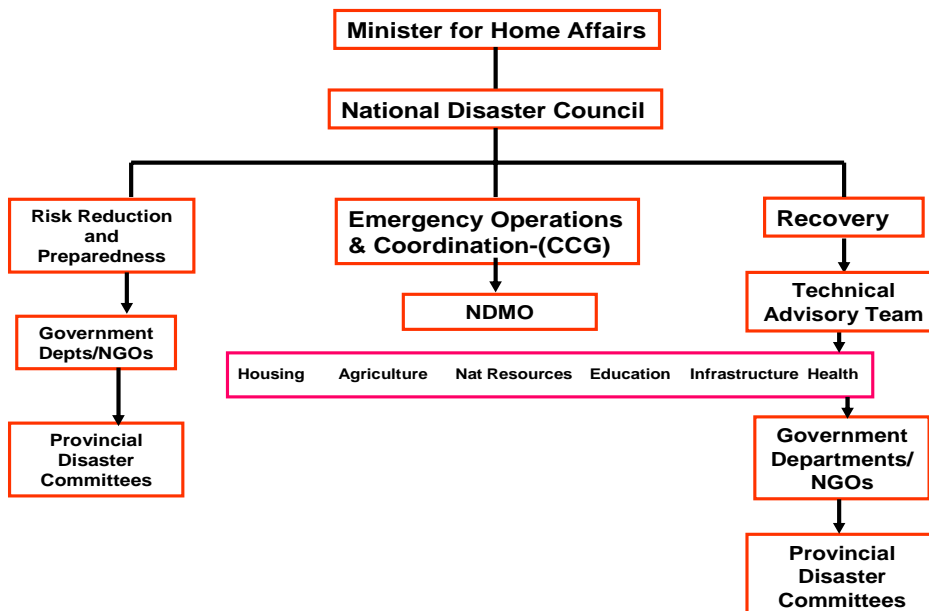
The key stakeholders include the Cabinet; the National Disaster Council (NDC); Provincial Disaster Committees (PDC), committees appointed by NDC; National and Provincial

Governments; national and international agencies including the Solomon Islands Red Cross, International Federation of Red Cross Societies, United Nations; other NGOs; RAMSI; development partners; community groups; church organizations; and the general public.

3.0 Disaster Management Structure

3.1 Organizational Arrangement

The following are the main components of the Solomon Islands national disaster organizational structure (also refer diagram below):



- Minister Responsible**
 National responsibility for all disaster-related matters rests with the Minister for Home Affairs, the Hon. Bernard Ghiro.
- National Disaster Council**
 The Council is responsible for ensuring that disaster preparedness, response, and recovery measures exist at all times. The Chairperson is the Permanent Secretary, Home Affairs, Mr Fred Fakarii.
- National Disaster Management Office**
 This office reports to the Chairman of NDC, located in the Ministry of Home Affairs. The Manager of NDMO, Mr Loti Yates, acts as Secretary to the NDC. The role of this office is to carry out disaster management and other responsibilities as directed by the Chairman NDC.

- **Provincial Disaster Committees**

The role of a provincial disaster committee is to ensure that all persons within the province who have responsibilities under or relevant to the NDC Plan are aware of the plans contents, and to implement the plan at the provincial level and in accordance with any additional advice or direction which may be issued by the NDC. Provincial Disaster Committees (PDC) also ensure that the best possible arrangements exist to implement disaster preparedness and response measures at provincial level and to contribute through the Technical Advisory Team, information and data to assist in the formulation of recovery programmes. The PDC also keeps the Provincial Government informed of all disaster related matters, especially those relevant to the NDC plan. The PDC is chaired by the Provincial Secretary. Two Provincial Secretaries are directly involved in this disaster: Mr Jeffrey Pakipota (Choiseul Province); and Mr Arnold Moveni (Western Province).

- **Central Control Group**

The role of the CCG applies specifically to the Emergency phase when it is concerned with the implementation and coordination of programs to meet the needs that arise immediately following disaster impact (e.g. provision of food, shelter etc). After the official end of the emergency phase, the CCG will continue to function in this role for as long as the NDC considers necessary. This Group is chaired by the Commissioner of Police, Mr Walter Kola.

- **NDC Technical Advisory Team**

The role of the TAT is to develop recovery plans, identify needs which will have to be met in the recovery phase, advise the NDC on the types of programmes which need to be undertaken in the recovery phase and to estimate the costs of such programmes, and undertake any special assignment which may be required by the NDC, and coordinate the effective implementation of recovery and rehabilitation of different organization to maximize its effectiveness and efficiency. The Chairperson is the Permanent Secretary, Planning (Ministry of Development Planning and Aid Coordination - MDPAC), Mrs Jane Wa'etara (Note: Mrs Wa'etara will be absent during May 2007; Mr Dudley Mazini, Director of Strategic Planning, will be Acting Director TAT during this period).

3.3 Coordination Support

The Government has requested UNDP and ADB to provide technical support to NDC for recovery and rehabilitation. UNDP and ADB will coordinate their efforts and both will work with all relevant stakeholders. UNDP will assist the Government, through the NDC-NDMO-TAT structure, in the early recovery phase, with a view to: (i) augmenting on-going emergency assistance operations through measures that foster the self-reliance of the affected population and meet the most critical needs to rebuild livelihoods, (ii) promoting spontaneous recovery initiatives by the affected population and mitigate the rebuilding of risk, and (iii) establishing the foundations for longer-term recovery. A UNDP recovery adviser will be in Honiara for up to 5 weeks from 27 April.

Government has formally requested ADB to support the coordination of the reconstruction and rehabilitation phase, and will work through the NDC-NDMO-TAT structure. ADB fielded a disaster specialist on 22 April for 2 weeks and will place a reconstruction and rehabilitation adviser in Honiara initially for 2 months. ADB will take a lead coordination role to support SIG in (i) undertaking a comprehensive damage assessment that will focus on infrastructure damage,

but also coordinate and consolidate input from ministries in other sectors; (ii) development of a reconstruction and rehabilitation program; (iii) analysis of funding gaps, and coordination of donor support to close possible funding gaps; and (iv) the implementation of the reconstruction and rehabilitation program, including monitoring and reporting support, at least in the initial phase. ADB is also considering preparing a grant-based emergency assistance project for support in rehabilitating damaged roads and bridges, wharves and jetties, and water supplies. Such project would be contingent to availability of grant-cofinancing by other development partners.

4.0 RELIEF EFFORTS AND STATUS QUO

4.1 Immediate Response

The Government (SIG) through its the National Disaster Management Office (NDMO), is responsible for overall rescue and relief activities while the Ministry of Development Planning and Aid Coordination (MDPAC) is tasked with the recovery and reconstruction phase. The Provincial Disaster Committee was activated in Gizo by the Government, and after some initial logistical problems, relief supplies reached all residents in the affected areas. The rescue and relief phase is now in its final stage and this has given the Authorities more time to focus upon the next ones.

The initial relief effort was led by the NDC, the Solomon Islands Red Cross (SIRC) and the International Federation of Red Cross (IFRC). The United Nations Disaster Assessment and Coordination Team (UNDAC), mobilized on 5 April 2007, assisted NDC in coordinating the emergency response. A joint UNDAC/NDC team arrived with a team in Gizo on 7 April to support the Provincial Disaster Council and coordinate the relief effort.

Communities have organized themselves from day 1 after the disaster hit through the spontaneous creation of Disaster Committees in the various villages. These were mostly based on traditional copying mechanisms and were led by the Chiefs; it has greatly supported the organization of relief operations, the quick damage assessments, and the set up of camps. The Government, which has provided relief assistance to the people along with NGOs, relied heavily on this community-driven mechanism to assess the needs and organize the distribution of relief aid.

The SIG has provided heavy-duty tents, water tanks, etc... and it has also started temporary schools and other facilities to assist affected families in reestablishing their lives.

Frequent aftershocks, continued fear of the population to return to their villages, destroyed homes, businesses and social superstructures, all contribute to the preference of residents to remain in temporary shelters. The SIG understands that there is need for some type of intermediate arrangement as a transition stage between the current one and the time when residents will once again return to their rehabilitated and reconstructed houses and villages. This is a delicate task since examples from other disasters have shown that one drawback of efficient and well-run intermediate temporary facilities is the encouragement of dependency and a reluctance of residents to transition back to their former lifestyles. Also, in several instances, these temporary facilities do not disappear but become squatter areas and lead to conflict with landowners and host communities. Consequently, and to address or anticipate these transitional issues, an Early Recovery Strategy has been developed by the SIG and is presented in Chapter 5 of this document, which will be followed by a comprehensive Recovery Action Plan.

A number of international and local NGOs, supported by international donations, have provided relief on the ground. As of 27th April 2007, donations provided to SIG (including SIG contributions) were approximately \$SBD12.4 million, comprising private donations and international contributions from Australia, Canada, European Union, Fiji, Indonesia, Japan, South Korea, New Zealand, the Pacific Forum, Papua New Guinea, Republic of China, Republic of Kiribati, Turkey, UK, and USA. In addition, donors funded NGO, Red Cross and UN activities through funds, staff, material and logistics support. UNICEF had a leading role in non-food item distribution, water supply and sanitation, shelter, and health. Logistics support and medical services were also rendered by RAMSI and the Australian, French, New Zealand and US defense forces. Early in the emergency phase, cluster working groups on shelter, health, water and sanitation, non-food item distribution, and child protection were facilitated by UNDAC.

4.2 Status Quo

Due to remoteness, access difficulties and the number of islands affected (at least 15), there had been initial issues with access to damage information in the remoter islands. This led to difficulties in determining needs for relief, and deploying available resources. Affected areas have poor communication facilities where HF radios are the only available means of two-way communication. Outreach to the affected people (delivering both message and material) has been one of the largest challenges for disaster, activities to date. This situation still prevails as of the end of April.

Many affected people remain on higher ground under makeshift shelters. They are distressed by the tremors and waves that deprived them of their assets and family members. Re-establishment of their lives and livelihoods is urgent, and establishing support mechanisms for them is a priority.

Estimation and assessment for rehabilitation needs are urgent tasks to move from disaster response phase to early recovery phase. UN-OCHA's Pacific regional disaster response advisor has played an important role, including additional support to NDMO during the transition from response to recovery.

An initial damage assessment was undertaken by NDC. On the advice of NDC, the Technical Advisory Team (TAT) was convened. TAT created six subcommittees (sectors) around (i) Health (including water supply and sanitation), (ii) Infrastructure, (iii) Education, (iv) Natural Resources (including Fisheries, Mines, Energy, and Environment), (v) Agriculture, and (vi) Housing.

Given the extent of damage and remoteness of the impacted areas, the Emergency Phase has extended beyond a calendar month. NDC discussed lifting the state of emergency on 1st May and is advising the Minister, (who has the power under section 12 of the Act to revoke the Order), as to when this might occur. There are still pockets of vulnerability, and targeted relief activities are still likely. NDMO and TAT will work in close collaboration to ensure these pockets do not remain unassisted.

4.3 Impact of the disaster and preliminary damage assessments

With the exception of Gizo, the affected area is remote with dispersed isolated cluster settlements. Indications are that the island of Gizo has about 60% of those affected while the other islands have about 500 villages from which officials are collecting data in order to finalize their damage assessment work. There were several rapid assessments done during the relief phase; however, because of various reasons (limited access, other priorities, etc.) these

assessments show several important gaps. For example, there were figures on the number of houses damaged or lost by villages but no information regarding type and estimated cost of damage and loss. Not all sectors are in this situation. For example, the health sector contains greater details partly because of an ongoing donor programme and a rehabilitation data base which was recently completed. A database is being compiled by the National Disaster Management Office (NDMO), the National Disaster Council (NDC), which shows that about 52 people lost their lives. Around 300 residents were directly injured and, just after the event, illnesses related to poor sanitation, overcrowding, malnutrition and similar problems were significant, especially among the young.

The psychological impact is also an important factor which has not yet been fully assessed. It is estimated that about half of the 100,000 population of Western and Choiseul provinces are in some way affected by this disaster with about 3,000 people displaced in the worst affected areas. Many are still located in several improvised camps in the vicinity of Gizo town with the rest in other areas. The authorities are currently reviewing various options for better temporary shelter facilities and it is proposed to address this issue in the early recovery strategy..

While this disaster is not comparable to the recent tsunami in the Indian Ocean, it does have several complex elements which make it a challenge to manage. Among such challenges are the remoteness and dispersal of the affected areas, absence of roads and easy communications to many of them, weak provincial as well as national systems, communal land owned by diverse groups (including a sizable group who migrated into the area decades ago) and the presence of foreign peacekeepers following a period of social unrest.

Assuring continued access to potable water supply (both piped and from other sources) is a key area of concern because of salt water infiltration and contamination of natural sources and broken mains and fittings, etc., in the few urban areas which had such service before the disaster. Health, public, business and commercial facilities also suffered significant capital as well as income and service disruptions and losses. For example, apart from fisherfolks losing their boats, nets and other equipment, in several villages, the sea coast has been drastically reshaped by the earthquake and tsunami and in some areas many of the coral reefs and traditional fishing grounds are reportedly gone.

By the end of the first month, an overall assessment of the impact consequences, identifying and costing the damages/losses/needs is still problematic. The figures for some locations such as Choiseul Island, Gizo and Vella Lavella are firming up and are expected to be available at NDMO by mid-May. For other islands such as Simbo, Shortland and Rennonga, government field teams are currently either fielding initial assessment teams or systematically re-appraising initial assessments. Damage details from these islands are expected to be collated shortly. Some NGOs and the Red Cross are also re-assessing early estimates as they provide victims with relief items. Damage assessment details are being coordinated through the TAT sub-committee structure, and with NDMO

Information collected through the NDMO database has been instrumental in coming up with preliminary assessment. This is being complemented by additional information collected by other missions. However this needs to be further enhanced as proposed in the strategy below in order to obtain comprehensive needs and damages figures and to come up with a common beneficiary database.

While the extent of damage are still coming in and cost estimates have yet to be made, the sectors that have been affected either by the earthquake, the tsunami, a combination of these two, and/or subsequent landslides include:

- Infrastructure (including transport, roads, bridges, wharves, power, telecommunications)
- Water and sanitation systems
- Public buildings (schools, hospitals, rural health clinics, aid posts, government housing – which will necessitate asbestos clean-up)
- Disruption of Provincial Government services
- Houses and shelters
- Community based approaches to assist well being and healing at the individual and community levels
- Livelihood provisions (including gardens, boats, fishing equipment)
- Natural resources (fisheries, environment)
- Commercial activities (tourism industry, copra and cocoa production, local business enterprises)

As part of the emergency phase hospitals, rural health clinics and aid posts have received drugs and essential materials, and re-supply will continue.

An official Government delegation including the Western Province Secretary, ADB, UNDP and the European Commission visited the affected villages in Gizo, Simbo, Ranongga and Vella Lavella islands on 28–29 April. While the observations related below are restricted to these specific locations, it is believed the findings are representative of damages in the affected areas in both provinces:

- This tragedy has reinforced awareness of actual vulnerabilities to various natural hazards and raises fears among the population.
- Communities are unclear whether they relocate to the devastated areas.
- Spontaneous organization of the communities by local disaster committees, led by the Village Chiefs, to manage the relief phase and establishment of the camps was observed in all villages.
- On **Gizo Island**, communities along the south coast of Gizo, including Government quarters, Titiana and Niumanda have been totally devastated; people are living in camps set up in the hills and completely dependent on external assistance. Precarious water supply is being organized.
- The northern part of **Simbo Island** is one of the areas most affected by the tsunami. Communities are also concerned about volcanic activities. People in camps face water and sanitation issues. The bridge connecting an adjoining island in the south-east has been destroyed, disrupting people's daily lives.
- **Ranongga Island** suffered strong seismic activity. It was uplifted by around 3 meters on the east coast, creating significant access problems to the coast. This has affected local livelihoods as products cannot be transported to local markets. Large-scale landslides occurred along the west coast and some villages including Mondo are still vulnerable to potential landslides.
- **Vella Lavella Island** witnessed partial damage in villages from the tsunami. While some sectors have been seriously damaged, whole populations in villages have been affected and moved into camps. Implications on water and sanitation are serious. There is little evidence of spontaneous recovery.
- **Choiseul province** was not visited by the team but other missions have stated damage around Sasamunga is significant, with clinics, schools and any kind of construction facing the coast being destroyed.

The following table summarizes preliminary figures based on community reports to NDMO in the two affected Provinces, as of 25 April 2007. Updated information and additional categories will be added when available.

Province	Community Reported	Estimated Population	Estimated Household	Estimated Affected Population	Dead	Injured	Missing	House Destroyed	House Damaged	School Damaged	Clinic Damaged	Note
Western Province	405	51,120	8,283	9,072	46	297	9	2,625	1,174	7	5	Including Shortlands
Choiseul Province	67	17,410	2,260	2,250	6	6	0	726	NA	2	5	
Total	472	68,530	10,543	11,322	52	303	9	3,351	1,174	9	10	

4.4 Partnerships

Various international NGOs, Red Cross, and donor agencies are extending support on the ground. A meeting of NGOs and UNICEF in Gizo on 29 April revealed the following activities were being undertaken (list not exclusive):

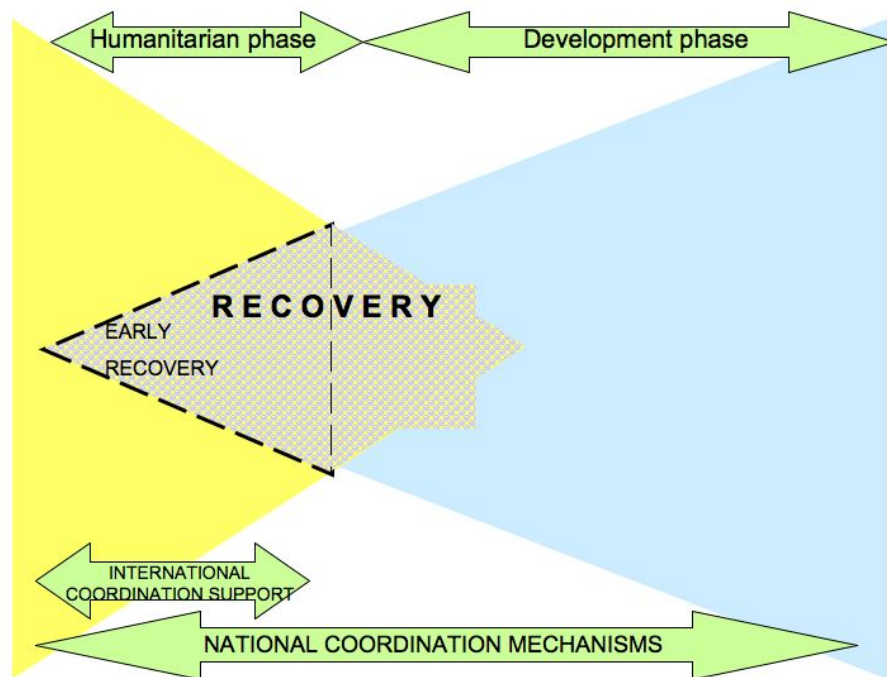
- UNICEF—Have a draft plan. Working on water and sanitation through the Rural Water Supply Department. Also working with ministries of Health, Education and Social Welfare.
- World Vision—Expect to have a 3-month draft plan by early May. Working on Simbo and Ranongga on rehabilitation of water. Health and hygiene is a major focus. Working with UNICEF and Save the Children Fund (SCF) on child protection.
- IFRC—Working with Solomon Islands Red Cross (SIRC) on Choiseul. Undertaking relief distribution (tents, kitchen utensils).
- Australian Red Cross—Working on Vella Lavella, Choiseul and elsewhere. Providing building items.
- SCF—working on Ranongga, Gizo, Vella Lavella and Simbo. Working with ministries of Education, Health and Social Welfare. Working with UNICEF on child protection. Also working with OXFAM.

5.0 ROAD TO RECOVERY

Terminology: the National Disaster Plan outlines 3 phases (see page 2). In order to adjust to the current requirements, it is suggested to adopt the following terminology in this paper:

- ⇒ **Early recovery:** Also relates to “Recovery phase” in the National Disaster Plan. Early Recovery is recovery that begins early in a humanitarian setting. This phase is expected to last between 1 to 4 months. It is a multi-dimensional process, guided by development principles. It aims to generate self-sustaining, nationally-owned, and resilient processes for post-crisis recovery.

⇒ **Recovery:** Also referred as Rehabilitation and Reconstruction phase in the National Disaster Plan. This phase for this disaster is expected to last up to 2 years. A recovery approach focuses on how best to restore the capacity of the government and communities to rebuild and recover from crisis and to prevent relapses. In so doing, recovery seeks not only to catalyze sustainable development activities but also to build upon earlier humanitarian programmes to ensure that their inputs become assets for development.



Effective and consistent coordination of stakeholders is paramount for the success of the recovery. Priority should be given to enhancing the coordination capacities at National and Provincial levels with appropriate and dedicated full time staffs.

5.1 Early Recovery Operation

The early recovery operation will aim to:

- Ensure smooth transition with the phasing out of the emergency operations
- Promote spontaneous recovery initiatives by the affected population and mitigate the rebuilding of risk
- Establish the foundations for longer term recovery.
- Integrate risk reduction measures into recovery and development.

TAT endorses the priorities NDMO has identified for the transitional phase from relief to long term recovery and complements these as follows (*the sectors below are not listed in order or priority but reflect all the needs to be covered during the early recovery phase*):

Housing and shelter	Water supply and sanitation	IDPs Management	Coordination and Information Management	Livelihood recovery	Health and education services	Transport infrastructure
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Housing and shelter

- Making temporary shelters more liveable: permanent housing can take months to be built and temporary/semi-permanent shelters for Tsunami and earthquake victims will need to be upgraded in order to improve living quarters, sanitation and security, keeping in mind the special needs of women.
- The design of permanent houses and settlements should maximize local participation in order to ensure cultural acceptability. At the same time, hazard resistant measures should be included.
- Systematization of construction practices by adopting Disaster resistant construction technology and developing standards for permanent shelter, building on traditional knowledge and local practices (preparation and dissemination of technical guidelines, capacity building, demonstration). Use of materials that are locally available will be prioritized.
- Clarification of issues around land tenure and land rights issues related to housing, displacement and relocation in view of the need for safe resettlement to reduce vulnerabilities.

Water supply and sanitation

- Temporary and future semi-permanent camps need to be provided with proper water supply system and sanitation facilities;
- Rehabilitation of water supply/sanitation systems in destroyed areas based upon future needs and risk assessment.

Internally Displaced Persons (IDP) camp management

- Service reliability (water supply, sanitation, education, health, etc) need to be ensured soonest.
- Compliance to internationally-agreed Sphere standards for camps should be followed in all temporary camps.
- Duration of temporary camps should be announced by Government as an indicative timeframe for planning long-term recovery interventions by all stakeholders.
- Identify and record the families that can quickly return to damaged houses and those which have to remain in temporary shelter. Adjust the assistance accordingly.

Livelihood recovery

- Re-establishment of household livelihoods will be carried over the long term. The immediate requirements during the transitional phase relate to provide tools/supplies for gardening activities, construction of semi-permanent shelter in camps, fishing activities, etc...
- Investigate appropriate financing mechanisms for recovery of livelihoods.
- Conduct an Environmental impact analysis of the earthquake and the tsunami and its impact on coastal livelihoods.

Strengthening information sharing and coordination mechanisms at all levels.

- Local leaders have taken initiatives in creating and running community level disaster committees. These mechanisms need further support to lead the recovery planning process at community level.
- Strengthen NDC and PDCs to coordinate actors in their early and long-term recovery efforts and strengthen links with village-level disaster committees.
- Develop a common beneficiary database, building on the existing NDMO database, to be used as a tracking system to identify gaps/overlaps, provide clear information to all actors on damages/losses, costs, needs and plans, and monitor equity and efficiency of aid delivery.
- Map existing interventions and agencies in the field and identify intentions, capacities and resources.
- Provide information to affected communities to assist decisions on their recovery plans.
- Sustain forums between Government, Civil society, NGOs at various levels for knowledge networking and information sharing.

Health and education services

- Quick resumption of health and education services to bring back the lives of the people as close to normalcy as possible.
- Create “temporary learning and play centres” with the Ministry of Education so that structured activities can take place while building process commences.
- Using a well-being approach, assist communities to create systems of support and care to enhance the affected populations coping mechanisms.

Transport Infrastructure

- Prioritize damaged wharves and other coastal access points, particularly ones that are impeding cargo offloading, preventing access to livelihood restoration and creating safety issues.
- Identify destroyed and/or damaged bridges that are hampering access to gardens, medical and educational services.
- Give preference to damaged or blocked roads that are obstructing access to livelihood, educational and medical facilities.

A Recovery Action Plan will be delineated to operationalize the above priorities.

5.2 Guiding principles and cross cutting issues for sustainable recovery

- **Promote participatory approaches and decentralized planning and programming for recovery:** There is a need to empower affected communities and local governments to take their own recovery in their hands. Decision-making on programme content and direction is best done by those who are most affected by them. Island-level consultations in the planning phase and gender representative planning would enhance local ownership and accountability, and will result in plans that meet the needs of the affected community, and will, therefore, be the most effective. This is particularly important in the context of reconstruction and possible resettlement of affected households.

- **Respect for cultural diversity and specificities.** Efforts must be responsive to the diverse communities' needs to maintain their integrity, at the same time developing programmes that result in the improvement of the quality of their lives.
- **Mainstreaming disaster risk reduction in the recovery process:** disaster risk management needs to be considered as a cross sectoral approach to recovery. In particular, enhancing safety standards and avoiding the danger of rebuilding previous vulnerabilities or creating new risks must be factored in the reconstruction of houses and infrastructures. Over the long term, measures to reduce other commonly manifesting risks, associated with cyclones, earthquake and volcano eruption need to factor in the recovery process.
- **Make recovery inclusive and broad based.** The post-disaster situation provides a window of opportunity to change the pre-existing situation in favor of greater gender equity and equality and social inclusion. Special measures are needed to ensure that the poor and most vulnerable groups have opportunities to improve their lives through the long-term recovery programmes.
- **Seek greater equity in the distribution of assets and Gender sensitivity:** The recovery and rehabilitation phases provide opportunities to increase equality within communities, more evenly distribute ownership of assets, and improve the condition and position of women and other vulnerable groups.
- **Building National and local capacities for guiding a sustainable recovery process, for increased resilience, and risk management.** Achieving the goal of building local and national capacities implies that external technical assistance must complement existing capacities, be conceived as supportive and not directive, and must entail transfer of technology, know-how and capacities for increased resilience, risk management and sustainable recovery.

5.3 Local level consultation planning

As described in the above guiding principles, a **bottom-up planning approach emphasizing community empowerment and decentralized planning** should be prioritized so that the affected people and the Provincial Governments own their recovery programme. Hence a right balance between Governance and participation will have to be found. Communities and the spontaneous Disaster Committees created after the disaster in the various villages need to be provided with the necessary information, facilitation resources, and know-how so that they are enabled to competently make decisions and find solutions to programme challenges.

It is understood that **technical standards** will have to be developed in the various recovery areas, especially housing and water and sanitation, in order to guide the local recovery planning process. These standards would also promote equity, avoid provision of different quality of assets, which would in the end avoid tensions within and between communities.

It is for example suggested that **island-level consultations in the planning phase of the recovery** be conducted. This would enable communities to identify and authenticate beneficiaries, share information, ensure transparency and reach an equitable recovery plan. Relying on local capacities and knowledge would also allow communities to set realistic goals and timing based on perceived priorities. This would be crucial in enhancing accountability and facilitating community ownership. Funding would have to be identified and pledges recorded during the course of this planning process so as to avoid raising expectations. Provincial Governments would lead the facilitation of these consultations with external support as required.

5.4 Coordination

The NDC chairperson will brief Cabinet regularly on progress. Regular meetings are being held between NDC and TAT, and NDMO receives information on all travel arrangements undertaken by TAT sectors. NDMO and TAT have developed a standard assessment format that is currently in use by TAT sectors in the field.

The exact time at which rehabilitation efforts will be absorbed by regular government operations is yet to be determined, pending the comprehensive damage and needs assessment. As required by the National Disaster Plan, TAT has (i) established a sub-committee structure to ensure a coordinated approach by Government, and (ii) is identifying needs and issues arising from the disaster. It will (iii) develop a Recovery Action Plan (RAP); (iv) develop a reconstruction and rehabilitation program for the medium and longer term; (v) develop a monitoring and reporting plan; (vi) monitor program implementation and report progress to NDC; and (vii) undertake donor coordination.

In light of the above suggested local level consultation planning process, coordination mechanism with the various NGOs and other stakeholders will have to be strongly oriented at making use of these local recovery plans in order to maximize the various available resources, value local ownership and locally-driven planning, and avoid gaps/overlaps.

Suggested coordination organizational structure for recovery, and rehabilitation and reconstruction phases (See Coordination Structure diagram in **Annex 1**):

- The NDC execute the national coordination mechanisms. The National Coordination Cell (NCC) will operationalize and manage the coordination and information sharing activities, on behalf of the NDC and through the TAT to which it reports, and the NCC will be based at NDMO office. The NCC will be the focal point at National level for donors, NGOs and other stakeholders implementing and planning recovery activities.
- The Provincial Secretaries are in each province responsible for leading and facilitating the coordination mechanisms operationalized by the Provincial Coordination Cell (PCC), on behalf of the Provincial Government. They report on their provincial coordination cell activities to NDC through the NCC in charge of the overall National Coordination.

5.5 Public Information Strategy

NDMO and TAT will keep stakeholders informed. Regular information updates are emailed and posted on UN-OCHA's Relief Web website during the emergency phase. Twice-daily radio broadcasts (0640 hours and 1730 hours) are aired on 1035 khz. Regular meetings with the resident donor community are convened. Wider stakeholder meetings for the NGO community are taking place regularly to maintain coordination.

Under the proposed coordination structure, Forums for NGOs, Government, civil society and other actors will be further enhanced and sustained to facilitate knowledge networking and information sharing; including sector groups led by the respective line ministries with participation of the concerned NGOs at National and Provincial levels.

5.6 Towards Long-Term Recovery

It is envisaged by the Ministry of Planning and Aid Coordination to quickly delineate a longer-term recovery strategy, which will address the various reconstruction and rehabilitation needs currently being identified. Indeed a TAT assessment mission is currently fielded in all affected areas and is divided in 5 sectors as follows: Education, Infrastructure, Health, Natural resources, Agriculture and Housing. The long term strategy will draw on these sectoral assessments.

The TAT plans to finalize the sectors' damage and need assessment reports by the end of second week of May.

6.0 NEXT STEPS AND TIMELINES

The following are the principal action points:

Action points	Responsible party	Deadline
ADB Disaster Adviser fielded at Honiara	ADB	22 nd April
UNDP Early Recovery Advisor fielded at Honiara	UNDP	27 th April
Organization of donor meeting, sharing of Initial recovery Strategy and streamlining of future regular donor meetings	TAT	7 th May
Submission of Initial Recovery Strategy paper to NDC for endorsement	TAT	8 th May
UNDP Early Recovery Advisor fielded at Gizo	UNDP	11 th May
TAT Sector damage and need assessment final report	TAT	11 th May
Collect and compile Donors' existing funded projects and intention for recovery interventions	NDMO/TAT/Donor Agencies	15 th May
Organization of a NGO Consultation to share Initial Recovery Strategy; discuss the progressive shift to recovery; gather information about intentions and resources for recovery.	TAT/NDMO	15 th May
ADB reconstruction and rehabilitation adviser fielded in Honiara	ADB	16 th May
Coordination Cells at national and provincial levels set up and staffed	TAT/NDMO/PDC	18 th May
Damage and Needs assessment	ADB	16-25 May
Recovery Action Plan finalized	TAT	31 st May
Monitoring and Evaluation Framework developed	TAT	31 st May
Donor consultation meeting	TAT/NDC	Early June
Comprehensive Damage and Needs Analysis	TAT	Mid-June
Financing gap analysis	TAT	Mid-June
Long-term recovery strategy outlined	TAT	End-June

The detailed plans and programs for the recovery phase will be determined by an evaluation of the recovery activities. It will include a detailed vulnerability analysis that takes into account the pre and post disaster risks, hazards and vulnerabilities. A multi sector Governmental team possibly supported by external specialists will undertake this. Refinement of the plans and programs will be ongoing and will benefit from inputs by all parties.

A monitoring, reporting and evaluation framework will be developed in conjunction with the recovery components and incorporated in the RAP. The contents will be developed by TAT/NDMO in discussions with ADB, UNDP, and other relevant parties. The monitoring, reporting and evaluation framework will be submitted to NDC for its endorsement.

6.1 Government Decision

A specific issue that requires both National and Provincial Government deliberation centers on land ownership and tenure with respect to the hazardousness of current settlements and possible relocation alternatives.

ORGANIZATIONAL SET UP OF THE RECOVERY COORDINATION CELLS AT NATIONAL AND PROVINCIAL LEVELS

ANNEX 1

Terms of Reference of the Coordination Structure

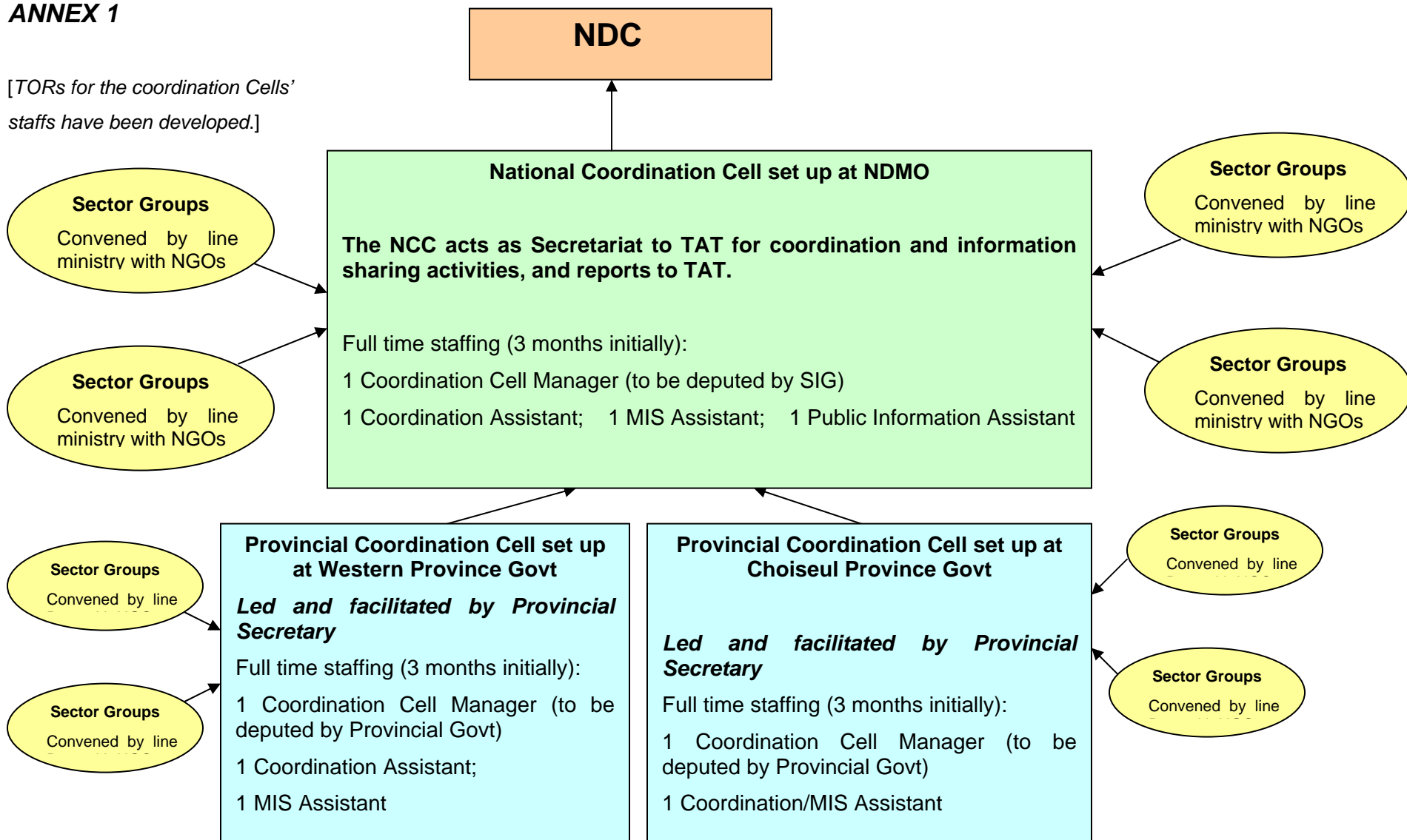
The NDC and the TAT envisage the creation of a National Coordination Cell (NCC) , and 2 similar Provincial Coordination Cells at Gizo and Choiseul, to support the National and Provincial Governments and all stakeholders involved in post-tsunami and earthquake recovery. The NCC will act as Secretariat of TAT for Coordination and Information sharing activities and will report to TAT. Local leaders have taken initiatives in spontaneously activating and manning community level disaster committees. These mechanisms need further support to lead the recovery planning process at community level and the proposed coordination structure would build on and enhance these existing mechanisms. The main objectives of the coordination cells are to:

- Enhance coordination of all stakeholders in their early and long-term recovery efforts and strengthen links between National and Provincial Coordination cells and with village-level disaster committees.
- Sustain forums between Government, civil society, NGOs at various levels organized around Sector Groups for knowledge networking and information sharing.
- Develop a common beneficiary database, building on the existing NDMO database, to be used as a tracking system to identify gaps/overlaps, provide clear information to all actors on needs and plans, and monitor equity and efficiency of aid delivery.
- Map existing interventions and agencies in the field and identify intentions, capacities and resources.
- Streamline public information systems about damages/needs, planned interventions and progress of recovery activities.
- Provide information to TAT/NDC/PDC, and affected communities/village disaster committees to assist on their recovery planning/implementation.

ORGANIZATIONAL SET UP OF THE RECOVERY COORDINATION CELLS AT NATIONAL AND PROVINCIAL LEVELS

ANNEX 1

[TORs for the coordination Cells' staffs have been developed.]



**Solomon Islands Emergency Assistance Project
Supplementary Appendix C**

INITIAL ENVIRONMENTAL EXAMINATION

New Georgia South Road, Western Province

A. Introduction

1. The proposed Solomon Islands Emergency Assistance Project will rehabilitate essential infrastructure that was damaged by the earthquake and tsunami in Choiseul and Western provinces, including (i) approximately 35 kilometers (km) of rural and town roads, along with about 19 bridges and 35 culverts, (ii) about five wharves and jetties, and (iii) the Gizo town water supply and sanitation system. These estimates are subject to detailed damage assessments and cost estimates. The Project will be implemented via a sector approach.

2. This initial environmental examination (IEE) relates to a section of road connecting rural communities on the south coast of New Georgia Island to the provincial administrative station of Munda (Refer to Map in Supplementary Appendix D). The road is also used as an alternate route for traffic between Noro Township and Munda. The road has been selected as being representative of an important route linking rural communities with a regional market and service centre, including a hospital, police station, wharf and airport. The IEE is based upon a reconnaissance level of fieldwork and should be refined on the basis of further detailed fieldwork if the road is selected as a subproject.

3. The subproject is categorized as environmental category B in accordance with ADB's *Environmental Assessment Guidelines* (2003). The road does not pass through any protected or ecologically sensitive area and there are no known sites of cultural or archaeological significance. The road passes through some seven villages serving a rural and urban population of about 8,500.

4. Road works are expected to entail repair of about 5.3 km of unsealed roads, about 6 culverts, and replacement of 1 bridge. The road hugs the coastline closely for the entire subproject, and in places protection from coastal erosion will be required through placement of about 225 meters (m) of retaining walls.

5. The design recommendations, mitigation and monitoring measures set out in this initial environmental examination (IEE) will ensure that environmental impacts arising from the subproject works will not be significant. The provisions of the IEE will be implemented during the construction phase through the adoption of the environmental monitoring and management plan (EMMP).

B. Subproject Description

6. The southern coast road on New Georgia Island between Lambete Station in the east and the village of Kindu in the west represents an important access route between the rural community and the town. The subproject road commences at the police station at Lambete Station closely follows the coastline passing through several villages to Kindu situated at the end of the subproject. The road continues a further 5 km or so to the village of Tomelolu and Mbakabaka at the northern tip of the island but this section did not suffer major damage in the disaster and therefore was not included in the subproject. However, the two villages will also benefit from the road.

7. The existing road is single lane, typically no more than 3 m wide, and is constructed from coral gravels and sands. It is currently in hazardous to poor condition. There is a 0.3 m wide crack along the seaward side of the road, running for about 100 m. All the under-road water crossings and culverts also suffered major damage. During any tidal and storm surges, the road will be flooded and the crushed coral and sand surface becomes slippery and water-logged during heavy rains.

8. The subproject road has been divided into three environmentally distinct sections consisting of the following conditions, with the main distinguishing factor being the residential density along the road.

Segment No.	Start–End	Segment Length (km)	Grade	Environment
I	Lambete Station–Kekehe	1.0	Flat coastal	Urban, airport low density residential, gardens
II	Kekehe–Lokuloku	2.0	Flat coastal	Hospital, medium density residential, Villages, gardens
III	Lokuloku–Kindu	2.3	Flat coastal	Villages, gardens, plantations, beach

9. The subproject section of the road from Lambete Station to Kindu has a 3 m width. The surface, which was previously sealed, is in very bad condition and has totally deteriorated in places.

10. Seismic activity has disturbed the shoreline causing an increase in sediments, and most of the coastal sections of the road have become more subject to erosion. Mangrove areas where sediments have been disturbed are more prone to erosion, and buried organic sediments have been exposed, with potential for acid sulphate soil formation. New sandy and muddy sections of the road along the coastline are more vulnerable to projected sea level rises. New structures should be designed to withstand a projected increased likelihood of severe low pressure/storm surges, with wave heights in excess of 5 m, and a rise of overall sea level of 500 millimeters (mm) within the expected life of the proposed infrastructure.

11. All three sections will be fully rehabilitated to single lane width of 3 m. Some 200 m length of shore protection works at will also be carried out. The new road will be constructed with an efficient drainage system, dressing and sealing. The rehabilitation works will also involve repair of 6 culverts and one bridge.

12. Either basalt or coral aggregate sources will be identified along the road corridor or existing quarries and borrow sites will be re-opened as required. Coral sources are ancient uplifted limestone areas and will not entail excavation of any modern reef or beach material. An existing coral quarry located north of Munda area is currently used as a source of road aggregate and will be used for part of the rehabilitation works. Small basalt quarries are also used on the south coast and will be utilised as a local aggregate source.

C. Description of the Environment

1. *Physical Resources*

13. Western Province is an archipelago of islands stretching from Alu, at the southern tip of Bougainville, to the uninhabited volcanic Mborokua Island just north of the Russell Islands of Central Province. Other sizeable islands include Vangunu, Kolombangara, Vella Lavella and Ranongga.

14. New Georgia Island is the largest island in Western Province. Munda area is situated at the Southern part of the island, and Lambete serves as the provincial station to the Western Province. Topographically, the island is relatively hilly, rising to a maximum of about 1006m (Mt Vina Roni) above sea level the geology being primarily volcanic rocks (basalts and volcanoclastic breccias) with conglomerates. Two lagoons with associated barrier islands, reef platforms, and sand cays form much of the south coast and Munda is at or close to sea level. In lower lying areas, Munda has poorly drained clays and peats which accumulated in former swamps. There is the Roviana Lagoon to the east and Vona Vona Lagoon to the western side.

15. The province has a tropical climate with rainfall averaging between 2,900 to 3,500 mm per annum with higher rainfall occurring over mountainous areas. Maximum temperature averages 30 to 31 degrees Celsius, and minimum temperatures average 23 to 24° C. Relative humidity in the morning is between 86–92% and 74–78% in the evening.

16. Western Province is deemed to be highly vulnerable to coastal flooding, tsunamis, earthquakes, landslides and volcanic eruption. It has medium vulnerability to river flooding while it is classified as low vulnerability in terms of cyclones, drought and volcanic eruption.

17. Western Province has a legally established Provincial Disaster Committee, comprising of the Provincial Secretary as the chairman and the members are the Provincial Police Commander, Director of Health and Medical Services, Director of Works and Utilities, Officer in-charge for Communications, Marine and a representative of the Church and Communities. The Western Provincial Disaster Committee is established under the National Disaster Council Act 1989 and the National Disaster Plan 1987.

18. The subproject road follows the ancient reef platform along the south coast, crosses peat and swamp deposits (Kokenggolo Village), and volcanic/conglomerate (Kekehe Village). The road crosses a number of small streams and creeks along the south coast rural section relating to small, previously logged catchments. The topography along the road is flat all along the south coast road. Soil conditions are variable and comprise free to poorly drained clays and loams or very poorly drained clays and peat.

2. *Ecological Resources*

19. Western Province has a large number of terrestrial and marine ecosystems, many exhibiting an exceptionally high degree of biodiversity and endemism. Most of the islands are covered with dense tropical rainforest which is a very important traditional resource for rural communities providing food, building materials and herbal medicines. The province also has a productive and diverse marine environment which includes the presence of large lagoons, extensive coral reefs, and deep water passages. Timber and fish resources have been the source of a high proportion of national income.

20. The natural ecological character of Munda is largely modified. Logging is currently occurring in the interior and northern part of New Georgia. In coastal areas, villages are well established and parts of the island have been re-planted with exotic timber species. There are

also remnants of World War II, both on land and in the sea. The remaining natural forest in the interior is slowly being taken over by subsistence gardening.

21. Fisheries and other marine resources constitute an important component of the natural environment upon which the island population is highly dependent. The Munda community is heavily reliant upon on finfish and shellfish as a food source harvested largely from near-shore coral reefs, lagoons, mangrove swamps and sea grass beds. Marine products from Munda and surrounding islands are sold in the markets in Lambete Station providing an important source of income to individuals in the community.

22. The road does not pass through any protected area and does not transect any ecologically sensitive areas. There is no vegetation adjacent to the subproject road that has any conservation significance and the roadside vegetation is not representative of the original vegetative cover. Occasional trees located adjacent to the road have no special characteristics to merit their protection or road deviation.

3. Socioeconomic Conditions

23. The subproject road section provides access directly to a number of villages in the Munda area between Lambete Station and Kindu Village. The total population of the corridor of influence is about 8,500. Villages, schools, hospital and an airfield are located along the subproject road. All villages are generally located along the road. Detailed information on socioeconomic conditions is provided in the social and poverty assessment in Supplementary Appendix E.

D. Screening of Potential Environmental Impacts and Mitigation Measures

24. The south coast road has been in existence since the Second World War and the most significant adverse effects associated with its location would have occurred when it was first constructed. Consequently, the impacts of rehabilitating the road are regarded to be minor. The implementation of environmental mitigation measures during rehabilitation, backed up by a robust monitoring and review process, will ensure that any short-term adverse impacts are avoided or minimized.

1. Pre-construction Phase

25. Pre-construction activities address design and planning issues and include the following:

- Siting of infrastructure
- Land and property acquisition (when necessary)
- Sourcing construction materials
- Inclusion of seismic risk and climate proofing in design

26. Siting of infrastructure: Rehabilitation various infrastructure will be required in many different locations throughout the tsunami and earthquake devastated areas. In most cases the reconstruction effort will be undertaken within the existing footprint of the destroyed structure. In this situation there will be few environmental concerns. However, where the structure (e.g., bridge) or any part of it (e.g., road realignment or construction of a new wharf at a new location) is to be reinstated at a new location, care will be taken with regard to assessing the environmental sensitivity of the area. Location within areas such as shoreline adjacent to reefs, wetlands, coastal environments, mangrove areas or any protected area will be avoided. When such habitat will be affected, careful assessment will be undertaken prior to construction activities to meet the ADB environmental safeguard requirements.

27. All reconstructed sites will be assessed for their location with regard to their impact on any environmentally sensitive areas. This will be the responsibility of the Environment Management Consultant (EMC) and Design Engineer.

28. Land Acquisition: In most situations as the rehabilitation will occur on an existing site, land acquisition will not be required. Although no new locations are expected, if required any relocation of the structure outside its existing boundaries will involve some form of land acquisition while loss of property especially clearing of trees and loss of crops and gardens may also apply. In such cases a Land Acquisition and Resettlement Plan (LARP) will need to be prepared that establishes the procedures for land acquisition and compensation payable for loss of private property.

29. Sourcing construction materials: Sources of rock, gravel and sand will be required for reconstruction activities. Where possible extraction of road pavement materials will be from established quarry sites. Where new sites are to be opened, approval will need to be obtained from the relevant authority or landowner. Compensation will be payable for any new material sites that are located on private land. These arrangements will be provided in the LARP. Sources of construction materials include:

- rock quarries, where rock may either be supplied in a rough form or crushed to achieve the required size for road paving or concrete manufacture. Consideration will be given to the need to rehabilitate quarries after extraction has been completed
- Gravel and sand would normally be sourced from sand bars within river channels. Care will be taken during excavation to avoid creating a new channel that may unintentionally redirect the channel flows to susceptible areas. Sediment will be yielded from these operations but at reasonable extraction rates this is unlikely to affect turbidity to the extent that it will endanger aquatic life. Sand will not be removed from beaches or sand hills should this endanger the stability of the fore-dune and the surrounding aesthetics.
- All surface excavations will be rehabilitated when the borrow pit or quarry is no longer needed by re-vegetating and stabilizing the borrow area.

30. Selection and approval of quarries and borrow pits will be the responsibility of the Design Engineer with assistance from the EMC. Operation of quarries will be the responsibility of the Supervising Engineer. Codes of environmental practices will be used to monitor the extraction of the materials from the sites.

31. Inclusion of seismic risk in design: Since Solomon Islands is located within a seismically active area the design will address this risk within the design criteria. Assessment of the seismic risk and inclusion within the design will be addressed by the Design Engineer.

32. Climate change is expected to increase extreme weather events in particular rainfall and wind. There is an increased risk that tropical cyclones may further intensify or become more frequent. Structural design will need to accommodate greater protection within the normal design criteria to address these risks. While climate change influenced design criteria are not available for the Solomon Islands the methodology to incorporate climate proofing within design is detailed in an ADB publication.¹ The Design Engineer will be responsible for reviewing climate change requirements and incorporating these within the transmission line structural design.

33. These issues will be transferred to a design brief which identifies the will be the responsibility of the Design Engineer with assistance from the EMC, as being responsible for

¹ . 2005. *Climate Proofing A Risk Based Approach to Adaptation*. Pacific Studies Series. Manila.

addressing these issues. All of these issues will need to be addressed before reconstruction activities commence.

2. Construction Phase

35. Rehabilitation impacts will be short term and can be readily mitigated by addressing the EMMP requirements. Mitigation measures as stated in the EMMP will be included in contractor's contract to allow the EMMP requirements to be carried through. The contractor will have initial responsibility for the supervision and monitoring of construction activities and will use the EMMP as the reference for establishing these conditions. The overall responsibility for the completion of the work and direction of the contractor or labor to meet the EMMP requirements will be the responsibility of the Project Supervising Engineer (SE) who will be supported by the Environment Management Consultant (EMC).

36. Construction related activities include:

- Removal and disposal of debris
- Excavation of sites and disposal of excavation waste
- Storage and handling of materials including fuel and lubricants
- Siting and management of construction camps
- Noise from construction activities
- Dust
- Worker health and safety
- Vehicle and machinery hazards to communities and other road users
- Solid and liquid waste management
- Rehabilitation and closing of construction sites

36. Removal and disposal of debris: As most debris has been cleared and removed, reconstruction work can commence almost immediately. In some situations the debris has been moved to the side of the site awaiting final disposal. In relation to the reconstruction of roads, water crossing and culverts, there will be a majority of inorganic waste such as concrete. There is minimal contaminated material (e.g., asbestos) which will require special attention. The simplest and quickest way of disposing of the debris will be to push it up by loaders to allow it to be carried away and buried in suitable sites.

37. Land fill sites to dispose of such materials will need to be contained and not allow it to leach into household water supplies. Where private land is used, landowners will need to be identified, approval sought to use the area and if required, compensation assessed. The site will need to be prepared by clearing and disposing of vegetation, the topsoil stripped and put to one side and the pit excavated. After dumping is completed the debris in the pit is compacted, the topsoil returned and the area re-vegetated. Environmentally sensitive areas (shoreline, wetlands, mangrove estuaries, marine sites and protected areas) that have already been identified during the pre-construction activities are not to be used as dump sites.

38. Excavation of sites and disposal of excavation waste: Excavation of sites will be needed for roads including road batters, bridge and culvert foundations. Excavation in high rainfall areas such as the Western Province will require proper planning to avoid excessive sedimentation

39. Excavation is preceded by clearing the site for vegetation and stripping topsoil. Where the site is grassed both the grass and topsoil can be pushed into one common heap. Topsoil is used later for re-vegetation work. Care must be taken to ensure that invasive/alien species do not get established in place of indigenous or original species. .

40. Roads: in some areas damaged road portions will need to be removed and new sub-base brought in. Where fill and batters have been exposed these will be re-stabilized and re-vegetated. Road drainage will need to be constructed so that excessive length of slope is not allowed to build up in side drains.
41. Bridge and culvert foundations: Care will need to be taken when working in waterways to minimize excessive disturbance to the waterway resulting in increased sediment delivery to the reef system adjacent to the road. When bridges permanently replaced, they will require a new set of foundations and more care will be required when working within the waterway. At the completion of work all foundations that will be exposed to river flow will be armoured against erosive forces. Where rocks and gabions are used these are to be laid on geo-textile membranes so as to prevent erosion occurring between the vastly different particle sizes.
42. Water Reticulation Systems: The Gizo town water supply system is to be repaired. Excavation work will be required for relaying pipes. Care needs to be taken in preparing the trench so that the length of open trench is minimized both from a community safety perspective and to avoid sediment issues arising from the excavated trench itself. Following the closure of the trench the area will require backfilling, carefully compacted so as not to limit revegetation success and then re-vegetated. Should long slopes be encountered water will be directed away from the newly established trench surface so as to avoid riling and possible gully erosion developing.
43. Storage and handling of materials including fuel and lubricants: Apart from sand, gravel and rock, other materials that will be brought onto site will include a range of construction material such as; cement stored in bags, reinforcing rods and mesh, wood and other construction materials, paint and thinners, fuel and lubricants. Storage and work place areas will be constructed for these materials so as to prevent these materials deteriorating and polluting adjacent water resources. Requirements for proper disposal methods will be specified in the contract documents. Fuel and oil will be stored in dedicated areas away from a watercourse. Vehicles and machinery are not to be refuelled near water courses. At the closure of the site all contaminated soil is to be excavated, removed and replaced with fresh topsoil. The Supervising Engineer, assisted by the EMC will be responsible for ensuring that these measures are implemented.
44. Construction camps for workers and storage of plant and materials may intrude on the lives of local residents. The Contract must include provisions for safe and considerate construction camps. Education on HIV/AIDS and sexually transmitted diseases (STD) must be provided. Wherever possible, contractors must consult local communities in decisions on camp locations and resource sharing with construction workers. Work encampments should be located at least 500m from any village, dwelling, school, other socially sensitive area, or water body. Waste from the encampments must be contained and disposed of effectively away from any water courses, the beach or drinking water supplies.
45. Noise from construction activities: Construction activities can lead to an increase in noise levels which may become an occupational health hazard to workers and a nuisance to adjoining communities. If possible construction work should be avoided between 6 pm and 8 am but otherwise it may not be possible to rationalize noise with the need for urgent essential work. Workers and operators of noisy equipment will be provided with ear protection while noise suppressors on construction equipment are to be maintained to the manufacturer's specifications. These activities will be the contractor's responsibility. The Supervising Engineer, assisted by the EMC will be responsible for ensuring that these measures are implemented.
46. Dust: Excavation and construction work may create dusty conditions in (i) in the workplace from the operation of machinery and (ii) within villages when contractor's machinery or haul vehicles pass through. The contractor will need to provide a water tanker as part of his

equipment which can be for dust control. The contractor is also required to maintain a record of dust control spraying. The Supervising Engineer, assisted by the EMC will be responsible for ensuring that these measures are implemented.

47. Worker Health and Safety: The contractor will be required to provide a safe working environment, protective equipment, on-site personnel trained in first aid and a first aid kit. A contingency plans must be developed by the contractor for handling both minor and major emergencies. The contractor is to keep a record of accidents and time lost from accidents. The contractor and Supervising Engineer, assisted by the EMC will be responsible for ensuring that these measures are implemented.

48. Vehicle and machinery hazards to communities and other road users: The subproject road is used by school children walking to and from school. It is also a heavily used route for most of the rural population, including logging trucks as well as Noro cannery vehicles. Construction activities will the potential to place children and other people at risk. The risk can be avoided by ensuring specific measures are undertaken, including timing the works to avoid the periods when children are on the road, clear signage, and site safety staff on duty at critical times, and through providing road safety education at the schools.

49. The contractor will need to transport materials and workers to site which in many instances will use roads passing through villages. Drivers will be required to drive cautiously and within the speed limits inside these areas. Employment agreement will state that drivers will be dismissed should they persistently ignore speed limits. The contractor will also ensure that construction site boundaries are defined and warning signs erected stating that these are construction sites with attendant risks. Supervision and monitoring of these issues will be overseen by the Supervising Engineer and assisted by the EMC.

50. Solid and liquid waste management: Various quantities of solid and liquid waste will be generated on construction sites e.g. metal and timber off-cuts, waste timber formwork, unused gravel and sand deposits and concrete waste etc. The contractor is to arrange disposal of these waste materials at approved dump sites as identified under the EMMP. Supervision and monitoring of these issues will be overseen by the Supervising Engineer and assisted by the EMC.

51. Rehabilitation and Closing construction sites: The contractor will be responsible for cleaning up and disposing of all waste materials and rehabilitating all construction sites and work areas so that these can be returned as close as possible to their previous use. This includes the stabilization of all of the construction sites and includes road and track construction where batters and embankment fill must be stabilized and road drainage completed. All quarries and borrow pits will be reshaped, re-vegetated and closed. Any contaminated soil will be removed from fuel and oil storage areas and be disposed of in an approved land fill. All spoil heaps will be reshaped and rehabilitated. To undertake this work the contractor will have saved topsoil and be familiar with site rehabilitation and have a revegetation plan in place prior to construction activities commencing. Revegetation must be effective so as to address the issue of avoiding invasive species establishing. Supervision and monitoring of these issues will be overseen by the Supervising Engineer and assisted by the EMC.

3. Post-Construction Phase

62. The construction of improved roads may introduce a risk of road accidents involving pedestrians and the rural population living around the roads. Mitigation measures may include the construction of speed control structures in villages (speed bumps), clear signage, and providing awareness information to the rural population and to schools. This should be implemented proactively at the start of the project and incorporate construction-related risks.

E. Institutional Requirements and Environmental Monitoring Plan

63. The overall implementation of the project will be administered by an existing Project Management and Capacity Building Unit (PMCBU), which will be headed by a Project Manager (PM). An Environment Management Consultant (EMC) will be appointed to the PMCBU who will report to the PM and will organize the implementation of the EMMP together with the Supervising Engineer (SE). As there will be several projects being undertaken simultaneously in different locations and on different islands the EMC will be supported by other PMCBU staff who will also supervise the implementation of the reconstruction works at other locations. The EMC will also be assisting the SE in monitoring the construction work.

1. Reporting Requirements

64. The SE shall report on a regular basis to the PMCBU the status of monitoring and compliance with the EMMP. The PMCBU shall report on the implementation of the EMMP quarterly to Government and ADB.

2. Costs of Environmental Measures

65. The project will require the appointment of an Environment Management Consultant. The EMC will oversee the implementation of the EMMP and assist and advise the Supervising Engineer in its implementation. The EMC will report to the Project Manager². The EMC's duties include over-seeing the preparation of a design brief which incorporates the EMMP design details to be addressed by the Design Engineer. As the project will be simultaneously undertaken in many different locations, supervision and monitoring during construction will require adequate additional staff in the PMCBU to undertake these roles.

66. Where work is carried out by contractors, the EMMP will be attached to the bidding documents so that the contractor is fully aware of the environmental conditions for costing purposes. The contractor will be required to certify that they have considered the EMMP requirements and have included these within their bid price.

F. Public Information and Information Disclosure

67. An emergency response mission was mobilized to the Solomon Islands on 6–24 April 2007. The mission met with key Government counterparts, partner agencies, and NGOs. At the completion of the mission a cabinet decision was made requesting the ADB to urgently coordinate the earthquake and tsunami relief operation and undertake the rehabilitation of damaged areas at the earliest possible time. Since then several teams of engineers, social specialists, and environmental specialists have been mobilized to assess infrastructure damage. The teams have travelled extensively through the affected areas and have determined the initial reconstruction requirements with national and local government officials and the communities. The teams consulted with communities to the extent feasible; however due to their involvement in emergency recovery it was not possible to hold detailed discussions.

68. Public consultations were conducted as an essential part of the damage assessment survey trip to ensure that the affected communities' requirements are being addressed within the project design and reconstruction activities. Additional consultations were also undertaken

² Site supervision remains as the Supervising Engineer's responsibility so as to avoid possible confusion of directions arising from other persons. Thus the EMC should communicate with the contractor via the SE. The SE will be assisted by the EMC and until a satisfactory environmental awareness level is created within the SE the EMC will be required to work alongside the SE.

with the relevant Government departments prior to and after the field survey to identify proper reconstruction process. However, because of the emergency nature of the Project, detailed public consultation with a large sample of stakeholders in the affected areas could not be undertaken. Nevertheless meetings during the formulation of the Project with concerned Government agencies, bilateral agencies, NGOs and individuals from affected areas confirmed wide interest regarding the proposed activities, as many of these are also seen to be providing the necessary framework to help restore livelihoods and improve sustainability.

69. In designing the rehabilitation activities and in the conduct of actual construction works, care will be taken that the concerns of local people are incorporated in the plans and programs of activities through public consultations. Further consultations will be conducted during the construction phase to ensure that the needs and requirements of the local people are considered. Representatives from the local communities will be invited to form part of the monitoring and evaluation team that will examine the overall implementation of the project.

G. Findings and Recommendations

70. The activities outlined in the project are mainly clean up, repair and rehabilitation of damaged infrastructure. These activities are expected to pose minor and temporary impact on the environment, and are tolerable with regard to the application of the mitigating measures. The implementation and subsequent completion of project activities will benefit the affected communities by helping them to reestablish livelihoods.

71. The activities that have been identified within the EMMP will allow damaged infrastructure to be repaired and reconstructed providing it is not located within any environmentally sensitive area. No large scale new infrastructure components are expected and no known environmentally sensitive areas will be affected. Should either of these conditions be altered by any activity this will need to be environmentally assessed and categorized according to the requirements of ADB's environmental guidelines.

72. An Environmental Management and Monitoring Plan (EMMP) has been developed which provides realizable mitigation measures that are identical with Best Construction Practices and will enhance the environmental sustainability of the relief operation. Compliance monitoring of the mitigation measures will be the responsibility of the Site Engineer who will be supported in this role by an Environment Management Consultant and support staff.

H. Conclusion

73. Based on the IEE findings it is concluded that there are no outstanding environmental issues remaining and as all impacts can be effectively mitigated no further environmental assessment is required for the project providing the reconstruction work is located outside environmentally sensitive areas. Where work may be required within environmentally sensitive areas these activities will need to be assessed according to ADB environmental safeguards.

ANNEX 1: ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN – NEW GEORGIA SOUTH ROAD

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
PRE-CONSTRUCTION								
Siting of re-constructed infrastructure	Intrusion into environmentally sensitive areas (forests, wetlands, marine environments and protected areas), need to minimise negative impacts on sensitive ecosystems or the natural environment	a. Evaluate all reconstruction sites for EMC to identify natural areas, especially environmentally sensitive or ecologically fragile areas. b. Locate optional construction sites/activities away from sensitive areas. c. Ensure construction personnel are aware of locations of sensitive areas and keep out of them. d. If the proposed construction must encroach onto or pass close to sensitive areas, construct temporary fences or permanent bunds or trenches to confine machines and activities. e. Use geotextiles or matting to minimise construction impacts in wetlands	a. EMC and Design Engineer b, c, d, and e: Contractor	Included as part of project design cost	Location of infrastructure facility with regard to presence of sensitive areas	a. Once, verify design. b. Design is to address any other comments received from public consultation.	EMC and Project Engineer	Cost included in project design budget
Land acquisition (if property is to be acquired) and	Loss of livelihood from acquisition of private land and property; and avoidance of social disturbance to maximise	a. Compensation to be paid for loss of land (if any) as outlined in the LARP. b. Advise the local men and women of the project plans in advance of	a. LARP Team b to h: Design Engineer and Contractor	If required to be determined	Monthly LARP report or EMC reports	Outlined in LARP procedures	NGO organisation (if necessary)	Cost to be determined in hiring NGO

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
accounting for social or community concerns	community benefits from the project	<p>construction, and where possible involve them in planning.</p> <p>c. Avoid disturbances near living areas when possible.</p> <p>d. Identify culturally sensitive areas and avoid disturbing them.</p> <p>e. Control runoff and manage sediments near garden areas.</p> <p>f. Negotiate with the community about disposal areas and stockpiles.</p>						
Acceptance by planners that sea levels will rise, storm surges will be more extreme	Regular tidal or extreme storm surge impacts will damage infrastructure re-located close to shoreline	<p>a. For infrastructure planned to last ~50 years, take a conservative approach and plan for a sea level ~500mm above 2005 level.</p> <p>b. Where construction in immediate coastal zone is unavoidable, plan for structures that can be replaced readily if damaged by wave action.</p>	Design Engineer	Included as part of project design cost	Final site plans	Once, verify in design	EMC and Project Engineer	Cost included in project design budget
Sourcing construction materials, sand, rock and gravel	If poorly located sites are opened results in long-term loss of environmental resources. (forests, agricultural areas, rivers, wetlands and marine environments)	<p>a. Determine suitable sites during planning.</p> <p>b. If sites are accessible materials are to be drawn from approved existing sites. Otherwise extraction sites will need to be verified.</p> <p>c. For new extraction areas, prepare quarry management plans using the</p>	a, b, c and d: EMC and Design Engineer	Included as part of project design cost	Environmental suitability of raw material sites	<p>Once, verify locations in design.</p> <p>Rehabilitation plan prepared</p>	EMC and Project Engineer	Cost included in project design budget

Project Activity	IMPACT MITIGATION				IMPACT MONITORING			
	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>following guide:</p> <p><i>For solid rock quarries identify</i></p> <p>The proposed plan of extraction</p> <p>The methods which will be used for containment (of sediment-loaded runoff and contaminants) at the site</p> <p>Safety measures which will be employed to avoid any loss of load from trucks</p> <p>Methods which will be employed to reduce dust emission from the loads</p> <p>Number and timing of truck trips to and from the quarry site</p> <p>Safety methods which will be put in place to reduce potential road accidents in village or urban areas</p> <p>Safety measures which will be employed to ensure stability of exposed faces or overburden stockpiles</p> <p>Plans to rehabilitate or (re)vegetate the site after use, to reduce visual impacts and sediment runoff</p> <p>Quarry plans in such areas should also set out:</p> <p>a) The steps which will be taken to</p>						

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		avoid contamination of underground drainage systems b) Methods for containing oil leaks or spillages to prevent pollutants reaching the river c) Prepare Rehabilitation Plan						
Inclusion of seismic strength factors in design	Unexpected and costly failure of infrastructure; roads, bridges, culverts, and coastal protection walls	Ensure established seismic design criteria is incorporated in design.	Design Engineer and EMC	Project design cost	Structural and location design drawings	Once, verify structural and location design.	Project Engineer and EMC	Cost included in project design budget
CONSTRUCTION								
Removal and disposal of debris	Improper dumping leading to loss of environmental resources and human livelihoods.	a. Debris to be dumped in land fill sites to be approved by EMC. b. Contaminated material disposed of separately c. Sites to be closed and rehabilitated	a, b and c: Contractor	Costed by contractor and cost carried into contract	Verify dump site meets environmental criteria.	Once, verify locations for non-contaminated and contaminated materials	Supervising Engineer and EMC	Cost included in PMU management budget
Reducing erosion at excavation and construction sites	In wet conditions sediment can be lost from the site	a. Limit size of disturbed areas and plan work so that excavation is completed quickly within waterways and on land. b. Reduce the time surfaces remain bare. Keep vegetation clearing to a minimum. Avoid disturbance on steep slopes.	a to g: Contractor	Costed by contractor and cost carried into contract		Spot checks and weekly inspections of construction sites	Contractor, Supervising Engineer and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<ul style="list-style-type: none"> c. plan drainage to control soil erosion. d. Space turn-offs at 2.0 m Vertical Intervals. e. Keep vehicles on defined tracks. f. Construct necessary temporary or permanent control structures. g. (Re)vegetate where necessary after construction activity finishes. 						
Controlling sediment at any operational sites	Stormwater containing sediment can have a negative impact on streams and coastal systems	<ul style="list-style-type: none"> a. Install control structures at the outset of construction. These may need to include silt traps along flow lines. b. (Re)vegetate or prepare for natural revegetation all disturbed areas not to be paved (eg batters) after final land shaping. c. Phase ground disturbance so that it is limited to areas of a workable size. d. Schedule construction so that large areas of soil are not laid bare during wet seasons. e. Place construction sites on flat ground. 	a to h: Contractor	Costed by contractor and cost carried into contract		Spot checks and weekly inspections of construction sites.		Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>f. Contain construction areas by using a bund or trench, or isolate the areas from other surface runoff, and clean and rehabilitate them when construction is complete.</p> <p>g. If the road is on loose or unstable rock, gently slope the batters, provide steps or horizontal benches for high batters, and (re)vegetate where necessary.</p> <p>h. Avoid discharging water onto unstable slopes or old landslips.</p>						
Managing runoff water and controlling stormwater	Contaminated runoff water can harm ecosystems and cause inconvenience to local communities	<p>a. Have prior agreement with local landowners for accessing/abstracting any water to be used.</p> <p>b. Divert (temporarily) runoff from non-construction areas around the construction areas to keep natural flow separate from construction runoff.</p> <p>c. Pass stormwater runoff from construction areas through a gross pollutant trap (to filter plastics, cans, etc) and over a vegetated surface to remove petroleum-based organic pollutants before discharging it into culverts or drainage systems.</p>	a to e: Contractor	Costed by contractor and cost carried into contract		Spot checks and weekly inspections of construction sites.		Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>d. Design drains and culverts to remove all runoff water without scour. If necessary, step drains on steep slopes using rock slabs or gravel in gabion baskets.</p> <p>e. Store oil and bituminous products at a contained location away from drainage lines and in an appropriate manner.</p>						
Removal and disposal of waste (spoil) for; roads, bridges and culverts, wharves and jetties, trenches and water systems	<p>a. Sediment arising from construction sites entering water courses and marine environments.</p> <p>b. Possible introduction of invasive species.</p>	<p>a. In areas close to water courses use soil conservation technology to control sediment .</p> <p>b. Hold discussions about dumping with local landowners.</p> <p>c. Ensure site plans include all drainage provisions suggested for construction sites.</p> <p>d. Choose the stockpile or spoilheap location to avoid blocking surface runoff or drainage lines. If the site is not a ridgecrest or flat plain, level and contain the base.</p> <p>e. Cover the spoilheap or stockpile containing fine sediments if it is to remain bare for long in a high rainfall area in order to prevent erosion and sediment runoff.</p> <p>f. Subject spoilheaps and stockpiles</p>	a to i: Contractor	Costed by contractor and cost carried into contract	<p>a and b. excavated sites stabilized.</p> <p>c. water quality maintained</p> <p>d. Sites revegetated and presence of invasive species</p>	a, b, c and d, Spot checks and weekly inspections of construction sites.	Contractor, Supervising Engineer and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>to stability calculations to safeguard against major slippage.</p> <p>g. Revegetate bare areas as quickly as possible to reduce erosion and avoid invasive species establishing.</p> <p>h. Discuss with local landowners or community groups whether they can or want to use spoil locally. If they do, ensure that a clear level site is prepared on which the spoil can be dumped.</p> <p>i. Where possible, use spoil to backfill quarry areas or waste disposal pits before they are vegetated.</p>						
Storage and handling of construction materials, fuel and lubricants	Contamination of soil and water resources	<p>a. Prepare material storage areas with impermeable bases and suitable bund drainage.</p> <p>b. Bund fuel tank storages to 110% of tank capacity</p> <p>b. Refuel vehicles and equipment 20 m away from water courses</p> <p>c. Dispose of used oil and oil filters to meet accepted industry procedures, or by using crush-burn and bury process where no waste disposal facility is available.</p>	a, to e: Contractor	Costed by contractor and cost carried into contract	Fuel and lubricant storage and handling procedures implemented	<p>a. Verify fuel storage areas</p> <p>b. At start then spot checks as required</p>	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>d. Prepare an accidental spill handling action plan</p> <p>e. Have appropriate spill clean-up equipment available.</p>						
Siting and management of construction camps	<p>a. Loss of environmental resources</p> <p>b. Worker health and the maintenance of environmental health</p> <p>c. Pollution of fresh and marine water and soil through sewage and waste disposal</p>	<p>a. Recruit local labor so as to avoid bringing in workers from outside areas.</p> <p>b. No camps to be constructed within 3 km of forest areas, or within 50m of wetlands, reefs, beaches.</p> <p>c. Camps to be provided with suitable accommodation, potable water, sanitation and waste handling facilities</p> <p>d. Dispose of sewage into hygienic pit latrines or into a septic tank system. In low-lying areas, to ensure that no sewerage pollution of the local groundwater occurs, elevate the latrine areas and construct them on and drain septic effluent into a mound of sandy sediment that may need to be built up for this purpose.</p> <p>e. Dispose of solid waste in a 'sanitary landfill' area, ensuring (if no well-managed local facility is available) the process involves three stages:</p>	a to f Contractor	Costed by contractor and cost carried into contract	<p>a. local people preferentially employed</p> <p>b. camp location</p> <p>c. provision of potable water, sanitation and waste facilities to meet MoH standards.</p> <p>d. area rehabilitated</p>	<p>a. Camp sites verified before erection.</p> <p>b. At start and then spot checks as required.</p> <p>c. On closure of camp and before final contract payment made</p>	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		(i) burning non-recyclable wastes in a well-aerated incinerator that should be installed at the construction camp site, (ii) crushing all unburned residues, (iii) burying the crushed residues in a pit dug to avoid contamination of the watertable and covered regularly with a veneer of sediment. f. When finished camps to be closed and rehabilitated						
Noise from construction equipment; e.g. air compressors and pile driving machines	a. Nuisance to surrounding communities b. Workplace hazard	a. Use modern and well-maintained equipment fitted with approved sound suppression equipment b. Use noise screens or mounds near residential areas. c. Operators provided with ear protection d. Limit activities to daylight hours e. Advise local people when there will be blasting or unusual, unavoidable noise.	a to e: Contractor	Costed by contractor and cost carried into contract	Workers and communities satisfied with conditions	Spot checks and monthly inspections: for: a. Noise b. hearing protection	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
Dust	<p>a. workplace hazard</p> <p>b. community hazard from haul traffic</p> <p>c. health risks or inconvenience due to dust production</p>	<p>a. Contractor to include water tanker in List of Equipment to be brought to site.</p> <p>b. Contractor to spray water on exposed surfaces of work areas and roads as required during dry periods.</p> <p>c. Contractor to Install wind breaks or fences around mixing/batching plants.</p> <p>d. Contractor to wet quarry loads or road-fill loads being carried in open trucks.</p>	a, b, c and d: Contractor	Costed by contractor and cost carried into contract	<p>Water tanker provided.</p> <p>Contractor's Dust Spraying record</p>	Spot checks and monthly inspections	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget
Worker and local community health and Safety	<p>Accidents and loss of worker productivity</p> <p>Need to ensure maximum safety of construction personnel and local residents</p>	<p>a. Contractor to implement workplace safety awareness program.</p> <p>b. Ensure all occupational health and safety requirements are in place on construction sites and in work camps.</p> <p>c. Workers to be provided with safety equipment and instructed in its use.</p> <p>d. Establish a project hazard reduction plan.</p> <p>e. Install cautionary signs in hazardous areas.</p>	a to f: Contractor	Costed by contractor and cost carried into contract	Inspection and verified by Contractor's Labour Accident Report	Spot checks and monthly inspections	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		f. Establish footpaths and vehicle pull-off bays along roads, through villages and near markets, schools and other community facilities.						
Vehicle and machinery hazards to communities and road users	Accidents to communities and road users	a. Safe operation of vehicles stipulated for drivers within employment agreement. b. Erection of warning signs and if needed traffic control at construction sites.	a, and b. Contractor	Costed by contractor and cost carried into contract	Accident reports filed by community	Spot checks and monthly inspections	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget
Solid and liquid waste management	Soil and water pollution from solid wastes and sewage	a. All solid and liquid wastes to be disposed of to meet <i>Removal and Disposal of Debris</i> criteria. b. Contain all stores waste within construction sites. c. During site clean-up, burn all spilled fuel oils. d. Crush, burn and bury all inorganic solid waste, including paper used in bitumen spraying, in an approved disposal area or a pit sited above the watertable, prepared for this purpose. e. Remove all disabled machinery	a to g: Contractor	Costed by contractor cost carried into contract	Visual inspection of work sites Local community complaints of exposed rubbish or leachate seeping from pits	Spot checks and monthly inspections	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		<p>from the project area.</p> <p>f. Use above-watertable pit latrines or composting toilets at residential construction sites.</p> <p>g. Compost or use as animal food all green or organic waste.</p>						
Rehabilitation and closing construction sites	Impairment of environmental resources, aesthetics and community safety mean need to minimise ongoing impacts after construction is completed	<p>a. Remove all waste and contaminated soil</p> <p>b. Restore sites by replacing topsoil and raking or loosening all compacted ground surfaces, or re-shaping batters and road margins</p> <p>c. Revegetate area by establishing a site (re)vegetation plan, engaging where possible local women's groups to provide materials and implement (re)vegetation. The vegetation plan should include: name(s) of contact landowner or community group summary discussions and decisions on what will be planted a list of stock to be provided, by whom, agreed price an agreement for planting and tending.</p>	a, b and c: Contractor	Costed by contractor cost carried into contract	<p>Sites closed according to requirements</p> <p>Local community reports of concerns</p>	Following completion of work. Before final payment	Contractor, Supervising Engineer (SE) and EMC	Cost included in PMU management budget
OPERATION								

	IMPACT MITIGATION				IMPACT MONITORING			
Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
Regular maintenance of infrastructure	Early failure of infrastructure leading to more costly replacement	a. Arrange budgets for maintenance b. Arrange maintenance contracts with local communities	Responsible Line agencies	Responsible Line agencies	Reconstructed facilities maintained and operate as expected	Six monthly. Infrastructure meets expected operating requirements	Line Agencies	Line agencies cost

EMC = Environment Management Consultant, located within the PMU

PMU = Project Management Unit; LARP = Land Acquisition and Resettlement Plan; SE = Supervising Engineer (owner's engineer, located within PMU)

**Solomon Islands Emergency Assistance Project
Supplementary Appendix D**

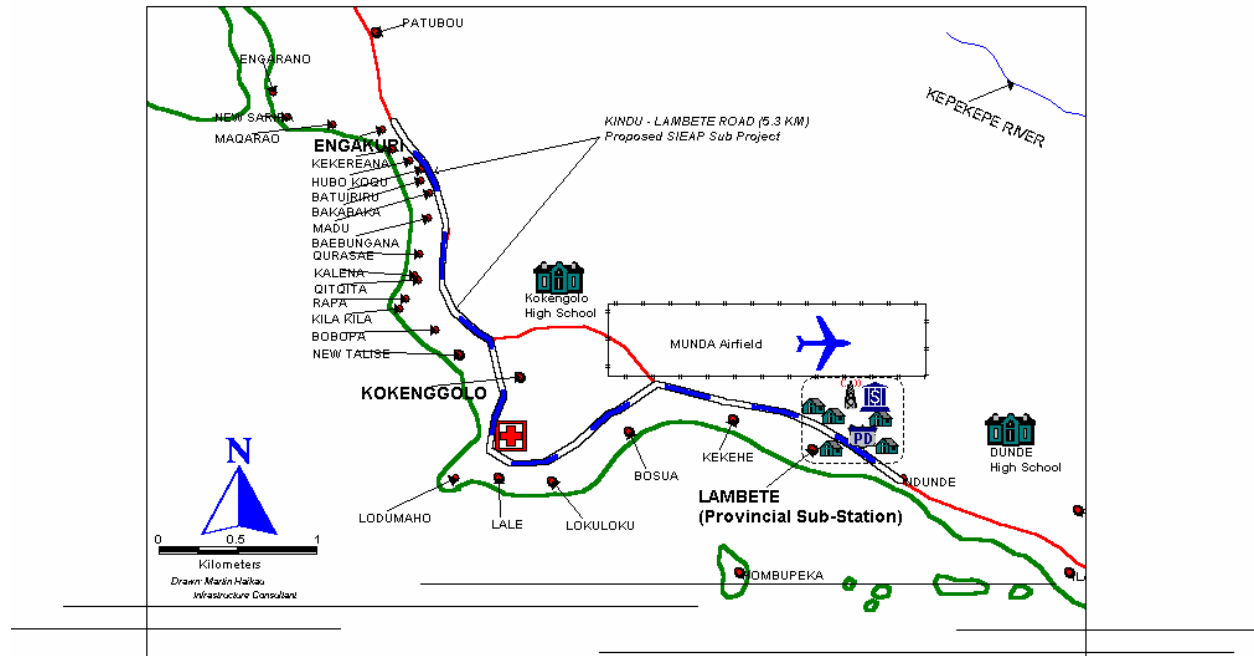
SAMPLE SUBPROJECT DOCUMENTATION

New Georgia South Road, Western Province

A. Summary Data Sheet

Province	Western
Island	New Georgia
Road Section	Lambete to Kindu (Noro/Munda Road)
Road Length	5.3 km (refer to attached Location Map)
Population Estimates	2,300 Along road 6600 Beyond the ends of subproject
Existing surface type	Coral gravels and sands
Existing surface condition	Poor (after emergency post tsunami patching work, temporary only)
Average Daily Traffic	515 AADT Traffic ranges from motor cycles, cars, 2–3 ton 2 axles trucks, vans, 25-seater buses, 3 ton 3 axles trucks and 4–6 ton > 3 axles trucks.
Type of improvement	ROAD: 1 km road reformation 1000 mm and resheeting 150 mm; 4.3 km road resheeting 150 mm BRIDGE: 1 severed concrete-gabion replaced with bailey-concrete CULVERT: 2 severed need replacement, 4 need de-silting and head reinstallation
Estimated construction cost (including bridge and culverts)	\$355,900
Estimated construction cost per km (including bridge and culverts)	\$67,150
Estimated construction cost per head of population who benefit from improved road	\$42
Environmental Category	B
Major Environmental Issues	None (replacement and construction shall be done at existing locations of existing structures)
Land Acquisition Required	None, government registered public road.

B. Sub Project Location Map



C. Description and Project Identification

1. The proposed subproject consists of three sections based on the identified improvement rating as assessed. 1 kilometer (km) of road (adjacent to Kekehe village with severe cracks, refer attached Location Map) shall require total reconstruction and new shoreline protective wall installation. One World War II made twin pipe culvert was destroyed and shall need replacement on this road section. The other two sections along the rest of the 5.3 km shall require basic 150 millimeter (mm) gravel/sand resheeting. It is also these remaining sections that require a severed bridge replaced and culvert crossing on a natural water pool reinstalled.

2. The road is a two lane, and forms part of the most economic road of the province that is, linking Noro industrial town which is the only other international seaport besides Honiara in the country. A good 90% of the proposed road is free of threat due to weather vegetation overhung and flooding. The entire road camber appeared intact in general with the exception of the described portion requiring reconstruction from the cracks. The full road section is generally flat. The vehicle travel speed has not been affected that much due to the quick response of the community to at least temporarily correct the damaged components as described, verifying this proposed subproject as an anticipated as an anticipated awaited assistance by all road users here.

D. Traffic

3. The road is moderately trafficable, having a quite considerable AADT of 515 for a rural traffic. The reason is obvious, being the link between the two growing townships of Noro and Munda.

E. Design of Road Improvements

4. The subproject will rehabilitate the existing road on the current alignment without alterations to both the grade and alignment. The proposed upgrade effort should ensure improved all-year quality traffic performance and an economically well paced periodic major maintenance need.

5. The road shall keep its specific highway geometric aspect throughout as a design consideration. The actual work will include reshaping, re-sheeting and re-compacting to 1km and re-sheeting and re-compacting to the rest of the road as specified. Speed humps will also be erected at busy spots on the road as and where deemed necessary by standard.

6. Road components such as the bridge, culverts and shoreline protective structures will be built in compliance to MID specifications and/or approved standards. The shoreline protection wall will seemingly do not carry potential threats on its proposed local conditions, but to ensure risk free development or containment of such, the wall shall be strictly built by its centerline distance to the road shoulder made not to exceed 2 meters (m) over the entire section affected by the protective installations.

F. Cost Estimates

7. The cost estimate for this subproject (including rehabilitation of 5.3 km of road, feasibility studies, design, contingencies) is US\$355,900. Note that consideration has been made on the fact that quality usable surfacing gravel and sand is abundant locally in regards to hauling associated costs during construction.

8. This preliminary cost may vary. The main variables being the physical aspects such as the actual length and foundation options for the seawalls, just for ambiguity for the actual number and degree of damage on the substructures (culverts and the like), and risks of ease of implementation cost escalation, availability of qualified project implementation personnel, and related construction logistics and inter island transport.

G. Initial Environmental Evaluation

9. An initial environmental examination (IEE) was conducted and an environmental management and monitoring plan (EMMP) drawn up (referred to the corresponding supplementary appendix). Overall recommendation of the IEE is that the proposed project will not cause environmental impacts of technical significance, been implemented under adequate mitigation measures. The proposed mitigation measures are provided in the IEE and the EMMP attached. The supervision of the EMMP will be undertaken by an appointed and qualified unit that will report to ADB, and operate under the monitoring guidelines of the Department of Environment and Conservation.

H. Land Acquisition Issues

10. The road is a Government-registered facility under the classification of the country's network of roads, and is therefore not subject to the need for land acquisition. Similarly, it will be implemented under existing road alignment, again nullifying any chances of land acquisition and dispute issues arising during the stages of implementation of the project.

I. Social, Community and Poverty Issues

11. A social and poverty analysis was conducted. The overall finding was the subject project will bring about several potential benefits to the communities within the corridor of influence, and

to the surrounding communities relying on the services of the Noro and Munda townships for that matter. Some of the obvious benefits are noted as: 1) reduced transport and marketing costs related to food items, marine and timber projects, cash crops and workers mobility for Noro Port and tuna processing labor needs; 2) direct employment and cash income in the proposed road rehabilitation activities; and 3) improved access to education, health, bank and communications facilities and services available in both towns. Refer to the corresponding supplementary appendices covering these issues.

J. Benefit Monitoring and Evaluation

12. Benefit monitoring and evaluation is an assessment of the socio-economic impacts of the subproject. A baseline of variables will be established by Government with the local community as described in the main report. Benefit monitoring should include these 3 main activities: 1) benchmarking to provide baseline data for objective assessment, 2) monitoring of subproject implementation, and 3) monitoring after subproject completion. Guidelines for subproject performance indicators are provided in the corresponding appendix attached.

**Solomon Islands Emergency Assistance Project
Supplementary Appendix E**

**SOCIAL AND POVERTY ASSESSMENT
New Georgia South Road, Western Province**

A. Introduction

1. The 5.3 kilometers (km) of road to be rehabilitated runs from Lambete to Kindu on the southern New Georgia coast. The road section directly connects Munda with seven villages, a major hospital run by the church and a secondary school ranging in size from 59 to 565 people and with a total population of 2,408 people (estimate 2007). The other villages in the vicinity of the subproject are Panopano, Dundee, Pihariki, Ilangana, and Kilivirae. This road is also connected to the Helena Goldie Hospital (the second biggest hospital in the province) and Noro the biggest industrial town and fishery centre in Solomon Islands, with a 2007 estimated population of 4,484.

2. People from the Munda and Noro areas and surrounding villages use the road to access health care and schools. The total COI population therefore becomes an estimated 8,542 people. The subproject COI encompasses about 14 percent of Western Province's population.

Table 1: Beneficiary Population

Community	Population (1999)	Est. Population (2007)
Directly adjacent to the subproject		
Kindu	230	296
Rapa	46	59
Kokengolo	208	268
Lodu Maho	94	121
Lokuloku	439	565
Helena Goldie Hospital	239	308
Kekehe	374	482
Lambete	240	309
Subtotal	1,870	2,408
Villages/town in the vicinity		
Panopano	67	86
Dundee	298	383
Kilivare	5	7
Pihariki	311	401
Ilangana	289	372
Nurse Aide Post	311	401
Noro		4,484
Subtotal	1,281	6,134
Total		8,542

3. Western Province's population growth rate is 3.2%, significantly above the national average of 2.8%, and some 40.5% of the population is under 15 years of age. In terms of development needs, this translates into an expanding demand for more education, health and

other social services, and for employment opportunities. After Guadalcanal, Western is the most urbanised province in the Solomon Islands, with some 10% of its population living in its two urban areas of Gizo and Munda-Noro area. Munda area has a land area of more than 15 square kilometres (km²) and a population density of approximately 161 people per km², making it one of the most densely populated areas in the Western Province. The population density for Western Province as a whole is just 14 people per km². The beneficiary population in the COI are predominantly Melanesians originally from New Georgia.

4. Churches are the key civil society organisations in the communities, with denominations varying by communities and with some having several churches. The churches assist some of the communities with small development projects, including infrastructure projects such as water supply and sanitation. Churches have also organised youth groups and women organisations at the community level, for outreach programmes and community projects.

5. A team made up of officers from the Asian Development Bank, Ministry of Infrastructure Development (MID) and local consultants visited the site during the damage assessment and subproject examination visit to Western and Choiseul Provinces. The team consulted with communities to the extent feasible; however due to their involvement in emergency recovery it was not possible to hold detailed discussions.

B. Livelihood opportunities

6. The population directly within the COI is mostly urban or peri-urban and many households depend on waged employment for their livelihoods. The Noro cannery, and the United Church Headquarter, hospital, Munda station, Kokenggolo Secondary School and the private sector are major providers of employment. It is located to the centre of the fishery industry in Solomon Islands and this has generated demand for related services such as hotels, guesthouses, banking and catering. The improvement of the Munda section of the road could help boost the local tourism industry to the area.

7. The rural villages in the vicinity of the COI depend on subsistence farming and fishing, as well as wage employment in Munda and elsewhere, for their livelihoods. They generate cash income from the local marketing of food and marine products. The important staple foods are cassava, sweet potato, yams, pana and taro, supplemented with purchased rice. Other important foods include fish, vegetables, fruits and purchased foods such as noodles, tinned fish and sugar.

8. There are three major markets in the area at Lambete, Kokenggolo, and Noro. These markets attract sellers from a number of major islands. Proximity to the water allows for easy off-loading. The produce most commonly marketed by villagers are seasonal root crops, vegetables and fruit, plus fish and other marine products. About half the population of Western Province sell fish at local markets, a higher proportion than any other province in the country. Root crops, vegetables, and fruit are mainly sold by women, whereas men often sell fish. Occasionally some produce is directly sold to trade stores and hotels.

9. Copra has traditionally been a significant smallholder cash crop in the area. However, chronic problems in the marketing and supply chain in recent years have hampered production. Most copra is now purchased by Western Province Copra Limited (WPCL), based in Noro-Munda. Copra is usually transported by road to main ports. There are 22 buying points that buy copra from the villagers and transport them to Noro. The buying points occasionally bring about 6 tonnes of copra per trip, while individuals can sell an average of 500 kilograms (kg). Some other cash crops, including betel nuts, are produced in small quantities.

10. Livestock, particularly pigs and chickens, provide an additional source of food and cash income to a number of households in rural and peri-urban areas. Relatively few households own

cattle. The demand for meat is high in Munda but most of it is imported because of limited local supply. Poor slaughtering, processing, storage infrastructure, and transport hamper the market contribution of local producers.

11. Virtually all transport of market produce from the villages around Munda to markets is undertaken by road, with the mode of transport being motorised vehicles or foot. Walking time from furthest villages to Munda (8 km) is about 75 minutes. A fairly regular road transport service operates from Munda to nearby villages and to Noro town. Some people use motorized canoes to access the markets from further villages.

12. The rehabilitation of the road under the subproject would enable more regular and cheaper motorised transport services between the villages along the southern coast and Munda. This would reduce travel time and transport costs associated with the marketing of local produce. It would also facilitate easier travel within the small town of Munda.

13. Lower transport costs should induce more production in the rural villages for the markets, but land scarcity for expansion of agriculture may pose a constraint. Population pressure, increasing cultivation periods and declining fallow periods, and decreasing soil fertility contribute to lower crop yields. Increasing food and cash crop production, or even sustaining them at current levels, will likely require a considerable increase in fertiliser application.

14. Whilst on the one hand the cash income earning opportunities created by road rehabilitation and maintenance are welcome, on the other hand the impact of these on people's—especially women's—overall burden and other commitments need to be carefully considered. The sharing of resources is an integral part of local culture and the project should actively explore group-based labour contracting arrangements with local community leaders and groups. Working on road rehabilitation and maintenance may not be very attractive to households that already have members receiving regular wages through work in Munda.

15. Land tenure on Munda is dominated by customary tenure. Most of the alienated land is held by national government and the Church. Land holds tambu (sacred) sites and monuments, that represent the history of people's clans, lineage and society in general. It is because of these historical ties that land becomes an important link between the living and their ancestors. Politically, land is important as it binds people together as a landowning group. It is a source of political and economic power and is fundamental for Solomon Islanders' identity.

16. The implication of the centrality of land to people's identity is that the project needs to work closely and sensitively with resource owners to avoid misunderstandings and gain their cooperation. Road rehabilitation work will entail gaining access to, and the use of, aggregates on customary land. It might also involve minor road realignments or the reclaiming of the fringes of remnant roads over which de facto property rights have developed. It is therefore critical that the project establishes a credible liaison scheme with communities in the COIs in order to discuss these issues and gain resource owners' oral and written consent. A single liaison process that encompasses both issues of resource access and community employment opportunities is recommended.

C. Social service access

17. Western Province has an adult literacy rate of 94%, the highest in the country (including Honiara) and considerably greater than the national average of 76.6%¹. A major contributing factor is the number of schools, with WP having the highest number of schools in the country,

¹ 1999 Population and Housing Census.

and their relatively even distribution among populated areas. Enrolments rates (5–19 year olds) in WP are 65.4%, well above the national average of 56.3%².

18. There are three kindergarten schools in Kindu, Kokenggolo and Dunde. These villages also have secondary schools. Three other secondary schools that accept students from these areas are and their enrolments are Noro (618), Elelo (560) and Goldie National Secondary School (400). The kindy, primary and secondary schools enrolments in Kindu (56), Kokenggolo (246) and Dunde (407) are adjacent to the road. However, the other five primary schools and five secondary schools are in within the vicinity of the road and have been counted in the COI. Those in kindergarten and primary schools walk daily to schools but some in the secondary level have to use motorised transport services. It is however difficult to determine the impact that increased accessibility will have on school attendance and educational outcomes, given the lack of information on attendance rates and the importance of physical access (versus other factors) in explaining attendance.

19. Western province is second only to Honiara in terms of accessibility to health services, when accessibility is defined as being within one hour or less of health services using the prevailing mode of transport. Some 73.1% of WP's population enjoy such access³. Munda is well serviced, having one of the only two hospitals in WP, with the other one being located in Gizo.

20. The subproject would certainly improve the access of villages along the COI to the government hospital in Munda. The road is presently passable but by generating more traffic and facilitating speedier travel, road rehabilitation will enable a faster response to medical emergencies. It also could encourage greater utilisation of health services as well as the case of education. The road will connect to the Kokenggolo primary and secondary school to other villages.

D. Road safety

21. There is little information available on road safety and accidents/injuries in Western Province. However, a variety of factors contribute to make road safety a significant issue for the subproject: (i) the route of the road, which runs through a number of villages; (ii) the high level of pedestrian (including children) traffic, which is likely to continue to some degree post-project; and (iii) the increase in traffic volume and speed. For these reasons, a local road safety awareness campaign and speed bumps in villages are recommended.

E. HIV/AIDS

22. The reported rate of HIV/AIDS in Western Province remains low. However, as with the rest of the Solomon Islands, WP is vulnerable to HIV/AIDS. Risk factors include (i) the prevalence of sexually transmitted infections, (ii) teenage pregnancy, (iii) gender inequality and violence, (iv) cultural and religious factors, (v) the international port at Noro (connected to Munda), and (vi) the labour dynamics of the significant logging industry and fishing industry; and the tourism industry. It is recommended that contractors be required to provide access to education and control programs for crew and communities.

² 1999 Population and Housing Census.

³ 1999 Population and Housing Census.

F. Conclusions

23. The subproject will bring about several potential benefits to the population of about 8,500 people living in the corridor of influence. These benefits are: (i) reduced transport and marketing costs associated with food and marine products, and cash crops (especially copra); (ii) direct employment in road rehabilitation and maintenance activities; and (iii) improved access to educational and health facilities and services on the island. The improved road in Munda town could also contribute to tourist numbers and stimulate related businesses.

24. However, the decrease in transport and marketing costs may not induce greater rural production for the market, depending on the influence of other constraints (land and labour scarcities) that hamper villagers' capacity to respond. People's willingness and ability to participate in road rehabilitation and maintenance activities will be constrained by the numerous other potential income earning opportunities available and their other time commitments. There will be some improvements in accessibility to education and health facilities, but the impact of this is somewhat indeterminate in the absence of further analysis.

25. Key social issues that need to be considered during project design and implementation include (i) customary land tenure, (ii) road safety and (iii) HIV/AIDS. Strategies for addressing these include: (i) a good project liaison process with local communities, especially landowners; (ii) a local road safety awareness campaign and the construction of speed bumps in residential areas; and (iii) integration of HIV/AIDS education and prevention into the project.

**Solomon Islands Emergency Assistance Project
Supplementary Appendix F**

ENVIRONMENTAL ASSESSMENT AND REVIEW PROCEDURES

A. Introduction

1. The environmental assessment and review procedures (EARP) documented here will be adopted for the Solomon Islands Emergency Assistance Project (SIEAP) for the environmental assessment and review of subprojects. They have been developed in accordance with the Government's Environment Act (1998; gazetted 2003) and ADB's *Environment Policy* (2002).

B. Subprojects to be Assessed

2. The subprojects will entail rehabilitation of damaged existing rural roads and bridges, wharves, and a town water supply and sanitation system in Western and Choiseul Provinces. The candidate subprojects will be selected on the basis of clearly defined economic, social and environmental criteria.

3. The potential significant environmental impacts associated with the rehabilitation works will occur temporarily during the construction phase, which will typically involve:

- (i) excavation and disposal of unsuitable materials from road substrate, shoulders, foundations, abutments, pilings, and gabions;
- (ii) placement and compaction of road base;
- (iii) construction of new shoulder drains, culverts, foundations, abutments, pilings, and gabions
- (iv) in some cases overgrown road easements will be reclaimed which will require removal of vegetation directly adjacent to the road;
- (v) construction of road protection through gabion walls will be required to avoid severe tidal and storm surges erosions
- (vi) some unstable segments of road may be sealed with bitumen;
- (vii) construction of slope stability and coastal erosion control structures, most likely through placement of gabion walls; and
- (viii) Trenching, excavation, and backfill to repair water distribution pipes.

4. Existing facilities will be rehabilitated but none will have major alignment deviations. Construction materials such as sand, gravel and quarry/borrow material will be sourced from the surrounding areas and brought to the construction sites.

C. Country Environmental Assessment Requirements

5. The principal piece of environmental legislation is the Environment Act of 1998 (gazetted in 2003). The Act defines the responsibilities of the Department of Environment and Conservation (DEC) of the Ministry of Natural Resources, and establishes a framework for an environmental impact assessment process. The Act adopts "precautionary principles" to "maintain the health, diversity, and productivity of the environment for future generations." These conditions embody a strong commitment to safeguarding environmental values for the long-term benefit of the nation's citizens. The main thrust of the Act is to require a thorough and appropriate environmental impact assessment of all development proposals, regardless of

scale, before development commences. It also requires negative environmental impacts to be avoided or mitigated through the planning process.

6. The Environment Act advocates a two-tiered EIA process, the public environmental report being the less stringent (for smaller-scale projects not expected to produce significant adverse impacts), and the environmental impact statement (EIS) being more stringent (for major infrastructure projects with potentially larger impacts). This is comparable to accepted EIA practices in many countries. Although the Act provides a framework, there is no detailed guidance on how to conduct or comply with EIA procedures.

7. ADB's project classification procedure is consistent with the Environment Act having several tiers of impact categorization dependent upon the environmental sensitivity to a proposed activity. The Category B impact status of this Project requires the production of an Initial Environmental Examination (IEE) for each subproject which incorporates an Environmental Management and Monitoring Plan (EMMP).

8. According to the Act, DEC is mandated to protect and restore the environment, promote sustainable development; set compulsory environmental standards, conduct environmental monitoring, assist in the development of provincial and local environmental plans, and promote research and environmental education. The primary role of DEC in the project will be to review environmental assessments produced for the project before submission to ADB for approval.

9. There is still very limited capacity of the existing institutions to carry out the requirements for environmental monitoring and compliance (among other stated requirements) as DEC is understaffed. Therefore the Project Management and Capacity Building Unit (PMCBU) established for the Solomon Islands Road Improvement Project (SIRIP) within the Ministry of Infrastructure Development will provide additional environmental expertise. The PMCBU also provides capacity building in environmental assessment to Ministry and DEC staff, so that internal capacity will increase over the Project's duration, supervised by experienced international and national consultants.

D. Specific Procedures to be Used for Subprojects under the Sector Project

1. Responsibilities and Authorities

10. All environmental assessment, management, and monitoring (including preparation of IEE or EIA, preparation and review of tender and contract documents that take account of the EMMP, and regular monitoring reports) will be the responsibility of the PMCBU. Compliance monitoring of the mitigation measures will be the responsibility of the Site Engineer who will be supported in this role by an Environment Management consultant (EMC). The EMC will be supported by full time PMCBU staff to undertake supervision and monitoring of the EMMP. The PMCBU through the Project Manager will ensure that the construction phase EMMP is adequately prepared and consistent with the IEE. The Site Engineer will ensure that the contractor takes adequate and timely remedial actions.

11. DEC will review all documents prior to submission for approval by ADB, and will provide advice regarding their compliance with the Government's Environment Act.

12. Review and approval of assessments (IEE or EIA) and tender and contract documents will be the responsibility of ADB.

13. The Contractor will be responsible for ensuring compliance with the EMMP, particularly in conducting civil works to minimize impacts through appropriate construction techniques and

facilitating community consultations to ensure operations are sensitive to local people's concerns.

14. Local communities will have access through the PMCBU site engineer regarding project related concerns or problems. Any construction related problems, along with follow-up actions undertaken, will be reported by the PMCBU site engineer to ADB on a quarterly basis. Responsibilities for environmental monitoring and management during project implementation are summarized in Table 1.

15. Monitoring and management of the upgraded facilities when operational will be the responsibility of MID.

Table 1: Summary of Responsibilities for Environmental Monitoring

Nature of Impacts	Project Stage	Responsible Organisation	Responsibilities
Direct	Construction	Contractor	As detailed in the EMMP
		PMCBU	As detailed in the EMMP
	Operation	MID	National road network management and maintenance
Indirect	Construction	MID / PMCBU MID/DEC	Gravel extraction; Environment
	Operation	MID Relevant Government Departments	Maintenance Road Safety

2. Environmental Criteria for Subproject Selection

16. Environmental screening will be conducted for all subprojects in accordance with ADB's *Environment Policy*. In selecting subproject sites, including extraction sites for materials to be imported to construction sites, the following environmental criteria will be used for the first level of screening. If any of these criteria are found applicable to the site, then the subproject will require the production and approval of an environmental impact assessment (EIA), following the procedures and requirements of an environmental category A project according to ADB environmental guidelines:

- (i) sites in or adjacent to areas classified as ecologically sensitive;
- (ii) requirement for major re-alignment of an existing road or complete relocation of an existing bridge or wharf that may cause significant environmental impacts;
- (iii) significant adverse impacts on natural/primary forest or near-shore marine environments such as reefs, mangroves, or other sensitive coastal areas;
- (iv) permanent negative effect on a known rare or endangered species; and
- (v) permanent damage to irreplaceable cultural relics and archaeological sites.

17. The IEE process to be applied will confirm these criteria or recommend necessary further work to complete the assessment. The preparation of the IEE document will be carried out in accordance with the EARP. All subproject facilities will be the subjects of an IEE which will be undertaken by the Project design and supervision team.

3. Procedures for Environmental Assessment of Subprojects

18. To establish the scale of potential environmental issues, the appropriate mitigation actions, monitoring requirements, and institutional capacity to undertake mitigation and monitoring, sample subproject IEEs will be conducted. Based on this assessment, the EARP has been developed for use with the remaining subprojects as set out below. This EARP has been prepared to meet the requirements of ADB's *Environment Policy* (2002) and is consistent with the requirements of the *Environmental Management Act* (1998).

4. Preparation of Initial Environmental Examinations (IEEs)

19. The EMC attached to the PMCBU project design team will prepare the IEEs for each subproject, along with outline Environmental Management and Monitoring Plans (EMMP), prior to subproject implementation. Based on these documents, site-specific environmental management action plans will be completed by the contractor. The contractor's plans will be reviewed and endorsed by the PMCBU.

20. These documents will be reviewed and approved by ADB. Once the IEE and EMMP has been reviewed and approved, the documents will be produced in quantities adequate for distribution to contractors and other stakeholders.

21. The contractor will be required to submit mitigation progress and monitoring checklists every 3 months to the PMCBU, showing progress on mitigation actions defined in the EMMP. At the end of the construction period, a summary report should be prepared by the PMCBU to verify that mitigation actions were undertaken and were effective, and to list work to be continued by the MID during the operating period. MID will be required to undertake monitoring of road operation, and file monitoring reports every year for the duration of the project, focusing on identifying the success of environmental mitigation measures as well as maintenance requirements.

5. The Environmental Management and Monitoring Plan (EMMP)

22. As part of the IEE, an outline EMMP will be prepared for completion by the contractor who will be responsible for its implementation. The PMCBU will be responsible for supervising the implementation of the EMMP. The outline EMMP is designed to follow the general template established during the pilot subproject IEEs prepared during Project preparation but adapted to the specific requirements of the subproject in question. The contractor will complete the program details, responsibilities, contingency plans, and costs.

6. Monitoring Environmental Performance and Reporting

23. The EMMP defines how mitigation measures prescribed in the IEE are to be tracked during the course of planning, construction, and operation of any subproject. The EMMPs completed for the pilot IEE were designed to be used as a general template to be matched and/or exceeded in detail for all subprojects. The EMMPs will clearly establish the reporting requirements and program, and define how frequently any particular mitigation actions will be monitored.

7. Documentation

24. Documentation of mitigation and monitoring activity is essential. The EARP is incomplete without a reporting process agreed to by the units responsible for the work during the three key

- (i) Project design team/PMCBU during detailed design/preconstruction;
- (ii) PMCBU during construction; and
- (iii) the operator of the facility, MID, during operation.

25. The content and frequency of mitigation and monitoring reports will be agreed by the MID. At least quarterly MMP implementation and reports will be submitted based on ADB's Environment Policy. General good practice requires that an IEE monitoring report will be completed according to the following schedule:

- (i) one report at the end of project design,
- (ii) one report every 3 months during construction, and
- (iii) annually during operation for as long as the monitoring is specified in the EMMP.

26. The monitoring report should also contain a summary of the effectiveness or failures of mitigation measures - the extent the mitigation actions had or were reducing the predicted negative impacts to an acceptable level as defined in the EMMP.

27. The format of the monitoring report for the three periods is largely the same, with the focus on the description of what actions were taken, when and where they were taken in relation to the instructions provided in the EMMP. The report format should be standardized for each period. General monitoring reports will be highly focused; providing a combination of text, tables, and relevant photos, addressing each mitigation action as defined in the EMMP. The EMMP will define how frequently any particular mitigation actions will be monitored; for example: the requirement for air quality testing and water quality sampling and testing.

8. Public Consultation and Information Disclosure

28. For any subproject subject to the EARP and where an IEE is required, formal and documented public consultation and information disclosure will be required. For IEEs this will be done once at the start of the IEE to inform stakeholders of the project components and to encourage input to identify overlooked environmental issues. Stakeholders to be invited to IEE consultations will include government agencies, provincial authorities, representatives of affected people and communities, and NGOs. At least 3 weeks notice of consultation meetings will be given.

29. IEEs will document (i) the consultation process adopted, (ii) date(s) of consultation (two consultation points are required for category A subprojects), (iii) information disclosed, (iv) the disclosure process adopted, (v) the medium used to disclose information (written or verbal), (vi) the affected persons or groups including NGOs informed, (vii) when they were informed with reference to the EIA or IEE preparation process, (viii) concerns raised, and (ix) how concerns were addressed in the IEE/EIA/EMMP. Environmental assessment reports will be made publicly available in accordance with ADB's Public Communications Policy (2005).

9. Reviews

30. The assessment documents prepared as part of the Project using the EARP Process will be reviewed and approved by both the Government and ADB. The process will be as follows:

- (i) Draft IEE and EMMP documents will be submitted to the PMU for processing, i.e., distribution to relevant stakeholders, assembly of comments, provision of a

coordinated response, and finally approved by DEC as representative of the Government.

(ii) Simultaneously the approved IEE and EMMP documents will be submitted to ADB for review and compliance check against ADB's *Environment Policy*.

E. Confirmation that Environmental Assessment and Review Procedures Conform to ADB's Environmental and Social Safeguard Policies

31. The Government's existing environmental assessment requirements under the Environment Act (1998) provides a sound framework for ADB's environmental analysis policy.

32. The proposed EARP conform closely with ADB's environmental and social safeguard policies. Specifically, it addresses the requirements for structured stakeholder consultation and places greater emphasis on monitoring and compliance within environmental standards during project implementation. The EARP is designed to be an ongoing process enabling the involvement of an effective environmental management and monitoring regime.

F. Staffing Requirements and Budget

33. An important project consideration is the establishment of local environmental expertise within the PMU to enable the unit to fulfill its environmental monitoring and management responsibilities. This will be initially achieved with the use of an international environmental consultant to provide on-site training to local counterparts attached to the PMU. Where possible, this on-site training should also extend to the DEC of the Ministry for Natural Resources. The specialist consultant will also be available as required to assist the local team and to regularly review its work. Furthermore, the PMU will need to assign at least one person dedicated to the supervision and management of EMMPs.

34. Subproject IEEs will be led by the EMC and assisted by local counterparts based in the PMCBU. Sufficient resources shall be provided within the PMCBU to support the required assessment and monitoring.

35. The project budget has made provisions to support environmental assessment, review, and monitoring. A total of 12 person months will be provided for an environmental specialist (national consultant) and up to 6 person months will be provided for provisional technical services (national consultants) if required. The national consultants will be supported by the environmental specialist (international consultant) assigned to the PMCBU, who is responsible for assessment, review, monitoring, and capacity building for a total of 11 person months over the duration of both projects.

36. Individual subproject IEEs will include cost estimates for implementation of the environmental management plan.