ソロモン諸島国
環境・気候変動・災害管理・気象省
国家災害管理局

ソロモン諸島国
大洋州地域コミュニティ防災能力強化
プロジェクト
業務完了報告書
（添付資料）

平成 25 年 11 月
（2013 年）

独立行政法人
国際協力機構 (JICA)

八千代エンジニヤリング株式会社
OYO インターナショナル株式会社

添付資料リスト

添付資料 1：Project Design Matrix（最新版、変更前）

Project Design Matrix（最新版）

PROJECT DESIGN MATRIX (PDM)

Project Design Matrix (PDM) Ver.2

Project Title: The Strengthening Community-based Disaster Risk Management Project (Solomon Islands) **Date: 27 October 2011**

Target Area: Tamboko, Guadalcanal Province **Project Term: October 2010 - September 2013 (three years)**

Target Group: NDMO, Ministry of Environment, Climate Change, Disaster Management and Meteorology;
Meteorology Service, Ministry of Environment, Climate Change, Disaster Management and Meteorology;
Water Resources Division, Ministry of Mines, Energy and Rural Electrification and Community Residents in Tamboko

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal A system in which the residents of the area(s) other than selected community (village or settlement) is(are) able to evacuate appropriately is enhanced.	Cases that the residents of the area(s) other than selected community have evacuation drills in cooperation with NDMO	NDMO Reports or newspaper articles on these cases	
Project Purpose A system in which the residents of the selected community (village or settlement) area(s) is (are) able to evacuate appropriately is established.	1) Percentage of the residents who take on the behavior of evacuation when the warnings are issued (80%) 2) Cases that residents of selected community have evacuation drills in cooperation with NDMO	1) Project Reports or Assessment results on these cases 2) Project Report	1.The policy in line with the National Disaster Council Act will be continued after the Project end 2.NDMO will disseminate the system established in the Project to other areas.
Outputs 1. A flood warning system is in place and appropriately managed by NDMO in cooperation with Met Service and Water Resources Division, and the target community/ residents understood and respond accordingly. 2. NDMO's disaster management capacity is developed. 3. The target community's awareness on disaster preparedness is enhanced.	1-1. Annual Report of Hydrological Observation in Umasani River issued by Water Resource Division 1-2. Number of validation calculation for the formulated flood forecast models (2 times per year) 1-3. Number of inspection and maintenance of the installed Rainfall gauge and Water Level Gauge (more than 6 times per gauge per year) 1-4. Established Warning Standard 1-5. Number of the radio contact with Tamboko village through HF Radio (the same number of the National Wamings) 2-1. Number of the meetings for formulating or revising the Provincial Disaster Management Plan of Guadalcanal (2 times per year) 2-2. Number of the simulation exercise conducted by NDMO (1 time per year) 2-3. Number of workshops or seminars to share good practices and information with both countries and other donors (2 times per year) 2-4. The Provincial / Community Disaster Management Plan formulated by NDMO for other areas 3-1. Number of the Community Disaster Committee meetings for revising the Evacuation Plan (more	1-1.Project Report 1-2.Project Report 1-3.Project Report, Activity Record and Maintenance Manual 1-4.Project Report 1-5.Project Report and Situation Report 2-1.Project Report, Provincial Disaster Plan and Manual 2-2.Project Report and Manual for simulation exercise 2-3.Project Report and Activity Record 2-4.Provincial / Community Disaster Management Plan 3-1.Project Report, Evacuation Plan and Activity Record 3-2.Project Report and Activity	NDMO continues to have commitment in the Project activities in terms of budget allocation and personnel assignment.

	than 2 times per year) 3-2. The participation rate of the target community residents' for the Evacuation Drill (more than 1 person from each household) 3-3. Number of inspection and maintenance of the Simplified Rainfall Gauges and Water Level Gauges in cooperation with Water Resource Division or Guadalcanal Province (more than 3 times per gauge per year) 3-4. Number of the community activities, such as village walkabout, evacuation drill and hazard mapping, conducted by NDMO / PDO for the target community. (more than 1 time per year)	Record 3-3. Maintenance Manual and Maintenance Record 3-4.Project Report and Activity Record	
Activities 1-1.To develop flood forecasting capacity of Meteorological Service and Water Resources Division 1-1-1.To strengthen the capacity to collect flood forecast data 1-1-2.To strengthen the capacity to forecast flood (including run-off analysis), conduct training for the related personnel 1-2.To strengthen a system for issuing a flood warning 1-2-1.To establish credible flood warning standards 1-2-2.To improve the system for sending flood forecast data from Met Service and Water Resources to NDMO 1-2-3.To improve the system by which NDMO informs residents of warning information 2-1.To strengthen the implementation system of community-based disaster management plans for the target community 2-1-1.To prepare community-based disaster management plans for the target community (including plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills) 2-1-2.To prepare the manuals on conduct of community-based disaster management plans established in activity 2-1-1 2-1-3.To arrange workshops to strengthen the C/P organizations' capacity to operate the manuals established in activity 2-1-2 2-1-4.To reflect any lessons learned from awareness program's activities to the manuals and the community-based disaster management plans 2-2.To enhance relevant organizations' capacity of emergency response 2-2-1.To prepare the emergency response manuals for relevant organizations 2-2-2.To do emergency simulation exercises in line with the emergency response manuals 2-2-3.To share good practices gained from the activities with both	**Inputs** **(Japanese side)** 1. Dispatch of the Japanese experts 1) Chief advisor (river disaster prevention, disaster management plan, strengthening of cooperation among the disaster-related organization) 2) Run-off analysis (hydrology, hydraulics) 3) Regional disaster management plan / Disaster simulation training 4) Early Warning System (EWS) 5) Community-based disaster management/ Evacuation drill and plan/ Project Coordinator 2.Training in Japan Training fields: -disaster management plan -flood forecast -planning and conduct of evacuation drill 3. Expenses for printing hazard maps 4.Expenses for conducting awareness program, emergency simulation exercises and evacuation drills 5. Expenses for social survey 6. Supply of Equipments -Anemoscope -Automatic measurement unit for air temperature -Self recording water-gauge -Self recording rain-gauge -Simplified rain gauge -Simplified water gauge -Warning instrument	**(Solomon side)** 1.Assignment of counterpart personnel (C/P) 1)P/D 2)P/M 3)Necessary number of C/P 2. Provision of facility -Provision of office space for the Project in NDMO 3. Provision of necessary data -GIS data, etc. 4. Expenses for operation and maintenance of the Project office 5.Expenses for annual and daily allowances for the Solomon C/P 6.Others, if any	1.NDMO allocate necessary budget for the Project activities as planned. 2.Roles of the C/P organizations are not greatly changed. 3.The equipments supplied by the Project are properly maintained. And they are not lost or stolen. **Pre-conditions** 1.The target community residents cooperate with the Project. 2.Enough security for the Project team to appropriately implement the Project is ensured by all means.

countries 2-2-4.To share good practices gained from the activities with other donors 3-1.To implement the awareness program 3-1-1.To select the pilot site(s), community(ies) 3-1-2.To arrange workshops in line with the awareness program 3-1-3.To conduct evacuation drills at the pilot site(s) 3-2.To assist residents at the pilot site(s) to conduct risk assessment (installation of simplified rain gauges and water gauges, preparation of hazard maps) 3-2-1.To support establishment of monitoring system for the installed rain gauge and water gauge maintained by the residents at the pilot site(s) 3-2-2.To support the residents in preparation of their own hazard maps	-PC for flood forecast model -The other necessary equipment for the effective implementation of the Project		

Project Design Matrix（変更前）

Project Design Matrix (PDM)

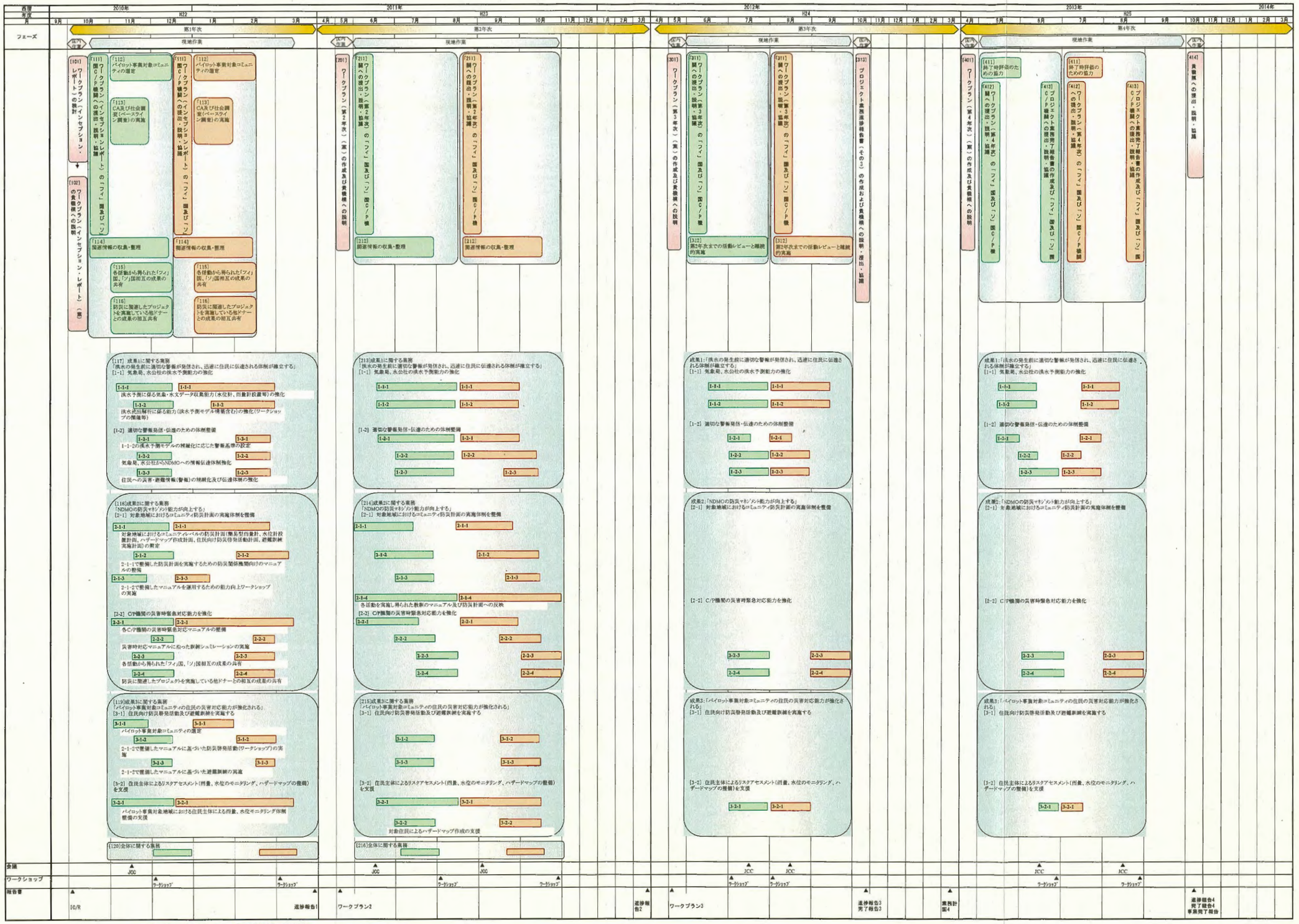
Project Title: The Strengthening Community-based Disaster Risk Management Project (Solomon) **Date:2011/03/02**

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal A system in which the residents of the area(s) other than selected community (village or settlement) is(are) able to evacuate appropriately is enhanced.	Cases that the residents of the area(s) other than selected community have evacuation drills in cooperation with NDMO	NDMO Reports or newspaper articles on these cases	
Project Purpose A system in which the residents of the selected community (village or settlement) area(s) is (are) able to evacuate appropriately is established.	1) Percentage of the residents who take on the behavior of evacuation when the warnings are issued **(80%)** 2) Cases that residents of selected community have evacuation drills in cooperation with NDMO	1) Project Reports or Assessment results on these cases 2) Project Report	1.The policy in line with the National Disaster Council Act will be continued after the Project end 2.NDMO will disseminate the system established in the Project to other areas.
Outputs 1. A flood warning system is in place and appropriately managed by NDMO in cooperation with Met Service and Water Resources Division, and the target community/ residents understood and respond accordingly. 2. NDMO's disaster management capacity is developed. 3. The target community's awareness on disaster preparedness is enhanced.	1-1.Increased volume of hydrological data (rainfall/river level) of the target river basin to be processed by the related organizations (**100%** increased) 1-2.Fomulated flood forecast model 1-3.Number of trainings for run-off analysis (**3 times** per year) 1-4.Established warning standards 1-5.Level of the residents' satisfaction on the timing, contents and accuracy of the warnings/disaster information disseminated to the selected community (**60 %** of the residents who gives more than 4 for satisfaction level rated on a 5-point scale) 2-1.Fomulated community-based disaster management plans 2-2.Formulated manuals necessary for implementing the community-based disaster management plans 2-3.Number of workshops for capacity building (**3 times** per year) 2-4.Formulated manuals for emergency response in each C/P organizations 2-5.Improved learning level of the participants in the simulation exercises 2-6.Number of workshops to share good practices with both countries (**2 times** per year) 2-7.Number of workshops to share information with other donors (**3 times** per year) 3-1.The residents' participation rate of workshops (**70 %**)	1-1.Project Report 1-2.Project Report 1-3.Project Report 1-4.Project Report 1-5.Project Report , Social Survey Results 2-1.Community-based disaster management plans (plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills) 2-2.Manuals on conduct of awareness program, installation of simplified rain gauge and water gauge, how to support residents in preparation of their own hazard maps, and conduct of evacuation drills 2-3.Project Report 2-4.Emergency Response Manuals 2-5.Project Report 2-6.Project Report 2-7.Project Report 3-1.Project Report 3-2.Project Report	NDMO continues to have commitment in the Project activities in terms of budget allocation and personnel assignment.

	3-2.Number of participants in the evacuation drills 3-3.The hydrological data (rainfall/river level) regularly recorded by the residents 3-4.Formulated hazard maps (community-based)	3-3.Project Report 3-4.Project Report 3-5.Hazard maps	
Activities 1-1.To develop flood forecasting capacity of Meteorological Service and Water Resources Division 1-1-1.To strengthen the capacity to collect flood forecast data 1-1-2.To strengthen the capacity to forecast flood (including run-off analysis), conduct training for the related personnel 1-2.To strengthen a system for issuing a flood warning 1-2-1.To establish credible flood warning standards 1-2-2.To improve the system for sending flood forecast data from Met Service and Water Resources to NDMO 1-2-3.To improve the system by which NDMO informs residents of warning information 2-1.To strengthen the implementation system of community-based disaster management plans for the target community 2-1-1.To prepare community-based disaster management plans for the target community (including plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills) 2-1-2.To prepare the manuals on conduct of community-based disaster management plans established in activity 2-1-1 2-1-3.To arrange workshops to strengthen the C/P organizations' capacity to operate the manuals established in activity 2-1-2 2-1-4.To reflect any lessons learned from awareness program's activities to the manuals and the community-based disaster management plans 2-2.To enhance relevant organizations' capacity of emergency response 2-2-1.To prepare the emergency response manuals for relevant organizations 2-2-2.To do emergency simulation exercises in line with the emergency response manuals 2-2-3.To share good practices gained from the activities with both countries 2-2-4.To share good practices gained from the activities with other donors 3-1.To implement the awareness program 3-1-1.To select the pilot site(s), community(ies) 3-1-2.To arrange workshops in line with the awareness program 3-1-3.To conduct evacuation drills at the pilot site(s) 3-2.To assist residents at the pilot site(s) to conduct risk assessment	**Inputs** **(Japanese side)** 1. Dispatch of the Japanese experts 1)Chief advisor (river disaster prevention, disaster management plan, strengthening of cooperation among the disaster-related organization) 2) Run-off analysis (hydrology, hydraulics) 3) Regional disaster management plan/ Disaster simulation training 4) Early Warning System (EWS) 5)Community-based disaster management/ Evacuation drill and plan/ Project Coordinator 2.Training in Japan Training fields: -disaster management plan -flood forecast -planning and conduct of evacuation drill 3. Expenses for printing hazard maps 4.Expenses for conducting awareness program, emergency simulation exercises and evacuation drills 5. Expenses for social survey 6. Supply of Equipments -Anemoscope -Automatic measurement unit for air temperature -Self recording water-gauge -Self recording rain-gauge -Simplified rain gauge -Simplified water gauge -Warning instrument -PC for flood forecast model -The other necessary equipment for the effective implementation of the Project	**(Solomon side)** 1.Assignment of counterpart personnel (C/P) 1)P/D 2)P/M 3)Necessary number of C/P 2. Provision of facility -Provision of office space for the Project in NDMO 3. Provision of necessary data -GIS data, etc. 4. Expenses for operation and maintenance of the Project office 5.Expenses for annual and daily allowances for the Solomon C/P 6.Others, if any	1.NDMO allocate necessary budget for the Project activities as planned. 2.Roles of the C/P organizations are not greatly changed. 3.The equipments supplied by the Project are properly maintained. And they are not lost or stolen. **Pre-conditions** 1.The target community residents cooperate with the Project. 2.Enough security for the Project team to appropriately implement the Project is ensured by all means.

(installation of simplified rain gauges and water gauges, preparation of hazard maps) 3-2-1.To support establishment of monitoring system for the installed rain gauge and water gauge maintained by the residents at the pilot site(s) 3-2-2.To support the residents in preparation of their own hazard maps			

添付資料 2：業務フローチャート


西暦
年度
月
フェーズ
2010年
H22
2011年
H23
2012年
H24
2013年
H25
2014年
9月 10月 11月 12月 1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月 1月 2月 3月
第1年次
第2年次
第3年次
第4年次
国内作業
現地作業
[101] ワークプラン（インセプション・レポート）の策定
[102] ワークプラン（インセプション・レポート）（案）
[111] C/P機関へのインセプションレポート）の提出・説明・協議
[112] パイロット事業対象コミュニティの選定
[113] CA及び社会調査（ベースライン調査）の実施
[114] 関連情報の収集・整理
[115] 各活動から得られた「フィ」国、「ソ」国相互の成果の共有
[116] 該当に関連したプロジェクトを実施している他ドナーとの成果の相互共有
[117] 成果1に関する実施
「洪水の発生前に適切な警報が発信され、迅速に住民に伝達される体制が確立する」
[1-1] 気象局、水公社の洪水予測能力の強化
1-1-1 洪水予測に係る気象・水文データ収集能力（水位計、雨量計設置等）の強化
1-1-2 洪水流出解析に係る能力（洪水予測モデル構築含む）の強化（ワークショップの開催等）
1-1-3
[1-2] 適切な警報発信・伝達のための体制整備
1-2-1 1-1-2の洪水予測モデルの補厳化に応じた警報基準の設定
1-2-2 気象局、水公社からNDMOへの情報伝達体制強化
1-2-3 住民への災害・避難情報（警報）の発厳化及び伝達体制の強化
[118]成果2に関する実施
「NDMOの防災マネジメント能力が向上する」
[2-1] 対象地域におけるコミュニティ防災計画の実施体制を整備
2-1-1 対象地域におけるコミュニティレベルの防災計画（簡易型雨量計、水位計設置計画、ハザードマップ作成計画、住民向け防災啓発活動計画、避難訓練実施計画）の策定
2-1-2 2-1-1で整備した防災計画を実施するための防災関係機関向けのマニュアルの整備
2-1-3 2-1-3で整備したマニュアルを運用するための能力向上ワークショップの実施
[2-2] C/P機関の災害時緊急対応能力を強化
2-2-1 各C/P機関の災害時緊急対応マニュアルの整備
2-2-2 災害時対応マニュアルに沿った訓練シュミレーションの実施
2-2-3 各活動から得られた「フィ」国、「ソ」国相互の成果の共有
2-2-4 防災に関連したプロジェクトを実施している他ドナーとの相互の成果の共有
[119]成果3に関する実施
「パイロット事業対象コミュニティの住民の災害対応能力が強化される」
[3-1] 住民向け防災啓発活動及び避難訓練を実施する
3-1-1 パイロット事業対象コミュニティの選定
3-1-2 2-1-2で整備したマニュアルに基づいた防災啓発活動（ワークショップ）の実施
3-1-3 2-1-2で整備したマニュアルに基づいた避難訓練の実施
[3-2] 住民主体によるリスクアセスメント（雨量、水位のモニタリング、ハザードマップの整備）を支援
3-2-1 パイロット事業対象地域における住民主体による雨量、水位モニタリング体制整備の支援
[120]全体に関する実施
[201] ワークプラン（第2年次）（案）の作成及び責機構への説明
[211] C/P機関へのインセプションレポート）の提出・説明・協議
[212] 関連情報の収集・整理
[213]成果1に関する実施
「洪水の発生前に適切な警報が発信され、迅速に住民に伝達される体制が確立する」
[214]成果2に関する実施
「NDMOの防災マネジメント能力が向上する」
[215]成果3に関する実施
「パイロット事業対象コミュニティの住民の災害対応能力が強化される」
[216]全体に関する実施
[301] ワークプラン（第3年次）（案）の作成及び責機構への説明
[311] C/P機関へのインセプションレポート）の提出・説明・協議
[312] 第3年次までの活動レビューと補強的実施
[313] プロジェクト進捗状況書（その3）の作成および責機構への説明・提出・協議
成果1:「洪水の発生前に適切な警報が発信され、迅速に住民に伝達される体制が確立する」
成果2:「NDMOの防災マネジメント能力が向上する」
[2-2] C/P機関の災害時緊急対応能力を強化
成果3:「パイロット事業対象コミュニティの住民の災害対応能力が強化される」
[401] ワークプラン（第4年次）（案）の作成及び責機構への説明
[411] 終了時評価のための協力
[412] C/P機関へのインセプションレポート）の提出・説明・協議
[413] プロジェクト業務完了報告書の作成及び「フィ」国及び「ソ」国
[414] 責機構への提出・説明・協議
会議
ワークショップ
報告書
JCC
ワークショップ
IC/R
進捗報告1
ワークプラン2
進捗報告2
ワークプラン3
進捗報告3
完了報告3
業務計画4
進捗報告4
完了報告4
事業完了報告
現地調査：「フィ」国
現地調査：「ソ」国

添付資料 3：詳細活動計画（第 4 年次）

詳 細 作 業 工 程 表 と 各 活 動 の 関 連 性

■ : Fiji ■ : Solomon ■ : Japan

平成25年度			2013年										
月			4	5	6	7	8	9	10	11	12		
活動 専門家	1	総括(河川防災、防災計画、防災関連組織連携)											
	2	流出解析(水文、水理)II											
	3	地域防災計画/災害対応シミュレーション											
	4	早期警報情報伝達システム											
	5	コミュニティ防災/避難計画・訓練											
	6	コミュニティ防災/避難計画・訓練 II											
0-1	国内作業												
	(1)	ワークプラン(案)の作成及び責機構への説明											
0-2	第4年次現地作業												
	(1)	ワークプラン)(案)のフィ」国及び「ソ」国C/P機関への提出・説明・協議											
1-1	気象局、水公社の洪水予測能力の強化する												
	1-1-1	洪水予測に係る気象・水文データ収集能力(水位計、雨量計設置等)の強化											
	(1)	定期観測及びデータ収集と機器の維持管理											
	1-1-2	洪水流出解析に係る能力(洪水予測モデル構築含む)の強化(ワークショップの開催等)											
	(2)	雨量・水位データ整理と水文観測年報の作成											
	(3)	モデル検証(流出解析)・更新の演習											
	(4)	マニュアル及びテンプレートを活用したEラーニング											
1-2	適切な警報発信・伝達のための体制を整備する												
	1-2-1	洪水予測モデルの精緻化に応じた警報基準の設定											
	(5)	警報基準の更新・SOP等への反映											
	1-2-2	気象局、水公社からNDMOへの情報伝達体制強化											
	(6)	水文情報システム等のマニュアル整備											
	(7)	防災関連カウンターパート機関による水文情報共有と災害情報伝達体制の設定											
	1-2-3	住民への災害・避難情報(警報)の精緻化及び伝達体制の強化											
	(8)	簡易警報機の運用											
	(9)	業務分掌(SOP)の整備(成果2)と避難訓練の実施(成果3)による住民への情報伝達体制強化											
2-1	対象地域におけるコミュニティ防災計画の実施体制を整備する												
	2-1-1	対象地域におけるコミュニティレベルの防災計画の策定											
	(1)	2012-13年の洪水災害情報の収集・分析・教訓抽出											
	(2)	対象地域における地域・コミュニティレベルの防災計画の修正											
	2-1-2	2-1-1で整備した防災計画を実施するための防災関係機関向けのマニュアルの整備											
	(3)	地方行政向けマニュアルの修正											
	2-1-3	2-1-2で整備したマニュアルを運用するための能力向上ワークショップの実施											
	(4)	マニュアル運用のためのワークショップ開催											
	2-1-4	各活動を実施し得られた教訓のマニュアル及び防災計画への反映											
	(5)	活動実施結果の評価会の実施											
	(6)	活動実施結果からの教訓の抽出											
	(7)	教訓の防災計画及びマニュアルへの反映											
2-2	C/P機関の災害時緊急対応能力を強化する												
	2-2-1	各C/P機関の災害対応マニュアルの整備											
	(8)	主要C/P機関向け災害対応マニュアルの協議、評価											
	(9)	協議結果に基づく災害対応マニュアルの修正											
	2-2-2	災害時緊急対応マニュアルに沿った訓練シミュレーションの実施											
	(10)	訓練シミュレーション教材の準備											
	(11)	訓練シミュレーションの実施、評価											
	2-2-3	各機関から得られた「フィ」国、「ソ」国相互の成果の共有											
	(12)	国際ワークショップの実施											
	2-2-4	防災に関連したプロジェクトを実施している他ドナーとの相互の成果の共有											
	(13)	ドナー向けワークショップの実施											
	(14)	リーフレット・DVDを活用した広報活動											
3-1	住民向け防災啓発活動及び避難訓練を実施する												
	3-1-1	パイロット事業対象コミュニティの選定											
	(1)	上位目標達成を見据えた事業対象コミュニティの選定											
	(2)	社会調査の実施(住民の防災意識、洪水経験、住民リソース、行政との連携等)											
	3-1-2	2-1-2で整備したマニュアルに基づいた防災啓発活動(WS)の実施											
	(3)	村落/コミュニティ防災計画作成のためのWS及び村落/コミュニティ防災委員会の開催											
	(4)	村落/コミュニティ防災ガイドブックの作成及び普及の取り組み											
	(5)	小規模事業所の防災に係る事業継続計画の作成、運用											
	(6)	マニュアルや各計画に基づく啓発活動の実施											
	3-1-3	2-1-2で整備したマニュアルに基づいた避難訓練の実施											
	(7)	避難計画の作成、改訂(早期警報伝達、避難場所、避難路、災害弱者配慮等)											
	(8)	避難計画に沿った避難訓練の実施											
	(9)	避難計画作成/避難訓練作成マニュアル(ガイドブックに含まれる)等の改訂											
3-2	住民主体によるリスクアセスメント(雨量、水位のモニタリング、ハザードマップの整備)を支援する												
	3-2-1	パイロット事業対象地域における住民主体による雨量、水位モニタリング体制整備の支援											
	(10)	簡易警報機と洪水早期警報伝達に係るワークショップの開催											
	(11)	簡易警報機維持管理マニュアルの改訂											
	3-2-2	対象住民によるハザードマップ作成の支援											
	(12)	手描きハザードマップ(安全地図)作成ワークショップ(村歩き含む)の開催											
	(13)	安全地図作成マニュアル(ガイドブックに含まれる)の作成、改訂											
0-3	業務期間を通じた業務												
	(1)	プロジェクトに関するセミナー/WS											
	(2)	JCC											
	(3)	終了時評価											
	(4)	報告書作成(プロジェクト業務完了報告書の作成及びJICAへの提出・説明・協議)											
月			4	5	6	7	8	9	10	11	12		

添付資料 4：専門家派遣実績（第 4 年次）

■ : Fiji, ■ : Solomon, ■ : Japan

	担当 Field	氏名 Name	所属	変更	第4年次 4th Year 2013 (4 5 6 7 8 9 10 11 12)	第4年次(M/M) 4th Year Site	Japan
◎	総括/河川防災/防災関連組織連携 Chief Adviser	亀山 勉 Tsutomu Kameyama	YEC	計画 Planned	61 / 59	4.00	0.40
				実績 Actual	6/11 (3) – 7/27; 8/7 – 8/27; 9/10 – 9/30; 10/7 – 10/1 10/6; 11/7 (5)	4.03	0.40
	流出解析（水文/水理）II Hydrologist, Runoff Analysis II	梅木 知裕 Tomohiro Umeki	YEC	計画 Planned	53 / 67	4.00	
				実績 Actual	6/11 – 8/2; 8/26 – 9/30; 10/7 – 10/1 10/6; 11/7	4.03	
◎	地域防災計画/災害対応シミュレーション Regional Disaster Management Planing	山崎 吉高 Yoshitaka Yamazaki	OIC	計画 Planned	81 / 60	4.70	0.30
				実績 Actual	6/11 (3) – 8/30; 9/11 – 11/7 (3)	4.70	0.30
	早期警報情報伝達システム Early Warning System	塚田 和美 Kazumi Tsukada	YEC (補強)	計画 Planned	45	1.50	
				実績 Actual	6/18 – 7/31	1.47	
	コミュニティ防災/避難計画・訓練II Community Disaster Management / Evacuation Drill II	渡辺 肇 Hajime Watanabe	YEC	計画 Planned	45	1.50	
				実績 Actual	7/7 – 8/19	1.47	
						15.70	
						15.70	0.70

＜凡例＞ ■ : 国内作業 ▒ : コンサルタント負担 □ : 実績 ◎ : 評価対象

添付資料5：供与機材実績（引渡しリスト）

No	Equipment	Specification and Manufacturer	Quantity	Total Price	Delivery Date	Handover	Location/Status
1	Automatic Rain Gauge (data logger, solar panel)	KOMATSU R1-502	1	USD965	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 6 and operated by WRD
2	Automatic W.L. Gauge (data logger, solar panel)	JTEKT TD8300(30m)	2	USD6,786	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 6 and operated by WRD. The other has not been installed and kept at WRD for necessary arrangement
3	Weather Sensor	VAISARA Weather Transmitter WXT520, Data logger WL2250	1	JPY892,290	July 2011.	SIMS	Installed at Upper Air Observation Station, SIMS
4	Simple Warning Rain Gauge	TOYO ELECTRONICS	2	JPY100,000	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 2, Zone 5 (now temporarily stored at WRD)
5	Simple Warning Water Level Gauge	TOYO ELECTRONICS	2	JPY100,000	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 1, Zone 5
6	Hand Siren	TEISHO:MODEL 5	2	JPY18,000	July 2011	NDMO	Handed over to Tamboko VDRC
7	Megaphone with Siren	NOBORU ELECTRIC:TS-613L	4	JPY86,400	July 2011	NDMO	Handed over to Tamboko VDRC
8	Desktop Computer	OPTX 380DT DC2.7/2/320/DVDRW/Win7	2	FJD3,390	December 2010	NDMO	NDMO office
9	Color Copy/Printer	DPC1190 Multifunction Laser Printer	1	FJD2,400	February 2011.	NDMO	NDMO office
10	Battery Charger					NDMO	NDMO
11	Simplified Rain Gauge	(handmade)	4	JPY285,084	Assembled in the workshop on 28-30 September 2011 in Fiji	NDMO	3 were installed at Turarana, Rate, Selwyn
	Simplified Water Level Gauge		4				3 were installed at Turarana, New Birao, Selwyn
12	Hand Siren	TEISHO:MODEL 5	5	JPY90,000	2011	NDMO	Kept at Tuararana 1, Selwyn 2, WRD 2
13	Megaphone with Siren	NOBORU ELECTRIC:TS-613L	1	JPY21,600	2011	NDMO	Out of order, Kept at Project Coordinator
14	Solar Panel (including Regulator, Battery and so on)		2	JPY28,673	2012	NDMO	Tuararana 1, New Birao 1
15	Portable DVD Player	SANSUI SPD-749TV	1	FJD235	FY2013	NDMO	NDMO (It is expected to be used at Guadalcanal Provincial Office)
16	Monitor for Simplified Gauge	TOYO ELECTRONICS	2	JPY15,000	FY2013	NDMO	Stored at WRD (equipment for spare)
17	Barometer	ESCO 100mm Barometer	2	JPY2,625	FY2013	NDMO	NDMO 1,Honiara Police Station 1
18	Manually-Powered Lantern	APLT001	4	JPY2,230	FY2013	NDMO	NDMO (it has not been delivered)

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of set of the following equipments, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Automatic Rainfall Gauge	1	NDMO
Automatic Water Level Gauge	2	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 18th July 2011

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;

Mr. Tsutomu Kameyama

JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of sets of the following equipments, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Weather Sensor	1	NDMO (Meteorology Division)
Simple Warning Rainfall Gauge	2	NDMO
Simple Warning Water Level Gauge	2	NDMO
Hand Siren	2	NDMO
Megaphone with Siren	4	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 2nd March 2011

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of set of the following equipment, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Desktop Computer	2	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 7th February 2011

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of set of the following equipment, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Color Copy/Printer	1	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 14th March 2011

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of sets of the following equipments, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Simple Warning Rainfall Gauge	4	NDMO
Simple Warning Water Level Gauge	4	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 28/10/11

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of sets of the following equipment, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Hand Siren	5	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 31/1/2012

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of set of the following equipment, which is procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Megaphone with Siren	1	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 2/2/2012

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of sets of the following equipment, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Solar Panel (including Regulator, Battery and so on)	2	NDMO

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 1st August 2012

The Strengthening Community-Based Disaster Risk Management Project in the Pacific Region

Equipment Receipt and Confirmation

Attention;
Mr. Tsutomu Kameyama
JICA Project Team

National Disaster Management Office, The Solomon Islands has confirmed the receipt of sets of the following equipment, which are procured by Japan International Cooperation Agency Project Team (JICA Project Team).

Equipment List	Set	Organization
Portable DVD Player	1	Guadalcanal Provincial Office (NDMO)
Monitor for Simplified Gauge	2	WRD
Barometer	2	Target Community (NDMO)
Manually-Powered Lantern	4	Target Community (NDMO)

Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Date : 15/2/13

添付資料 6：合同調整委員会会議議事録

1st JCC Meeting

2nd March 2011

MINUTES OF MEETINGS
BETWEEN
JOINT COODINATING COMMITTEE
AND
JICA EXPERT TEAM
ON
THE STRENGTHENING COMMUNITY-BASED DISASTER RISK MANAGEMENT PROJECT

The JICA Experts for the Technical Cooperation (hereinafter referred to as "the JICA Expert Team") dispatched by the Japan International Cooperation Agency (hereinafter referred to as "JICA") held a discussion meeting on the Strengthening Community-Based Disaster Risk Management Project (hereinafter referred to as "the Project"), on administrative matters of the Project, with Joint Coordinating Committee (hereinafter referred to as "JCC") on March 02nd, 2011.

As a result of the discussion, NDMO and the JICA Expert Team have agreed with the matters referred to in the document attached here to.

Honiara, March 02, 2011

Mr. Tsutomu KAMEYAMA
Chief Advisor,
JICA Expert Team,
Japan

Mr. Loti Yates
Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

Ms. Janet Prakash
Deputy Director,
National Disaster Management Office
Ministry of Environment, Climate Change, Disaster Management and Meteorology

THE ATTACHED DOCUMENT

Through the Kick-off Meeting held at NDMO Office on 02 March, 2011, the following are confirmed for the Project Implementation by JCC and JICA Expert Team.

1. Opening Remarks

The Chairman of JCC, Undersecretary of the Ministry of Environment, Climate Change, Disaster Management and Meteorology showed his appreciation to JICA and JICA Experts Team for the Project Implementation.

2. Project Progress

The JICA Experts gave the presentation of their activity for each outcome on the existing Project progress. JCC all members understood the existing condition.

3. Comments and Discussion

JICA Honiara remarked that it is important to grasp the improvement result on the capacity of the each organization and staff after the technical transfer or capacity assessments. In addition, the approach of evaluation on the result shall be required during the Project period.

The Experts Team remarked the sustainability of the hydrological data stock in Water Resources Division. The Solomon side explained the issues on the data stock and the lost of hydrological equipments under Pacific HYCOS. Then, the participants of local residents shall be required for the equipment maintenance at the site.

The Director of Meteorological Service made a comment that the utilization of the weather transmitter to be set under this Technical Cooperation Project is primary important to share the meteorological data with many countries including Pacific Region's countries under WMO system. Additional equipment of data transfer to NOAA GOES of USA Satellite shall be necessary to the granted equipment by JICA. The Team promised to convey the comment to JICA Headquarter.

4. Task Force Members for Outcomes

The Team listed up the candidates for the Task Force Members through the discussion in Capacity Assessment Survey and other activities. The necessity of joining of Tamboko residents and the representative of Church Group is emphasized to JCC. JCC agreed the joining to the Task Force.

5. Events and Next Stage Schedule

The events of the public awareness program, the simulation exercise and Project Seminar are explained and the all members took notice the program. The Experts Team also explained the tentative next stage schedule. JCC members accepted the schedule.

6. Closing

The Chairman declared the going off all right of the first JCC meeting.

(File : attendants)

Participants Attenting the JCC Meeting

No:	Organisation	Title	First Name	Last Name	Position
1	MEHRD	(Mr) · Ms	ASERI	YALANGONO	US Professional (ag)
2	MPGIS	Mr · (Ms)	[illegible]	NANEY	US (ADMIN)
3	MMERE	(Mr) · Ms	Michael	Maeluka	SENIOR Hydrologist
4	MECDM	(Mr) · Ms	DAVID	HIRIASIA	DIRECTOR - MET SERVICE.
5	NDMO MECDM	Mr · (Ms)	Janet	Rakesh	D. Director - NDMO
6	~~[illegible]~~ JICA	Mr · (Ms)	Yoko	ASANO	Project Formulation Advisor
7	JICA	(Mr) · Ms	Yoshinobu	Takishita	Resident Representative
8	MECDM	(Mr) · Ms	CHANEL	IROI	Undersecretary / Technical
9	~~[illegible]~~ RSIPF	Mr · Ms	Edmond	Tovosi	RSIPF
10	~~[illegible]~~ NDMO	(Mr) · Ms	Homac ~~[illegible]~~	Sauisi	PDO G/Province
11	RSIPF	(Mr) · Ms	George	Pukai	E Director EMSEP.
12	~~[illegible]~~ MLHSS	(Mr) · Ms	Jimmy	IKINA	Assistant Surveyor General
13	MID	(Mr) · Ms	JABIN	BASITAU	CHIEF CIVIL ENGINEER
14	JICA Project Team	(Mr) · Ms	Tsutomu	KAMEYAMA	Chief Advisor
15	JICA Project Team	(Mr) · Ms	Masaaki	KANAYA	Project Coordinator
	JICA Project Team	Mr.	TETSURO	FUKUI	Project member
	JICA Project Team	Mr.	Toshitaka	YAMAZAKI	Project member
	JICA Project Team	Mr.	Tomohiro	UMEKI	Project member

2nd JCC Meeting

27th October 2011

MINUTES OF MEETINGS
BETWEEN
JOINT COODINATING COMMITTEE
AND
THE PROJECT TEAM
ON
THE STRENGTHENING COMMUNITY-BASED DISASTER RISK MANAGEMENT PROJECT IN THE PACIFIC REGION

The Experts Team (hereinafter referred to as "the Expert Team") headed by Mr. Tsutomu Kameyama for the Technical Cooperation on the Strengthening Community-Based Disaster Risk Management Project (hereinafter referred to as "the Project") dispatched by the Japan International Cooperation Agency (hereinafter referred to as "JICA") had a discussion on administrative matters of the Project with the responsible officials concerned of the Government of the Solomon Islands (hereinafter referred to as "GoS"), including Ministry of Environment, Climate Change, Disaster Management and Meteorology (hereinafter referred to as "MECDM"), Ministry of Mines, Energy and Rural Electrification and other relevant organizations in the 2nd Joint Coordinating Committee (hereinafter referred to as "JCC") on October 27th, 2011.

As a result of discussions, the JCC members and the Expert Team came to understanding concerning the matters referred to in the document attached hereto.

Honiara, October 27, 2011

Mr. Tsutomu Kameyama
Chief Advisor
JICA Expert Team
Japan

Mr. Chanel Iroi
Under Secretary / Technical
Ministry of Environment, Climate Change,
Disaster Management and Meteorology
The Solomon Islands

Mr. Loti Yates
Director
National Disaster Management Office
Ministry of Environment, Climate Change,
Disaster Management and Meteorology
The Solomon Islands

THE ATTACHED DOCUMENT

1. Purpose of JCC meeting

In accordance with the Record of Discussion agreed on 23rd July 2010 between JICA and GoS in Honiara, JCC Meeting is held at least once a year and whenever the necessity arises in order to fulfill the following functions.

(1) To formulate the annual work plan of the Project
(2) To review the overall progress of the Project as well as the above-mentioned annual work plan
(3) To review and exchange opinions on major issues from or in connection with the Project

2. Amendment of Project Design Matrix (hereinafter referred to as "PDM")

The Expert Team suggested the following amendments of the Verifiable Indicators of PDM in order to measure the improvement of the counterparts' capacity positively.

[Indicators for Output 1]

Previous

1-1. Increased volume of hydrological data (rainfall/river level) of the target river basin to be processed by the related organizations (100% increased)
1-2. Formulated flood forecast model
1-3. Number of trainings for run-off analysis (3 times per year)
1-4. Established warning standards
1-5. Level of the residents' satisfaction on the timing, contents and accuracy of the warnings/disaster information disseminated to the selected community (60% of the residents who gives more than 4 for satisfaction level rated on a 5-point scale)

Revised

1-1. Annual Report of Hydrological Observation in Umasani River issued by Water Resource Division
1-2. Number of validation calculation for the formulated flood forecast models (2 times per year)
1-3. Number of inspection and maintenance of the installed Rainfall gauge and Water Level Gauge (more than 6 times per gauge per year)
1-4. Established Warning Standard
1-5. Number of the radio contact with Tamboko village through HF Radio (the same number of the National Warnings)

[Indicators for Output 2]

Previous

2-1. Formulated community-based disaster management plans
2-2. Formulated manuals necessary for implementing the community-based disaster management plans
2-3. Number of workshops for capacity building (3 times per year)
2-4. Formulated manuals for emergency response in each C/P organizations
2-5. Improved learning level of the participants in the simulation exercises
2-6. Number of workshops to share good practices with both countries (2 times per year)
2-7. Number of workshops to share information with other donors (3 times per year)

Revised

2-1. Number of the meetings for formulating or revising the Provincial Disaster Management Plan of Guadalcanal (2 times per year)
2-2. Number of the simulation exercise conducted by NDMO (1 time per year)
2-3. Number of workshops or seminars to share good practices and information with both countries and other donors (2 times per year)
2-4. The Provincial / Community Disaster Management Plan formulated by NDMO for other areas

[Indicators for Output 3]

Previous

3-1. The residents' participation rate of workshops (70%)
3-2. Number of participants in the evacuation drills
3-3. The hydrological data (rainfall/river level) regularly recorded by the residents
3-4. Formulated hazard maps (community-based)

Revised

3-1. Number of the Community Disaster Committee meetings for revising the Evacuation Plan (more than 2 times per year)
3-2. The participation rate of the target community residents' for the Evacuation Drill (more than 1 person from each household)
3-3. Number of inspection and maintenance of the Simplified Rainfall Gauges and Water Level Gauges in cooperation with Water Resource Division or Guadalcanal Province (more than 3 times per gauge per year)
3-4. Number of the community activities, such as village walkabout, evacuation drill and hazard mapping, conducted by NDMO / PDO for the target community. (more than 1 time per year)

3. The necessity of communication

NDMO and the Expert Team suggested the following measures in order to enhance information sharing.

1) Monthly Update (Meeting or e-mail)
2) Regular Reporting by the Project Manager (G-PDO)
3) Assignment for Chief Administrative Officer of NDMO

4. Maintenance of the provided Equipment

1) Rain Gauge / Water Gauge are responsible for Water Resource Division
2) Simplified Gauges are responsible for Water Resource Division
3) Integrated Weather Sensor is response for Solomon Islands Met Service
4) Hand Sirens are responsible for Guadalcanal Province / Tamboko Community

Annex-1 PDM version 2, dated on 27th October 2011
Annex-2 Attendance List of JCC

3rd JCC Meeting

26th September 2013

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

MINUTES FOR THE 3rd JOINT COORDINATION COMMITTEE MEETING

NDMO Emergency Operation Center

26 September, 2013

1.0 Present

Attached List.

2.0 Welcome

The Chairperson, Director National Disaster Management Office (NDMO), Mr. Loti Yates, welcomed the members of the meeting and extended a very warm welcome to the JICA Terminal Evaluation Team for Solomon for availing himself to be at the meeting.

3.0 Opening Address

Mr. Usui, the JICA Resident Representative for Solomon noted that the meeting was indeed a good opportunity to discuss the progress of the SCBDRM project in Solomon. He further noted that natural disasters such as Tropical Cyclone, Flooding, Tsunami and so on, may occur anywhere at any time, just remembering Temotu Earthquake and Tsunami early this year. So we must be prepared for disasters.

4.0 Presentation on the Progress and Output of Each Task in 4th Year Phase

In his presentation, Mr. Jonathan Tafiariki, Deputy Director (NDMO), addressed the progress and output of the SCBDRM covering the phases and the 3 tasks completed in the project.

5.0 Report and Recommendation for JICA Terminal Evaluation Survey

5.1 Ms. Doi of the Evaluation Team explained the evaluation result and the following main recommendations were made for the central Government / NDMO

6.3 Mr. Jack of WRD requested the workshop arrangement on the assembling of simplified warning equipment in Solomon Islands as held at Nadi International Workshop under the Project.

Mr. Yonebayashi expressed that Solomon side shall discuss with Mr. Kameyama on this matter.

7.0 Closing

Mr. Yonebayashi mentioned that the preparedness is very important key against the disaster risk management. If you pay one dollar for the preparedness, the benefit is worth of seven dollars for actual disaster reduction. The disaster is our business. The United Nation, Disaster Meeting 2015 is planned to be held in the northern Japan.

Mr. Loti of the NDMO Director thanked to JICA Terminal Evaluation Team, JICA Representative of Honiara, Japan Embassy and JICA Experts for three years support to the community based disaster risk management project implementation.

Honiara, September 26, 2013

Mr. Tsutomu KAMEYAMA

Chief Advisor

The Expert Team

Japan

Mr. Loti Yates

Director

National Disaster Management Office

Ministry of Environment, Climate Change, Disaster Management and Meteorology

The Solomon Islands

添付資料 7：終了時評価報告書

Attachment 1

Terminal Evaluation Report

Japanese Technical Cooperation

For

The Strengthening Community-based Disaster Risk Management Project

In the Pacific Region

(The Solomon Islands)

September 26, 2013
Terminal Evaluation Team

Abbreviation

C/P	Counterpart
DRM	Disaster Risk Management
HFA	Hyogo Framework for Action
HR Radio	High Frequency Radio
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
M/M	Minutes of Meetings
NDC	National Disaster Council
NDMO	National Disaster Management Office
NEOC	National Emergency Operation Center
OECD-DAC	Organization for Economic Co-operation and Development – Development Assistance Committee
PCM	Project Cycle Management
PDM	Project Design Matrix
PDC	Provincial Disaster Committee
PDO	Provincial Disaster Officer
PHRD	Policy and Human Resource Development Fund
PO	Plan of Operation
R/D	Record of Discussion
SBD	Solomon Islands Dollar
SIBC	Solomon Islands Broadcasting Corporation
SIMS	Solomon Islands Meteorological Service
SOPAC	South Pacific Applied Geoscience Commission
SOPs	Standard Operational Procedures
TF	Task Force
UNDP	United Nations Development Program
VDRC	Village Disaster Risk Committee
WB	World Bank
WRD	Water Resource Division

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Chapter 1: Outlines of the Terminal Evaluation

1.1 Background

Due to geographical and topographical factors, the Pacific region is prone to natural disasters such as cyclones, earthquakes, tsunami and volcanic eruptions, etc. It is also vulnerable to the effects of rising sea levels and abnormal weather conditions caused by climate change. Furthermore, because countries are dispersed over wide areas, implying that transport and telecommunication links are insufficient not only between cities and villages on the same islands but also between main islands and outer island groups, information concerning weather, earthquakes, tsunami and other disasters is not properly or accurately conveyed to the residents and emergency relief efforts are hampered. Accordingly, there is a growing interest in and need for community-based disaster countermeasures.

Solomon Islands are composed of six main islands and approximately one thousand islands. More than 90% of the total population of about 507,000 are living in the coastal areas and near the estuary of rivers. Therefore, they are still vulnerable to the disasters such as tsunami, high tide and flood, etc. Disasters by cyclones or floods are predominant in the eastern half of the Solomon islands.

National Disaster Management Plan for the Solomon Islands was first formulated in 1980 and the revised Plan was approved in 2009 through the Cabinet of the Solomon Islands. The National Disaster Management Office (NDMO) of the Solomon Islands is responsible for issuing the warnings and taking emergency response measures during disaster events. The telecommunication infrastructure such as a radio network is not well developed and human resources are also insufficient. In addition, guidelines and manuals for disaster responses are yet to be prepared, and disaster information and warnings issued to the local residents in the community and the collaboration among the disaster related agencies are still insufficient. Capacities of the Meteorological Service and the Water Resources Division in data observation and analysis are not fully developed particularly in terms of rainfall analysis and flood forecasting, due to the lack of equipment and human resources.

On the community level, it is impossible to obtain pertinent evacuation information due to the lack of evacuation routes and evacuation centers and poor means of transmitting warnings, and such conditions hamper the safe and timely evacuation of residents.

It was under such circumstances that the Government of the Solomon Islands issued a request to the Government of Japan pertaining to the Strengthening of Community-based Disaster Risk Management Project in the Pacific Region. In response to this, the Government of Japan consigned JICA to implement a detailed plan formulation study from March to April 2010, to reach an agreement on the Project contents with the Government of the Solomon Islands. The R/D was signed on 23 July 2010.

1.2 Objectives of the Terminal Evaluation

The objectives of the Terminal Evaluation are to:

1) confirm the actual inputs and activities, implementation process, the degree of the achievements of the outputs, and the prospects of achieving the project purpose and overall goal according to the Project Design Matrix (PDM);
2) assess the Project from the five evaluation criteria - Relevance, Effectiveness, Efficiency, Impact, and Sustainability – based on the JICA's guideline for project evaluation; and

3) make recommendations on the measures to be taken during and beyond the remaining project period in consultation with agencies concerned, and draw lessons learned for similar technical cooperation projects in future.

1.3 Members of the Evaluation Team

The members of Terminal Evaluation Team are as follows:

Name	Position	Title
Mr. Norihito YONEBAYASHI	Leader	Director, Disaster Management Division II, Global Environmental Department, JICA
Ms. Yuriko DOI	Survey Planning	Disaster Management Division II, Global Environmental Department, JICA
Mr. Hiroyuki OKUDA	Evaluation and Analysis	Tekizaitekisho, LLC

1.4 Schedule of the Mission

The Schedule of the mission is attached as Annex-3.

1.5 Outline of the Project

According to the PDM Ver.2, the outline of the project is as follows (Annex 1 and 2);

(Overall Goal)

A system in which the residents of the area(s) other than selected community (village or settlement) is (are) able to evacuate appropriately is enhanced.

(Project Purpose)

A system in which the residents of the selected community (village or settlement) area(s) is(are) able to evacuate appropriately is established.

(Output)

1. A flood warning system is in place and appropriately managed by the NDMO in cooperation with the Met Service and Water Resources Division, and the target community/residents understand and respond accordingly.
2. NDMO's disaster management capacity is developed.
3. The target community's awareness on disaster preparedness is enhanced.

(Target Area)

Tamboko, Guadalcanal Province

(Project Term)

October 2010 – September 2013 (three years)

(Target Group)

- NDMO (National Disaster Management Office) , Ministry of Environment, Climate Change, Disaster Management and Meteorology
- SIMS (Solomon Islands Meteorology Service), Ministry of Environment, Climate Change, Disaster Management and Meteorology
- WRD (Water Resources Division), Ministry of Mines, Energy and Rural Electrification
- Community Residents in Tamboko

1.6 Methodology of the Terminal Evaluation

The Terminal Evaluation is carried out in accordance with "the JICA New Guideline for Project Evaluation, Ver. 1 (June 2010)", which mainly follows "the Principles for Evaluation of Development Assistance, 1991" issued by OECD-DAC. The Project Design Matrix Ver.2 which was revised at the JCC meeting in October 2011 is used as the basic reference point for the review.

As a framework to collect relevant data and information as prescribed in the JICA guideline, two types of grid – Result Grid and Evaluation Grid – were prepared in reference to reports and documents on the Project. Japanese Expert Team provided information and data for the Result Grid, and Solomon counterparts were requested to fill out a questionnaire developed based on the Evaluation Grid. During the stay, the mission team interviewed those who had been involved in the Project, and findings and information from reports, interviews, questionnaire survey and site visits were collected and analyzed in the grids. The Team confirmed the achievements, assessed the Project based on the five criteria, made recommendations, and drew lessons learned. (Annex 3 and Annex 4)

The criteria used for the evaluation are the following five criteria: relevance, effectiveness, efficiency, impact and sustainability.

Relevance	Relevance is reviewed by the validity of the Project Purpose and Overall Goal in light of Solomon's development policies and needs as well as Japanese cooperation policy.
Effectiveness	Effectiveness is assessed to what extent the Project has achieved its Project Purpose, clarifying the relationship between the Project Purpose and Outputs.
Efficiency	Efficiency is analyzed with emphasis on the relationship between Outputs and Inputs in terms of timing, quality, and quantity.
Impact	Impact examines direct effects extended by the Project, mainly the advancement towards achieving the Overall Goal. The analysis also includes positive/negative and expected/unexpected influence caused by the Project.
Sustainability	Prospect of sustainability is analyzed from institutional, financial, technical, and human resource viewpoints by examining the extent to which the achievements of the Project will be sustained after the Project is completed.

Chapter 2: Achievements of the Project

2.1 Results of Inputs

(Japanese side)

1) Dispatch of Experts

The Project started with the two short-term experts (Chief Advisor, Hydrologist / Runoff analysis) dispatched to Fiji in October 2010. Since then, total seven short-term experts (Chief Advisor, 2 for Hydrologist / Runoff Analysis, Regional Disaster Management Planning, 2 for Early Warning System, Community Disaster Management) have been dispatched for the Project. One long-term expert (Community-based Disaster Management / Evacuation Plan/Drill / Project Coordinator) has been based in Solomon since November 2010. The Project also has hired local staff. (Annex 5)

2) Provision of equipment

Equipment such as automatic rain gauges and water level gauge, hand siren, solar panels were procured to be used at the pilot site. Simplified rainfall gauges and water level gauges established at Turarana, Rate, New Birao and Selwyn were assembled by the counterpart at the workshop organized for that purpose on 28-30 September 2011 in Fiji. (Annex 6)

3) Trainings in Japan

Counterpart training was conducted in Japan in 2011 and 2012, total four courses, with the participation of 20 counterparts from both Solomon and Fiji. The courses were Hydrology and Hydraulic Couse, Regional and Community Disaster Prevention Course, High Official Training, and Strengthening Community-Based Disaster Risk Management Training. (Annex 7)

4) Local Cost

Japanese side has provided a part of necessary local operation budget to carry out project activities. The expenses include rental fee, consumable supplies, local training, travel & transportation and miscellaneous, totaling 1.8 million SBD from October 2010 to the present. (Annex 9)

(Solomon side)

1) Assignment of counterpart

According to the signed R/D, the director of NDMO is the Project Director responsible for administration and implementation; Guadalcanal Provincial Disaster Officer, NDMO, is the Project Manager responsible for managerial matters; and Directors of SIMS and WRD are Co-Project Managers responsible for technical matters of the Project. (Annex 8)

2) Counterpart Budget

The budget amount of counterpart agencies (NDMO, SIMS, WRD) used for implementing project activities were not clarified during the terminal evaluation as the expenditure for the purpose had not been separately recorded at the agencies. (Annex 9)

2.2 Project Progress

Project activities have been implemented targeting one pilot village. Achievements and progress of the Project are examined in detail in the Result Grid 1 – Progress at Activity Level (Annex 10) and Result Grid 2 – Achievement of Indicator (Annex 11)

1) Output 1

- Hydrological equipment (simplified/automatic water level gauge and simplified/automatic rainfall gauge) was set up at Tamboko village along Umasani River in August 2011. Based on the hydrological measurement, the annual report on hydrological observation in Umasani River was issued by WRD in 2011 and 2012. A letter of consent on quarterly hydrological data exchange between SIMS and WRD was signed on 1 August 2012 (Indicator 1-4)
- The simplified water level gauge also functions as an early warning system, capable of issuing an alarm based on a set standard of flood water level in Umasani River. During the heavy rain in January 2012, the alarm went off and the villagers understood and responded accordingly. (Indicator 1-1, 1-4)
- Simplified rainfall and water level gauges were assembled by the counterpart at the workshop on 28-30 September 2011 in Fiji. The assembled equipment was installed at areas other than the pilot sites, namely, Turarana, Rate, New Birao and Selwyn, in July and November 2012.
- Inspection and maintenance of installed water level gauges and rainfall gauges are constantly conducted by WRD along with NDMO, Japanese experts and villagers. (Indicator 1-3)
- NDMO is responsible for issuing a national warning for Tsunami (recent warnings were in July 2012 and February 2013) and a flood precautionary safety message for flood (recent messages were in December 2012 and March 2013). NDMO is not capable of issuing a national warning for flood at present. HF radio at Tamboko village at the clinic is not operational, but through SIBC radio, villagers receive tbese public warning/message. (Indicator 1-5)
- Various manuals were developed in activities for Output 1 mainly for the use of WRD: Runoff Analysis Manual, Hydraulic Analysis Manual, Establishing Flood Warning Standard Manual, Manual of Assembling Hydrological Equipment for Community-based Flood Warning, and Manual of Maintenance Work for Simplified Gauges.

2) Output 2

- Guadalcanal Province Flood Disaster Management Plan was developed in 2012 and revised in 2013. At present, appendix including disaster management resources such as facility list and contact list are being prepared and plans to be completed in October 2013. The Plan was already endorsed by the Provincial Secretary of Guadalcanal, and used for reference and for checking up information. Then, the Plan will be approved by the Provincial Disaster Committee. (Indicator 2-1)
- Sectoral standard operational procedures for disaster risk management were drafted, through participatory consulting process of wide range of stakeholders, at Guadalcanal Province Education Department, Guadalcanal Health and Medical Services, and Guadalcanal Province Agriculture Extension. The SOP is yet to be endorsed by the Provincial Secretary of Guadalcanal, upon which the SOPs will become official documents. In the course of developing these documents, the Operation Manual for Flood Disaster management in Guadalcanal Province was prepared. (Indicator 2-1)
- NDMO has conducted simulation exercise in 2011 and 2012 along with relevant stakeholders. SOP of

Education Department and Health & Medical Services were tested in the simulation exercise in 2012. (Indicator 2-2)

- International workshop has been so far held 4 times to share good practices and information obtained from project activities between Fiji and Solomon and among other donors. The international workshop scheduled on 27 February 2013 in Honiara was canceled due to an earthquake occurred on 6 February 2013 in Temotsu Province. (Indicator 2-3)
- At present, the appendix of the Guadalcanal Province Flood Disaster Management Plan are being finalized, which includes disaster management resources such as facility list and contact list. Once this is completed and accepted, the Plan will be disseminated to relevant stakeholders and other provinces in October 2013. (Indicator 2-4)

3) Output 3

- VDRC (Village Disaster Risk Committee), consisting of 19 villagers, was established at Tamboko village in July 2011. The meeting of VDRC has since been held 9 times, including the preparation and revision of evacuation plan. Guidebook for Village Disaster Risk Management was developed by November 2012, which later encompasses manual for tbe simplified rainfall gauge, manual for the simplified water level gauge, and Tamboko village disaster risk plan. (Indicator 3-1)
- 1st evacuation drill was conducted at Tamboko village on 23 October 2011 with the participants of more than 150 people (household of Tamboko village is 157 according to a survey in 2009). 2nd evacuation drill was conducted on 23 September 2013 with the participation of 430 people (population of Tamboko village is 696 according to a government statistics in 2012). The Director of NDMO stopped by Tamboko Village during the evacuation drill. (Indicator 3-2)
- The simplified gauges and laud hailer in Tamboko village has been checked many times by WRD, villagers, NDMO, and experts based on a plan or on various occasions. (Indicator 3-3)
- An event of village walkabout as community disaster risk management activities was organized on 2 March 2011 with the participation of 9 VDRC member and more than 40 villagers. Support to develop a hazard map has been provided by the Project (such as the Guidebook and VDRC meetings) and a safety map is expected to be developed with the initiative of VDRC (Indicator 3-4)

4) Achievement of Output Indicators

The Project has so far delivered three outputs as summarized above. Based on the set indicators, the Project has achieved about half of its output level indicators as of September 2013. Some of "Partially Achieved" indicators mean the planned events (such as a simulation exercise and an international workshop) have not taken place in 2013 as yet as they are scheduled in September and October 2013. (Annex 11)

No	Indicator	Assessment
1-1	Annual Report on Hydrological Observation in Umasani River issued by Water Resource Division.	Achieved
1-2	Number of validation calculation for the formulated flood forecast models (2 times per year)	Achieved
1-3	Number of inspection and maintenance of the installed Rainfall gauge and Water Level Gauge (more than 6 times per gauge per year)	Partially Achieved (Not in 2013 as yet)
1-4	Established Warning Standard.	Achieved
1-5	Number of radio contact with Tamboko village through HF Radio (the same number of the National Warnings)	Not Achieved
2-1	Number of meetings for formulating or revising the Provincial Disaster Management Plan of	Achieved

	Guadalcanal (2 times per year)	
2-2	Number of the simulation exercise conducted by NDMO (1 times per year)	Partially Achieved (Not in 2013 as yet)
2-3	Number of workshops or seminars to share good practices and information with both countries and other donor agencies (2 times per year)	Partially Achieved (Not in 2013 as yet)
2-4	The Provincial/Community Disaster Management Plan formulated by NDMO for other area	Not Achieved
3-1	Number of the Community Disaster Committee meetings for revising the Evacuation Plan (more than 2 times per year)	Achieved
3-2	The participation rate of the target community residents for the Evacuation Drill (more than 1 person from each household)	Partially Achieved
3-3	Number of inspection and maintenance of the Simplified Rainfall Gauges and Water Level Gauges in cooperation with Water Resource Division or Guadalcanal Province (more than 3 times per gauge per year)	Achieved
3-4	Number of the community activities, such as village walkabout, evacuation drill and hazard mapping, conducted by NDMO/PDO for the target community (more than 1 time per year)	Achieved

2.3 Prospect of Achieving the Project Purpose

1) Progress towards Project Purpose

The project purpose is "A system in which the residents of the selected community (village or settlement) area(s) is (are) able to evacuate appropriately is established." By now, a flood warning system has been in place at the target village and it has been appropriately inspected and maintained by WRD. The target community's awareness on disaster preparedness is enhanced with the establishment of VDRC, the installation of hydrological equipment, and the practice of evacuation drill. Relevant stakeholders' disaster management capacity is increased with various trainings and the preparation of provincial disaster management plan and sectoral disaster SOP. As such, it can be concluded that the project has reasonably attained the Project Purpose even though the Indicators have not been fully achieved as below.

2) Achievement of Project Purpose Indicator

According to the set indicators, the Project has achieved one indicator and partially achieved the other. (Annex 11) The project has conducted two evacuation drills (on 23 October 2011, 22 September 2013) so far, and the last evacuation drill was participated by about 62% of villagers (430 people the population of 696).

No	Indicator	Assessment
1	Percentage of the residents who take on the behavior of evacuation when the warnings are issued (80%)	Partially Achieved (at most 62% at an evacuation drill)
2	Cases that residents of selected community have evacuation drills in cooperation with NDMO.	Achieved

2.4 Progress towards the Overall Goal

The Overall Goal is "A system in which the residents of the area(s) other than selected community (village or settlement) is (are) able to evacuate appropriately in enhanced. Since November 2012, the project has set up the same early flood warning system at Turarana, Rate, New Birao and Selwyn, other than the target community (Tamboko), but no evacuation drill have been conducted. Also, NDMO, with its own initiative, held a workshop at Masi village in Moli Ward, Guadalcanal, on 5-8 June 2012 to develop a village disaster response plan, safety map and disaster meetings, based on the practice at Tamboko village. This was, however, a one-time event. As such, the progress towards the Overall Goal, efforts of replicating project activities in other communities, so far has been very limited.

2.5 Implementation Process

According to the signed R/D, Director of NDMO is the Project Director, and Guadalcanal Provincial Disaster Officer of NDMO is the Project Manager. Directors of SIMS and WRD are Co-Project Managers responsible for technical matters of the Project. Counterparts are mainly from NDMO, WRD, SIMS, and Guadalcanal Provincial Government, along with a fair representation of wide range of stakeholders such as Ministry of Education & Human Resources Development, Ministry of Infrastructure & Development, Ministry of Police and Justice, Ministry of Health & Medical Services, Roman Catholic Church, World Bank, UNDP, Red Cross and Honiara City Council. All counterparts are divided into three task forces; Task Force 1 to work for Output 1, Task Force 2 for Output 2, and Task Force 3 for Output 3, respectively. NDMO in Honiara has provided the office space and facilities for the Project.

Chapter 3: Review by the Five Criteria

3.1 Relevance

The relevance remains high.

1) The relevance of the Project to Solomon's development policies associated with disaster management has been high since the beginning of the cooperation. There are no changes on the National Disaster Risk Management Plan revised in 2009, which provides for the establishment of institutional arrangements of the Solomon Islands Government to address disaster risk management. This includes the establishment of Provincial Disaster Committee and Village/Ward Disaster Risk Committee, the preparation of SOP's or Local Disaster Management Plan, the role of Provincial Disaster Officer, and the function of Provincial Emergency Operation Centre. The Project is contributing to the realization of some of such institutional arrangements stated in the National Disaster Risk Management Plan through its activities with the pilot site and the Guadalcanal Provincial Government.
2) The Project continues to meet the needs/expectation of implementing agencies as well as the residents of target village. NDMO's corporate plan 2010-2015 states one of its core functions as coordinating, supporting and monitoring the planning and arrangements for disaster risk management at provincial and community level. Staff of NDMO as well as WRD and SIMS indicates that the activities of the Project are in line with their duty and responsibility, thus supporting their daily tasks and assignment. The pilot village, Tamboko, has repeatedly experienced flood events as recently as 30 January 2012 when the alarm installed by the Project went off and the villagers responded accordingly. The selection of the pilot villages is still regarded very appropriate as the village remains not only prone to flood events, but also organized and cooperative to the Project.
3) The Project is aligned with the Japan's ODA policy. At the United Nations World Conference on Disaster Reduction in January 2005, Kobe, Japan stated its commitment to play an active role in promoting measures for natural disaster risk reduction through ODA. In accordance with the Hyogo Framework of Action (2005-2015) which was adopted at the conference, the development and strengthening of institutions and capacities at all levels for disaster risk management, in particular at the community level, is one of prioritized areas for Japan's developmental cooperation towards the Solomon Islands.

3.2 Effectiveness

The effectiveness of the Project is high.

1) The Project has attained the Project Purpose as summarized in the section "Progress towards Project Purpose". The 2nd evacuation drill at Tamboko village on 22 September 2013 was participated by 62 percent of villagers. According to the set indicators for the Project Purpose, the Project has achieved one indicator and partially achieved the other.
2) There are two output level indictors that will not be achieved during the project cooperation period: indicator 1-5) number of radio contact with Tamboko village through HF radio (the same number of the national warning), and indicator 2-4) the provincial/community disaster management Plan formulated by NDMO for other areas. Regarding the indicator 1-5, NDMO doesn't directly contact Tamboko village through HR radio, and the HR radio at Tamboko village at the clinic is not operational, either. Villagers, however, are able to receive the national warning and flood precautionary safety message through SIBC radio. Tamboko village is not in the coverage area of mobile phone network. As for the indicator 2-4, the Guadalcanal Province Flood Disaster Management Plan, and the Tamboko Village Disaster Risk Plan was formulated for the target province and village in the Project, but the extension and replication of such activities for other areas have not started as yet. The indicator 2-4 is more appropriate as an indicator for the Overall Goal.
3) Remarkable capacity development by the Project is indicated by various counterparts. The purpose of the project is the strengthening of community-based disaster risk management, in recognition of the fact that capacity of supporting agencies are limited and infrastructure is still underdeveloped such as roads, telecommunication, radio network and internet. NDMO acknowledges the community early flood warning system installed by the Project at the Tamboko village is the first of its kind in the country. Sectoral disaster SOPs prepared by the Project for supporting agencies, namely Guadalcanal Province Education Department, Guadalcanal Health and Medical Services, and Guadalcanal Province Agriculture Extension, are also the first disaster SOPs in each sector. The SOPs describe the role and operation of respective organization in case of disaster events.
4) The flood early warning system installed at Tamboko village worked as expected on 30 January 2012 while a few weeks of heavy rain due to a tropical depression was flooding Umasani River. Simplified water level gauges at Zone 1 and Zone 5 set off an alert when river water reached the warning level. Evacuation didn't take place as water didn't come up to the level of next action. This event was taken up in a newspaper, Solomon Star, on 14 February 2012.
5) The inspection and maintenance of installed equipment has been constantly conducted primarily by WRD in cooperation with NDMO, JICA experts and VDRC. Several manuals such as Runoff Analysis Manual, Establishing of Flood Warning Standards Manual, and Manual of Maintenance Work for Simplified Gauges were developed by the Project. WRD owns these manuals as well as a simplified version of maintenance manual to make it more user-friendly in the field. Shared responsibility for the maintenance of equipment and facilities installed at the pilot site was agreed at the JCC meeting in October 2011 among NDMO, SIMS and WRD. Also, a letter of consent on quarterly hydrological data exchange between SIMS and WRD was signed on 1 August 2012.
6) It is noted that extra efforts and measures are necessary to prevent the hydrological equipment from being broken by villagers. The simplified rainfall gauge at Zone 5 of Tamboko village is at present temporarily taken off because its pole was hit and destroyed by a truck driven by a drunker. The water level gauge installed at Turarana was broken by a drunker in May 2013, and this was cut off and pulled out in July 2013 for a fun. Activities to raise

awareness of villagers, especially of young people, on disaster management and the importance of hydrological observation are suggested by WRD.

7) Coordination of Japanese cooperation scheme is observed which has helped the Project achieve the Project Purpose. Financed by the grass-root grant of Japanese embassy, the construction of a community hall is ongoing at Tamboko village since April 2013. This community hall with two stories will function as an evacuation place in case of flood events, and hence the construction is identified as a promoting factor for the Project in that this encourages villagers to actively participate in disaster activities such as VDRC meetings and evacuation drill. Tamboko village was selected as the pilot site taking into consideration that the village had been a pilot site for JICA's technical cooperation project on malaria prevention. Tamboko village has been organized and cooperative, assumedly because of its experience working with JICA before.

3.3 Efficiency

The efficiency of the Project is medium.

1) The purpose and activities of the Project are well understood among those who are participated in the Project, and inputs of experts are appreciated by counterparts. The communication between experts and counterparts are good in general. The JCC meeting has been so far held twice, on 2 March 2011 and 28 October 2011, chaired by the undersecretary of Ministry of Environment, Climate Change, Disaster Management and Meteorology.
2) Some participants, due to what they have learned in the training in Japan, are motivated to be actively involved in project activities on community-based disaster risk management since they were back in the country. The training in Japan is also indicated effective in that the participants not only learned the practice in Japan but also learned from each other, among those from both Fiji and Solomon.
3) The workshop for the counterpart to assemble the simplified rainfall gauge and water level gauge by themselves on 28-30 September 2011 is noteworthy as unique and effective. These handmade gauges were actually installed at Turarana, Rate, New Birao, and Selwyn in July and November 2012 and used for hydrological observation. It was mentioned by a counterpart that the technology brought by the Project was simple and cost-efficient, yet very effective.
4) The earthquake and tsunami occurred in Temotsu Province on 6 February 2013 was repeatedly mentioned as a factor affecting project activities by counterparts. While dealing with the disaster, NDMO managed to accommodate the schedule of project activities as experts were in Solomon, but upon a request from NDMO, the Project had to cancel the International Workshop in Honiara scheduled on 27 Feb 2013, and the evacuation drill at Tamboko village scheduled on 28 Feb 2013.
5) Limitation on transport is indicated by both NDMO and WRD as a major constraint for efficient project activities. Both agencies have only two vehicles, which cannot always be used by counterpart for project activities. When counterparts go to the pilot site for meetings/events as well as conducting the maintenance of equipment, the Project has hired a vehicle. If the Project did not supply a vehicle, it was not east to visit sites by themselves.
6) The evaluation mission during its first stay in Solomon Islands from 9 to 16 August 2013 was not able to meet the Guadalcanal PDO (Provincial Disaster Officer), who is the Project Manager as agreed in the R/D. This evaluation will not be comprehensive without the Project Manager's input.

3.4 Impact

The impact of the project is limited in terms of the progress towards the Overall Goal, but there are some minor, but notable impacts.

1) The advancement towards the Overall Goal based on the achievements of the Project has not really been observed as yet although several activities are being undertaken by the Project and NDMO. Since November 2012, the project has set up the same early flood early warning system at Turarana, Rate, New Birao and Selwyn, other than the target community (Tamboko), but no evacuation drill have been conducted. Also, NDMO, with its own initiative, held a workshop at Masi village in Moli Ward, Guadalcanal, on 5-8 June 2012 to develop a village disaster response plan, safety map and disaster meetings, based on the practice at Tamboko village. This is, however, an isolated event.
2) Through project activities, related organization found the importance of outreach activities. WRD has visited communities more often than not for the data collection and maintenance of hydrological equipment. WRD has come to request the increase of staff and recurrent operational budget in recognition of the importance of flood data collection at river. NDMO also has come to request one officer for Community Based Disaster Reduction Management.
3) At present, a project of PHRD (Policy and Human Resource Development Fund) on community risk reduction is starting at NDMO. The project manager will be in the office next month and pilot sites are currently under selection. To the PHRD project, Director of NDMO recommended a "JICA model" – the combination of early warning system, VDRC and evacuation. Such recognition of NDMO is an impact the Project has generated based on its achievement. Some activities of the Project can be taken over and replicated by the PHRD project for other areas.
4) Through the activities of the Project, NDMO's function as coordinator is enhanced. Due to a contact from NDMO, stakeholders such as Oxfam visited Tamboko village during the evacuation drill conducted on 22 September 2013. And communication between WRD and SIMS is strengthened through the facilitation of NDMO.
5) Community-based activities brought significant change in People's mind set against flood.

3.5 Sustainability

The Prospect of sustainability is medium.

1) National and international policy environment is instrumental in promoting the community-based disaster risk management. The National Disaster Risk Management Plan is to be reviewed for revision every five years. Preparatory works for the next revision has already started this year, and NDMO intends to reflect the results of the Project in the revision. Cooperation among relevant agencies is gradually realized; for example, shared responsibility for the maintenance of equipment and facilities installed at the pilot site was verbally agreed at a meeting among NDMO, WRD, and SIMS. Developing a written document such as MOU or MOA, however, reflecting such working relationship will help ensure the continued cooperation
2) From technical viewpoint, equipment installed at Tamboko village is likely to be sustained with the efforts of WRD. The shortage of vehicle for visiting the equipment can be relieved this year as one vehicle which is now tied to a certain project will become available by the end of this year. The run-off model necessary for flood calculation

and forecast will also be managed and modified by WRD as observation data becomes available. Regarding the simplified rainfall/water level gauges, WRD is willing to go for the maintenance and provide technical assistance based on the request of NDMO. Furthermore, a new JOCV arrived on 5 August 2013, attached to the NEOC of NDMO, and a cooperation of activities with the JOCV can be considered for maintenance of equipment with WRD and VDRC. On the other hand, VDRC is expected to take a more active role in maintaining the equipment in future with the support of Guadalcanal PDO.

3) From the capacity of human resources viewpoint, the number of staff in NDMO is increasing. NDMO had 18 officials when the Project started, but now it bas 22; from 13 July 2013, Principal Operations Officer, a new permanent position at the NEOC of NDMO, started his duty to liaise with 10 PDOs. The NEOC is expecting another permanent staff next year. Besides, NEOC has the JOCV since August. Guadalcanal PDO is important in many aspects for project activities at the community level: a contact person for VDRC in case of equipment disorder and the revision of Village Disaster Risk Plan. With the new position of Principal Operation Officer, the communication between NDMO and PDO is expected to be improved. Also, it should be noted that WRD is also requesting an additional permanent staff on flood management.
4) Each organization is now preparing a budget plan for 2014, which will be submitted to the Ministry of Finance and Treasury, and approved by the parliament in November. From financial viewpoint, however, each organization implies there is little possibility to increase its budget to accommodate project activities despite their efforts. WRD, however, indicated that the Ministry of Finance and Treasury agreed a recurrent operation budget of WRD. The budget largely depends on the determination and prioritization of the Government for the community-based disaster risk management.
5) The approach which introduced by the Project, NDMO called JICA model, is noted as high reproducibility approach because of simplified method. It means that to introduce to the other communities by counterparts is possible.

Chapter 4 Results of Terminal Evaluation

4.1 Conclusion

The relevance of the Project remains high, contributing to the realization of National Disaster Risk Management Plan. The effectiveness of the Project is high as the Project is achieving the Project Purpose of strengthening the community-based disaster risk management at the pilot site. The efficiency of the Project is medium mainly because of the earthquake and tsunami occurred in February 2013 which affected the involvement of NDMO in planned project activities. The impact of the Project is limited at present as the advancement towards the Overall Goal based on the achievements of the Project has just recently started. The prospect of sustainability is rated medium as it depends on the determination and prioritization of the Government, including budget allocation, for the community-based disaster risk management.

4.2 Recommendations

1) Recommendations to NDMO are to:

(1) Complete the project activities as planned in PDM.

- Finalization of documents (such as Guadalcanal Province Disaster Management Plan, Operation Manual for Flood Disaster Management in Guadalcanal Province, SOPs) and their authorization through due processes.
- Completion of "partially achieved" indicators, i.e. the simulation exercise scheduled in October, the international workshops scheduled in October to share good practices.

(2) Hand over the hydrological equipment to WRD or prepare the MOU on the role/responsibility of NDMO, WRD and SIMS on the maintenance of hydrological equipment installed by the Project.

(3) Disseminate the practice of Project (Guadalcanal Provincial Disaster Management Plan, SOP for Flood Disaster Risk Management, Village Disaster Risk Plan, Evacuation Drill) to other areas as in the case of Masi village, Guadalcanal.

(4) Develop model of Community-Based activities for disaster management which based on the outputs of related projects.

(5) Provide necessary support to local governments for implementation of Community-Based disaster risk management activities.

(6) To make strengthening the cooperation with related ministries and stake holders.

(7) To utilize existing resources in ministries. For instance, it is desirable to involve the ministry in charge of communication infrastructure or liaise with such projects as the Project for the Improvement of Radio Broadcasting Network Administration of Disaster Prevention in Solomon Islands to establish emergency communication network in Nationwide.

2) Recommendations to WRD are to:

(1) Organize a technical workshop for the maintenance of simplified rainfall/water level gauges for dissemination of knowledge and skills.

(2) Consider to utilize the Group Training in Japan in the area of disaster risk management and the management of water resources.

(3) Discuss with NDMO and SIMS about the shared responsibility for maintenance of installed equipment, and agree in a MOU.

(4) Utilize experiences and skills on the flood calculation and the warning standard establishment for other river basins.

3) Recommendations to SIMS are to:

(1) Improve the system to share flood forecast data with WRD and NDMO, utilizing the weather transmitter installed by the Project.

4) Recommendations to local governments are to:

(1) Guadalcanal Provincial Government shall visit communities for promoting activities of community-based disaster risk management.

(2)Guadalcanal Provincial Government shall maintain and revise the documents developed in the Project (i.e. Guadalcanal Province Flood Disaster Management Plan, SOPs)

(3) Guadalcanal Provincial Government shall Share the practice and experience of the Project in the existing structure of the Guadalcanal Provincial Government such as in the Provincial Disaster Committee.

(4)To involve ministries especially the Ministry of Education for disaster risk management activities. Because Ministry of Education has delivery systems to the grounds and disaster risk awareness is important for primary pupils.

4.3 Lessons Learned

1) Although in the same pacific region, Solomon Island and Fiji are different in many respects such as economy, infrastructure, society, culture and capacity. Targeting two countries as a regional project does not necessarily lead to the efficient implementation of project activities. On the other hand, from a beneficiary viewpoint, targeting two countries can provide them with an opportunity to learn from each other.
2) Lessons learned should be compiled and shared at the last international workshop in October 2013 when all project activities are completed.

Annex 1: Project Design Matrix (PDM) Ver.2

Project Title : The Strengthening Community-based Disaster Risk Management Project (Solomon Island) Date:27 October 2011
Target Area : Tamboko, Guadalcanal Province **Project Term** : October 2010 - September 2013 (three years)
Target Group : NDMO, Ministry of Environment, Climate Change, Disaster Management and Meteorology;
Meteorology Service, Ministry of Environment, Climate Change, Disaster Management and Meteorology;
Water Resources Division, Ministry of Mines, Energy and Rural Electrification and Community Residents in Tamboko

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal A system in which the residents of the area(s) other than selected community (village or settlement) is (are) able to evacuate appropriately is enhanced.	Cases that the residents of the area(s) other than selected community have evacuation drills in cooperation with NDMO	NDMO Reports or newspaper articles on these cases	
Project Purpose A system in which the residents of the selected community (village or settlement) area(s) is (are) able to evacuate appropriately is established.	1) Percentage of the residents who take on the behavior of evacuation when the warnings are issued (80%). 2) Cases that residents of selected community have evacuation drills in cooperation with NDMO.	1) Project Reports or Assessment results on these cases 2) Project Report	1. The policy in line with the National Disaster Council Act will be continued after the Project end. 2. NDMO will disseminate the system established in the Project to other areas.
Outputs 1. A flood warning system is in place and appropriately managed by the NDMO in cooperation with the Met Service and Water Resources Division, and the target community/ residents understood and respond accordingly. 2. NDMO's disaster management capacity is developed. 3. The target community's awareness on disaster preparedness is enhanced.	1-1. Annual Report on Hydrological Observation in Umasani River issued by Water Resource Division. 1-2. Number of validation calculation for the formulated flood forecast models (2 times per year) 1-3. Number of inspection and maintenance of the installed Rainfall gauge and Water Level Gauge (more than 6 times per gauge per year) 1-4. Established Warning Standard. 1-5. Number of radio contact with Tamboko village through HF Radio (the same number of the National Warnings) 2-1. Number of meetings for formulating or revising the Provincial Disaster Management Plan of Guadalcanal (2 times per year) 2-2. Number of the simulation exercise conducted by NDMO (1 times per year) 2-3. Number of workshops or seminars to share good practices and information with both countries and other donor agencies (2 times per year) 2-4. The Provincial Community Disaster Management Plan formulated by NDMO for other area 3-1. Number of the Community Disaster Committee meetings for revising the Evacuation Plan (more than 2 times per year) 3-2. The participation rate of the target community residents for the Evacuation Drill (more than 1 person from each household) 3-3. Number of inspection and maintenance of the Simplified Rainfall Gauges and Water Level Gauges in cooperation with Water Resource Division or Guadalcanal Province (more than 3 times per gauge per year) 3-4. Number of the community activities, such as village walkabout, evacuation drill and hazard mapping, conducted by NDMO/PDO for the target community	1-1. Project Report 1-2. Project Report 1-3. Project Report, Activity Record and Maintenance Manual 1-4. Project Report 1-5. Project Report and Situation Report 2-1. Project Report, Provincial Disaster Plan and Manual 2-2. Project Report and Manual for simulation exercise 2-3. Project Report and Activity Report 2-4. Provincial/Community Disaster Management Plan 3-1. Project Report, Evacuation Plan and Activity Record 3-2. Project Report and Activity Record 3-3. Maintenance Manual and Maintenance Record 3-4. Project Report and Activity Record	NDMO continues to have commitment in the Project activities in terms of budget allocation and personnel assignment.

	(more than 1 time per year)		
Activities 1-1. To develop flood forecasting capacity of Meteorological Service and Water Resources Division 1-1-1. To strengthen the capacity to collect flood forecast data. 1-1-2. To strengthen the capacity to forecast flood (including run-off analysis), conduct training for the related personnel. 1-2. To strengthen a system for issuing a flood warning 1-2-1. To establish credible flood warning standards. 1-2-2. To improve the system for sending flood forecast data from Met Service and Water Resources to NDMO. 1-2-3. To improve the system by which NDMO informs residents of warning information. 2-1. To strengthen the implementation system of community-based disaster management plans for the target community 2-1-1. To prepare community-based disaster management plans for the target community (including plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills) 2-1-2. To prepare the manuals on conduct of the community-based disaster management plans established in activity 2-1-1. 2-1-3. To arrange workshops to strengthen the C/P organizations' capacity to operate the manuals established in activity 2-1-2. 2-1-4. To reflect any lessons learned from awareness program's activities to the manuals and the community-based disaster management plan. 2-2. To enhance relevant organizations' capacity of emergency response 2-2-1. To prepare the emergency response manuals for relevant organizations. 2-2-2. To do emergency simulation exercises in line with the emergency response manuals. 2-2-3. To share good practices gained from the activities with both countries. 2-2-4. To share good practices gained from the activities with other donors. 3-1. To implement the awareness program 3-1-1 To select the pilot site(s), community(ies). 3-1-2. To arrange workshops in line with the awareness program. 3-1-3. To conduct evacuation drills at the pilot site(s). 3-2. To assist residents at the pilot site(s) to conduct risk assessment (installation of simplified rain gauges and water gauges, preparation of hazard maps). 3-2-1. To support establishment of monitoring system for the installed rain gauge and water gauge maintained by the residents at the pilot site(s) 3-2-2. To support the residents in preparation of their own hazard maps.	**Inputs** **(Japanese side)** 1. Dispatch of the Japanese experts 1) Chief adviser (river disaster prevention, disaster management plan, strengthening of cooperation among the disaster-related organizations) 2) Run-off analysis (hydrology, hydraulics) 3) Regional disaster management plan / disaster simulation training 4) Early warning System (EWS) 5) Community-based disaster management/Evacuation drill and plan/Project Coordinator 2. Training in Japan Training fields: - disaster management plan - flood forecast - planning and conduct of evacuation drills 3. Expenses for printing hazard maps 4. Expenses for conducting awareness program, emergency simulation exercises and evacuation drills 5. Expenses for social survey 6. Supply of Equipment - Anemoscope - Automatic measurement unit for air temperature - Self-recording water-gauge - Self-recording rain-gauge - Simplified rain gauge - Simplified water gauge - Warning instrument - PC for flood forecast model - The other necessary equipment for the effective implementation of the Project	**(Solomon side)** 1. Assignment of counterpart personnel (C/P) 1) P/D 2) P/M 3) Necessary number of C/P 2. Provision of facility - Provision of office space for the Project in NDMO 3. Provision of necessary data - GIS data, etc. 4. Expenses for operation and maintenance of the Project office 5. Expenses for annual and daily allowances for the Fiji C/P 6. Others, if any	1. NDMO allocate necessary budget for the Project activities as planned. 2. Roles of the C/P organizations are not greatly changed. 3. The equipment supplied by the Project are properly maintained. And they are not lost or stolen. **Pre-conditions** 1. The target community residents cooperate with the Project. 2. Enough security for the Project team to appropriately implement the Project is ensured by all means.

Annex 2: Plan of Operation Ver.2

Activity	FY2010						FY2011												FY2012												FY2013					
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Output 1																																				
1.1.1 To strengthen the capacity to collect flood forecast data.										—							—						—												
To strengthen the capacity to forecast flood (including run-off analysis), conduct training for the related personnel.										—							—									—			—						
1.2.1 To establish credible flood warning standards.										—							—									—									
1.2.2 To improve the system for sending flood forecast data from Met Service and Water Resources to NDMO.										—												—				—		—	—	—					
1.2.3 To improve the system by which NDMO informs residents of warning information.										—							—					—				—		—	—	—					
Output 2																																				
2.1.1 To prepare community-based disaster management plans for the target community (including plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills)											—											—													
2.1.2 To prepare the manuals on conduct of the community-based disaster management plans established in activity 2-1-1.												—										—													
2.1.3 To arrange workshops to strengthen the C/P organizations' capacity to operate the manuals established in activity 2-1-2.														—									—												
2.1.4 To reflect any lessons learned from awareness program's activities to the manuals and the community-based disaster management plans.														—												—									
2.2.1 To prepare the emergency response manuals for relevant organizations.											—											—				—									
2.2.2 To do emergency simulation exercises in line with the emergency response manuals.												—														—									
2.2.3 To share good practices gained from the activities with both countries.													—													—									
2.2.4 To share good practices gained from the activities with other donors.														—												—									
Output 3																																				
3.1.1 To select the pilot site(s), community(ies).													—	—						—	—					—									
3.1.2 To arrange workshops in line with the awareness program.								—					—		—				—	—			—				—	—	—	—						
3.1.3 To conduct evacuation drills at the pilot site(s).								—		—		—			—								—		—	—									
3.2.1 To support establishment of monitoring system for the installed rain gauge and water gauge maintained by the residents at the pilot site(s)										—					—									—											
3.2.2 To support the residents in preparation of their own hazard maps.								—							—							—	—												
JCC Meeting (as project management activity)						○							○ Mid-term Review, 2nd JCC																						○ Terminal Evaluation		

Lines indicate actual operations of activities conducted with Japanese experts

Annex 3: Schedule of Evaluation Mission

No	Date		Leader	Survey Planning	Evaluation and Analysis
1st	Aug 8	Thu			11:10 Narita departure 21:15 Singapore departure
2nd	9	Fri			09:30 Brisbane → 13:45 Honiara arrival 15:30 Meeting at JICA Solomon Office
3rd	10	Sat			08:20 Tamboko Village Equipment Observation
4th	11	Sun			12:00 JICA Expert Meeting 14:20 Tamboko Village Hearing
5th	12	Mon			09:30 NDMO courtesy call 12:15 SIMS Interview
6th	13	Tue			10:20 Guadalcanal Provincial Government (Education) Interview 11:30 WRD Interview 15:30 JICA Expert Interview
7th	14	Wed			14:30 JICA Expert Interview 16:45 JICA Expert Interview
8th	15	Thu			13:20 Ministry of Rural Development Interview 14:20 Ministry of Police and Justice Interview 15:40 Guadalcanal Provincial Government (Health) Interview 17:15 Guadalcanal Provincial Government (Education) Interview
9th	16	Fri			10:00 NDMO Interview 16:20 NDMO Interview
10th	17	Sat			17:00 Solomon 1st draft completion
11th	18	Sun			10:00 JICA Expert Interview 14:10 Honiara → 18:10 Nadi
12th	19	Mon			09:30 Principal Administrator of BDO Courtesy Call 09:40 Assistant District Officer, BDO, Interview 11:00 Chief of Nawaqarua village Hearing 11:20 Chief of Nasolo village Hearing 11:55 National Fire Authority Interview 12:20 Former PA of BDO Interview
13th	20	Tue			08:00 FMS Interview 09:30 WAF Interview 11:25 Votua simplified rainfall/water level gauges observation 12:00 Nawaqarua equipment and community hall observation 13:30 Toge automatic rainfall/water level gauges observation
14th	21	Wed			09:20 CWD Interview（Lautoka） 18:00 Nadi → 18:30 Suva
15th	22	Thu			08:30 Meeting at JICA Fiji Office 09:30 NDMO Director Courtesy Call 10:10 NDMO Interview
16th	23	Fri			09:00 Fiji 1st draft completion 17:00 TV meeting with Evaluation Team
-	24	Sat			10:00 Suva → 10:30 Nadi 15:30 Nadi departure
-	Sep 12	Thu		Narita Departure	
-	13	Fri		Nadi arrival	
17th	14	Sat		Nawaqarua Evacuation Drill	
18th	15	Sun			18:50 Nadi arrival
19th	16	Mon		09:00 Hart Home Ba Interview	

				10:10 Former PA of BDO Interview 11:35 Ba Women's Forum Interview 12:40 Assistant District Officer, BDO, Interview 13:45 Ba Department of Woman Interview 15:00 Nawaqarua Household with Water Level Gauge 15:35 Nawaqarua Household with Rainfall Gauge	
20th	17	Tue		09:00 Director FMS courtesy call and interview 09:50 Hydrology Section FMS interview 13:50 Nasolo CDC member Interview 15:15 Nawaqarua CDC member Interview	
21th	18	Wed	08:35Arrival of the leader at Nadi 09:15 Ba site visit 12:30 Move to Suva		14:30 Nadi → 15:00 Suva
22th	19	Thu	09:00 Meeting at JICA office 10:00 NDMO Courtesy Call and Discussion 14:30 SOPAC discussion		
23th	20	Fri	09:00 Project Director Courtesy Call 10:00 JCC at NDMO, Suva 17:00 Suva → 17:30 Nadi		
24th	21	Sat	07:20 Nadi → Honiara 9:20 13:30 Selwyn Hearing		
25th	22	Sun	12:00 Evacuation Drill at Tamboko 13:00 Tamboko VDRC Hearing		
26th	23	Mon	10:00 JICA Solomon Office Meeting 11:00 Guadalcanal Provincial Government (Education) Interview 11:50 Ministry of Rural Development Interview 13:00 Water Resource Division Interview		
27th	24	Tue	10:00 NDMO Director Meeting and Discussion 13:00 SIMS Interview		15:00 Honiara departure
28	25	Wed	10:00 NDMO Evaluation Report Discussion		Narita arrival
-	26	Thu	10:00 Solomon JCC		
-	27	Fri	Honiara departure		
-	28	Sat	Narita arrival		

Annex 4: List of Interviewees

1	Solomon Side		
1)	Counterpart Organizations		
1	Mr. Joseph Tangi	School Inspector, Guadalcanal Provincial Office	8/10, 8/11,8/15,9/23
2	Mr. Jonathan Tafiariki	Deputy Director, NDMO	8/12,8/16
3	Mr. Lloyd Tahans	Deputy Director, SIMS	8/12,9/24
4	Mr. Joshua Leitavua	Chief Education Officer, Guadalcanal Provincial Office	8/13
5	Mr. Michael Maehaka	Senior Hydrologist, WRD	8/13
6	Mr. Jack Kaobata	Officer, WRD	8/13, 9/23
7	Mr. Isaac Lekelalu	Deputy Director, WRD	8/13
8	Mr William Okekini	Economic Growth Centre Specialist, Ministry of Rural Development (Former Ministry of Agriculture)	8/15,9/23
9	Mr George Paikai	Director, Emergency Management,Ministry of Police and Justice	8/15
10	Dr. John Paulsen	Health Director, Guadalcanal Provincial Government	8/15
11	Mr. George Baragamu	Chief National Operations Officer, National Emergency Operation Center, NDMO	8/16
12	Mr. Hotoravu Alenge	Principal Operations Officer, National Emergency Operation Center, NDMO	8/16
13	Mr. Steve Nasiu	Volunteer/Intend, NDMO	8/16
14	Mr. Sipuru Rove	Administration Officer, NDMO	8/16
15	Mr. Charlie Bepapa	Director, WRD	9/23
2)	Beneficiaries		
1	Mr.Lucovic Kaulake	Leader, Tamboko VDRC	8/11, 9/22
2	Mr. Charles Tada	Tamboko VDRC	8/11
3	Mr. Claypod Tovo	Tamboko VDRC	8/11
4	Mr. Ben Tovo	Tamboko VDRC	8/11
5	Mr. Colman Tomo	Villager, Tamboko	8/11
6	Mr. John Tuna	Villager, Tamboko	8/11
7	Mr. Luke Rade	Villager, Tamboko	8/11
8	Mr. Francis Pero	Villager, Tamboko	8/11
9	Mr. Renisio Kalebao	Villager, Tamboko	8/11
10	Mr. Iklson	Villager, Tamboko	8/11
11	Mr. Anisie Hautahi	Villager, Tamboko	8/11
12	Mr. Joseph Penele	Villager, Tamboko	8/11
13	Mr. Francis Conikiko	Villager, Tamboko	8/11
14	Mr. Alfred Tsui	Villager, Tamboko	8/11
15	Mr. Boniface Voulonga	Villager, Tamboko	8/11
16	Mr. Paul Solo	Villager, Tamboko	8/11
17	Mr. Bernard Oro	Villager, Tamboko	8/11
18	Mr. Marcel Toda	Villager, Tamboko	8/11
19	Ms. Angelica Lumukulo	Villager, Tamboko	8/11
20	Mr. Nelson Angisi	Villager, Tamboko	8/11
21	Mr. Fox	Principal, Selwyn	9/21
22	Mr. Philip	Head Master, Selwyn	9/21
23	Mr. Ben Misu	Villager, Tamboko (Zone 5)	9/22
24	Mr. Albert Tanimana	Tamboko VDRC	9/22
2	Japanese Side		
1)	Project		
1	Mr. Tsutomu Kameyama	Chief Advisor	8/9 - 23,9/21-29
2	Mr. Yoshitaka Yamazaki	Regional Disaster Managmenet Planning	8/10 -18
3	Mr. Masaaki Kanaya	Community Disaster Management / Project Coordinator	8/11 - 18,9/22-29
4	Mr. Tomohiro Umeki	Hydrologist, Runoff Analysis	9/22 – 29
2)	JICA Office		
1	Mr. Taiji Usui	Resident Representative	8/9,9/23
2	Ms. Naoko Laka	Project Formulation Advisor	9/23

Annex 5: Dispatch of Japanese Experts

As of September 2013

Name		Duration in Solomon (days of stay)							Total Days
		1st FY year Oct 2010	– Mar 2011	2nd FY year Apr 2011	– Mar 2012	3rd FY year Apr 2012	– Mar 2013	4th FY year Apr 2013 –	
		1st	2nd	1st (3rd)	2nd (4th)	1st (3rd)	2nd (4th)	1st (2nd)	
Tsutomu KAMEYAMA	Chief Advisor	Fiji only	2011/2/12-3/15 (32)	2011/7/12 – 7/19 (8)	2011/10/22-11/4 (14)	2012/7/21-7/29 (9)	Fiji only	2013/7/2-7/5 (4)	(110)
				Fiji only	2012/2/18-3/4 (16)	2012/11/6-11/13 (8)	Fiji only	2013/8/8-8/17 (10) 2013/9/21-9/29 (9)	
Tetsuhiro IMAGAWA	Hydrologist, Runoff Analysis I	2011/1/24-2/4 (12)		Fiji only		Fiji only	Fiji only		(12)
Yoshitaka YAMAZAKI	Regional Disaster Management Planning	2010/12/18-2011/3/16 (79)		2011/8/29-9/25 (28) 2011/10/1-10/23 (23)	Fiji only	2012/8/7-8/28 (22)	2012/11/25-12/18 (24)	2013/7/30-8/27 (29)	(205)
Tetsuo FUKUI	Early Warning System	2011/1/24-3/16 (52)							(52)
Kazumi TSUKADA	Early Warning System			2011/7/12-7/19 (8)	Fiji only	Fiji only	Fiji only	Fiji Only	(8)
Tomohiro UMEKI	Hydrologist, Runoff Analysis II	2011/1/29-3/14 (45)		2011/7/2-7/23 (22)	2011/8/16-8/27 (12)	2012/7/14-7/31 (18)	2012/11/1-11/26 (26)	2013/7/2-7/22 (21)	(208)
				2012/1/30-3/3 (34)		Fiji only		2013/9/21-9/29 (9)	
Masaaki KANAYA	Community Disaster Management / Project Coordination	2010/11/6						2013/10/25	3 years
Total									(595)

Local contract with the Project

Mrs. Yvonne Aitorea	Project Assistant	Feb 2011 – Dec 2012
Ms. Julia Garina'au	Project Assistant	Jan 2013 – Oct 2013
Mr. John Ani	Driver	Feb 2011 - Oct 2013

Annex 6: Provision of Equipment

As of Sep 2013

1) Provision of Equipment

No	Equipment	Specification and Manufacturer	Quantity	Total Price	Delivery Date	Handover	Location/Status
1	Automatic Rain Gauge (data logger, solar panel)	KOMATSU R1-502	1	USD965	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 6 and operated by WRD
2	Automatic W.L. Gauge (data logger, solar panel)	JTEKT TD8300(30m)	2	USD6,786	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 6 and operated by WRD. The other has not been installed and kept at WRD for necessary arrangement
3	Weather Transmitter	VAISARA Weather Transmitter WXT520, Data logger WL2250	1	JPY892,290	July 2011.	SIMS	Installed at Upper Air Observation Station, SIMS
4	Simple Warning Rain Gauge	TOYO ELECTRONICS	2	JPY100,000	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 2, Zone 5 (now temporarily stored at WRD)
5	Simple Warning Water Level Gauge	TOYO ELECTRONICS	2	JPY100,000	Bids conducted in January 2011. Delivered in July 2011.	NDMO	Installed at Tamboko Zone 1, Zone 5
6	Hand Siren	TEISHO:MODEL 5	1	JPY18,000	July 2011	NDMO	Handed over to Tamboko VDRC
7	Megaphone with Siren	NOBORU ELECTRIC:TS-613L	4	JPY86,400	July 2011	NDMO	Handed over to Tamboko VDRC
8	Desktop Computer	OPTX 380DT DC2.7/2/320/DVDRW/Win7	2	FJD3,390	December 2010	NDMO	NDMO office
9	Color Copy/Printer	DPC1190 Multifunction Laser Printer	1	FJD2,400	February 2011.	NDMO	NDMO office
10	Battery Charger					NDMO	NDMO
11	Simplified Rain Gauge	(handmade)	4	JPY285,084	Assembled in the workshop on 28-30 September 2011 in Fiji	NDMO	3 were installed at Turarana, Rate, Selwyn
	Simplified Water Level Gauge		4				3 were installed at Turarana, New Birao, Selwyn
12	Hand Siren	TEISHO:MODEL 5	5	JPY90,000	2011	NDMO	Kept at Tuararana 1, Selwyn 2, WRD 2
13	Megaphone with Siren	NOBORU ELECTRIC:TS-613L	1	JPY21,600	2011	NDMO	Out of order, Kept at Project Coordinator
14	Solar Panel (including Regulator, Battery and so on)		2	JPY28,673	2012	NDMO	Tuararana 1, New Birao 1
15	Portable DVD Player	SANSUI SPD-749TV	1	FJD235	FY2013	NDMO	NDMO (It is expected to be used at Guadalcanal Provincial Office)
16	Monitor for Simplified Gauge	TOYO ELECTRONICS	2	JPY15,000	FY2013	NDMO	Stored at WRD (equipment for spare)
17	Barometer	ESCO 100mm Barometer	2	JPY2,625	FY2013	NDMO	NDMO 1,Honiara Police Station 1
18	Manually-Powered Lantern	APLT001	3	JPY2,230	FY2013	NDMO	NDMO (it has not been delivered)

Annex 7: Counterpart Training

Community-Based Disaster Risk Management Training

Course	Name	Organization	Position	Period (Departure and Arrival)	Visited Institutions and Course
Hydrology and Hydraulic Course	Mr. Paula Tawakece	Fiji Water Authority of Fiji / Hydrology Section	Technical Officer	Sep 18 – Sep 28 / 2012	Regional Bureau (MLIT), Sanjo City Office, Ohkouzu Museum, etc.
	Mr. Richard Tirifa Molea	Solomon Ministry of Mines, Energy & Rural Development, water Resources Division	Senior Project Coordinator		
Regional and Community Disaster Prevention Course	Mr. Joji atakala	Fiji Ministry of Provincial Development & National Disaster	Principal Assistant Secretary	Oct 9 – Oct 19 / 2012	Education Committee, FM broadcasting company, Ohkouzu Museum, Sanjo City etc.
	Mr. Samuela Kanainaliwa	Fiji Ministry of Provincial Development & National Disaster	Assistant Officer		
	Mr. Joseph Tangi	Solomon Guadalcanal Provincial Government	School Inspector		
	Mr. George Paikai	Solomon Ministry of Police and Justice	Director, Emergency Management		
High Official Training	Mr. Inia eruiratu	Fiji Ministry of Provincial Development & National Disaster	Permanent Secretary	Oct 15 – Oct 19 / 2012	Sanjo City Office, Iguriwakafuji Community,Niigata Prefectural Office etc.
	Mr. Loti Yates	Solomon Ministry of Environment, Climate Change, Disaster Management & Meteorology, National Disaster Management	Director		
Strengthening Community-Based Disaster Risk Management Training	Mr. Ropate Rakadi Tuikenawa	Fiji Ministry of Provincial Development & National Disaster Management	Assistant Secretary/Admi.	Sep 5 – Sep 22 / 2011	JICA Hyogo International Center, Asian Disaster Reduction Center, Foundation of River and Basin Integrated Communications, Disaster Reduction and Human Renovation Instituion,etc.
	Ms. Litiana Naidoleca Bainimarama	Fiji Ministry of Provincial Development & National Disaster Management	Assistant Secretary		
	Mr. Vani Raiqomo Vakatalai	Fiji Ministry of Provincial Development & National Disaster & Sugar	Executive Officer Planning		
	Mr. Alifereti Abenisiga	Ministry of Provincial Development, Multi Ethnic Affairs	Assistant District Office		
	Mr. Seremaia Koroi	Water Authority of Fiji/Hydrology Section	Supervisor		
	Mr. Seutaia Jale hataogo Uluilakeba	Fiji Meteorological Services	Senior Training Officer		
	Mr. Herrick Charanibolivaolu Savusi	Solomon Ministry of Environment, Climate Change, Disaster Management & Meteorology, National Disaster	Provincial Disaster Coordinator		
	Mr. Frank Menoia	Solomon Ministry of Environment, Climate Change, Disaster Management & Meteorology, National Disaster	Senior Provincial Disaster Officer		
	Mr. Freddy Ferah	Solomon Islands Meteorological Service	Chief Meteorological Officer		
	Mr. Michael Siau	Solomon Islands Meteorological Service	Principal Forecasting Officer		
	Mr. Jack Maesugea Kaobata	Ministry of Mines, Energy & Rural Development, Water Resources Division	Senior Hydro-geologist		
	Mr. Samson Junior Bata	Ministry of Mines, Energy & Rural Development, Water Resources Division	Hydrological Assistant Trainee		

Annex 8: Assignment of Counterpart Personnel

As of Sep 2013

		Organization	Title	Duration and position
Task Force 1				
1	Mr. Jonathan Tafiariki	NDMO	Deputy Director	2nd year ～
2	Mr. Devid Hiriasia	SIMS, Ministry of Environment, Climate Change, Disaster Management and Meteorology	Director	-
3	Mr. Fredy Ferah	SIMS, Ministry of Environment, Climate Change, Disaster Management and Meteorology	Chief Forecaster	-
4	Mr. Charlie Bepapa	WRD, Ministry of Mines, Energy & Rural Electrification	Director	-
5	Mr. Michael Maehaka	WRD, Ministry of Mines, Energy & Rural Electrification	Senior Hydrologist	-
6	Mr. Jack Kaobata	WRD	Officer	-
7	Mr. Richard Molea	WRD	Officer	-
8	Mr. Lloyd Tahans	SIMS	Deputy Director	-
Task Force 2				
1	Mr. Timothy Ngele	Ministry of Education & Human Resources Development	Under Secretary, Administration	-
2	Mr. John Ta'aru	Ministry of Infrastructure & Development	Permanent Secretary	-
3	Mr. George Paikai	Ministry of Police and Justice	Director, Emergency Management	-
4	Mr. George Guna	Guadalcanal Provincial Government	Provincial Police Commander	-
5	Mr. Sipuru Rove	NDMO	Administration Officer	-
6	Mr. Max Lua	Guadalcanal Provincial Government	Provincial Engineer	-
7	Mr. George Guna	Guadalcanal Provincial Government	Provincial Police Commander	-
8	Mr. Lester Ross	Ministry of Health & Medical Services	Permanent Secretary	-
9	Mr. Joshua Leitavua	Guadalcanal Provincial Government	Chief Education Officer	-
10	Mr. Adrian Smith	Roman Catholic Church	Archbishop	2nd year ～
11	Ms. Janet Prakash	NDMO	Chief Administration Officer	～1st year
12	Mr. James	SICA	General Secretary	～1st year
13	Mr. Loti	NDMO	Director	-
14	Mr. Jonathan Tafiariki	NDMO		1st year ～ 2nd year
Task Force 3				
1	Mr. Sipuru Rove	NDMO	Administration Officer	-
2	Mr. Herrick Savusi	NDMO	Provincial Disaster Officer (Guadalcanal)	-
3	Mr. Brian Tom	NDMO	Provincial Disaster Officer (Central)	-
4	Mr. Augustin	AfP/PCIDRR	Project Officer	-
5	Ms. Jophine Maelaua	Ministry of Health & Medical Services	Nutritionist	-
6	Mr. Joseph Tangi	Posted to Guadalcanal Provincial Office from the Ministry of Education	School Inspector	-
7	Ms. Suzanne Paisley	World Bank	Program Officer	-
8	Ms. Christina Mitini	UNDP	Programme Assistant	-
9	Mr. Clement Manuro	Solomon Islands Red Cross Society	Deputy Secretary	-
10	Mr. Martin Amehana	Honiara City Council	Disaster Officer	-
11	Ms Jennifer Wate	Solomon Island Development Trust	Director	-
12	Mr. Jimmy Ikina	Ministry of Lands, Housing and Surveys	Assistant Survey General	～2nd year
13	Mr. John Ta'aru	Ministry of Infrastructure & Development	Permanent Secretary	～2nd year
14	Mr. Max Lua	Guadalcanal Provincial Government	Provincial Engineer	～2nd year
15	Mr. Joshua Leitavua	Guadalcanal Provincial Government	Chief Education Officer	～2nd year
16	Mr. Ben Tovo	Red Cross	Chairman, Tamboko Red Cross	～2nd year

Note) Those with no mention of duration, which is indicated by"-", are engaged in the Project from the beginning of the Project till present

Annex 9: Operation Budget

Japanese Side

(Currency: SBD)

Items	FY2010 Oct 2010 – Mar 2011	FY2011 Apr 2011 – Mar 2012	FY2012 Apr 2012 – Mar 2013	FY2013 Apr 2013 – Present	Total
Assistant Personnel	7,050	33,355	46,520	38,451	125,376
Consumable Supplies	43,784	56,084	58,437	47,634	206,989
Travel & Transportation	99,074	316,313	268,273	188,964	933,497
Communication & Transportation	11,600	12,820	14,950	10,400	49,770
Printing & Binding	0	0	5,360	20,340	25,700
Rental	42,540	80,260	92,867	98,998	314,665
Maintenance for Facility & Equipment	1,600	0	0	0	1,600
Local Training	15,077	22,832	1,648	13,861	53,418
Miscellaneous Expense	3,613	20,271	19,730	28,604	72,218
Total	224,338	541,935	507,785	447,252	1,783,233

Solomon Side

(Currency: SBD)

Items	FY2010 Oct 2010 – Mar 2011	FY2011 Apr 2011 – Mar 2012	FY2012 Apr 2012 – Mar 2013	FY2013 Apr 2013 – Present	Total
NDMO	-	-	-	-	-
SIMS	-	-	-	-	-
WRD	-	-	-	-	-
Total					

Note) The budget amount of counterpart agencies (NDMO, SIMS, WRD) used for implementing project activities were not clarified during the terminal evaluation as the expenditure for the purpose had not been separately recorded at the agencies.

Annex 10: Result Grid 1 (Progress at Activity Level)

As of Aug 2013

Activity		Progress (%)		Remaining actions in order to complete the activity
		Mid-term Review	Terminal Evaluation	
Output 1	A flood warning system is in place and appropriately managed by the NDMO in cooperation with the Met Service and Water Resources Division, and the target community/ residents understand and respond accordingly.			
1-1	To develop flood forecasting capacity of Meteorological Service and Water Resources Division	-	-	-
1.1.1	To strengthen the capacity to collect flood forecast data.	60	100	Hydrological equipment was set up at the target site (Tamboko village) in August 2011 and hydrological observation has since been going on.
1.1.2	To strengthen the capacity to forecast flood (including run-off analysis), conduct training for the related personnel.	40	100	With trainings, WRD is capable of conducting run-off analysis and its verification calculation.
1-2	To strengthen a system for issuing a flood warning	-	-	-
1.2.1	To establish credible flood warning standards.	20	70	Flood warning code has been established at the Umasani River. Accumulation of data is necessary to establish credible flood warning standards.
1.2.2	To improve the system for sending flood forecast data from Met Service and Water Resources to NDMO.	20	80	WRD doesn't have equipment to obtain a real-time flood data, but WRD has developed capacity for flood calculation and forecast, and agreed with SIMS on data sharing. The data is to be sent to NDMO through internet. When the website of NDMO is established, the data can be presented at the website.
1.2.3	To improve the system by which NDMO informs residents of warning information.	40	80	Weather Transmitter set up at SIMS obtains rainfall intensity data. Based on the warning code on the rainfall intensity data, advisory information will be sent to the NDMO, then NDMO will issue a warning information through SIBC.
Output 2	NDMO's disaster management capacity is developed.			
2-1	To strengthen the implementation system of community-based disaster management plans for the target community	-	-	-
2.1.1	To prepare community-based disaster management plans for the target community (including plans on: awareness program for residents, installation of simplified rain gauge and water gauge, supporting the residents in preparation of their hazard maps, and conducting evacuation drills)	50	90	Village Disaster Risk Plan for Tamboko Village was completed in July 2013. The plan is yet to be approved by VDRC with the endorsement of NDMO.
2.1.2	To prepare the manuals on conduct of the community-based disaster management plans established in activity 2-1-1.	60	80	Guadalcanal Province Disaster Management Plan was already endorsed by the Provincial Secretary of Guadalcanal and used for reference and for checking up information. The plan is yet to be approved by the Provincial Disaster Committee.
2.1.3	To arrange workshops to strengthen the C/P organizations' capacity to operate the manuals established in activity 2-1-2.	50	80	Workshop to operate the Manual is to be held in 2013 about 2 times (in August and October)
2.1.4	To reflect any lessons learned from awareness program's activities to the manuals and the community-based disaster management plans.	50	100	Lessons from recent disaster were reflected to revise the Manual and Guadalcanal Province Disaster Management Plan in August 2013.
2-2	To enhance relevant organizations' capacity of emergency response	-	-	-
2.2.1	To prepare the emergency response manuals for relevant organizations.	50	80	Operation manual for emergency response were distributed to counterpart, and is now awaiting comments and feedback. Appendix in SOP are under revision by counterpart (Health, Education, Agriculture, Police) The SOP is yet to be endorsed by the Provincial Secretary of Guadalcanal, upon which the SOPs will become official documents.
2.2.2	To do emergency simulation exercises in line with the emergency response manuals.	60	80	Table top exercise and evacuation drill for 2013 are to be conducted in October.
2.2.3	To share good practices gained from the activities with both countries.	60	80	International workshops is to be held in Honiara in October 2013

2.2.4	To share good practices gained from the activities with other donors.	30	75	International workshops is to be held in Honiara in October 2013
Output 3	The target community's awareness on disaster preparedness is enhanced.			
3-1	To implement the awareness program	-	-	-
3.1.1	To select the pilot site(s), community(ies).	100	100	Tamboko village was selected as the pilot site in Nov 2010.
3.1.2	To arrange workshops in line with the awareness program.	60	100	Meetings of VDRC (Workshop) have been held in line the Guidebook for Village DRM.
3.1.3	To conduct evacuation drills at the pilot site(s).	70	80	The evacuation drill has been conducted twice, the practice of which needs to be repeated by the initiative of VDRC.
3-2	To assist residents at the pilot site(s) to conduct risk assessment (installation of simplified rain gauges and water gauges, preparation of hazard maps).	-	-	-
3.2.1	To support establishment of monitoring system for the installed rain gauge and water gauge maintained by the residents at the pilot site(s)	80	90	Villagers in cooperation with WRD conducted inspection twice (21 Feb 2013,12 Jun 2013). The last inspection during the Project period is scheduled in Sept 2013 before the evacuation drill.
3.2.2	To support the residents in preparation of their own hazard maps.	30	90	Support to develop a hazard map has been provided by the Project (such as the Guidebook and VDRC meetings). Safety map is expected to be developed with the initiative of VDRC.

Annex 11: Result Grid 2 (Achievement of Indicators)

As of Sep 2013

<table>
<tr><th>Project Purpose / Output</th><th>Indicator</th><th>Current Status</th><th>Assessment</th></tr>
<tr><td><u>Project Purpose</u>
A System in which the residents of the area(s) other than selected community (village or settlement) is (are) able to evacuate appropriately is enhanced.</td><td>1) Percentage of the residents who take on the behavior of evacuation when the warnings are issued (80%)</td><td>・Evacuation drill was conducted in Tamboko as follows.
<table><tr><th>Date</th><th>Focus</th><th>Participation</th><th>Population according to survey</th><th>Participation rate</th></tr><tr><td>23 Oct 2 11</td><td>1st Evacuation Drill to test the evacuation plan</td><td>more than 150</td><td>157 (household) (Survey in 2009)</td><td>N/A</td></tr><tr><td>28 Feb 2013</td><td>This was postponed on the request from NDMO because of an earthquake and tsunami occurred in Temotsu Province on 6 Feb 2013.</td><td>-</td><td>-</td><td>-</td></tr><tr><td>22 Sep 2013</td><td>2nd Evacuation Drill</td><td>430</td><td>696 (population) (Government Statistics 2012)</td><td>62%</td></tr></table>・According to a village survey conducted in June 2012 by the Project, out of the surveyed 57 households, 44% (25 households) had attended an evacuation drill before.</td><td>Partially Achieved (At most 62% at an evacuation drill)</td></tr>
<tr><td></td><td>2) Cases that residents of selected community have evacuation drills in cooperation with NDMO.</td><td>・As above table, the evacuation drill was conducted 2 times in Tamboko.</td><td>Achieved</td></tr>
<tr><td><u>Output 1</u>
A flood warning system is in place and appropriately managed by the NDMO in cooperation with the Met Service and Water Resources Division, and the target community/ residents understood and respond accordingly.</td><td>1-1. Annual Report on Hydrological Observation in Umasani River issued by Water Resource Division</td><td>・Hydrological equipment was set up in August 2011 in Umasani River.
<table><tr><th>Zone of Tamboko village</th><th>Zone 1</th><th>Zone 2</th><th>Zone 5</th><th>Zone 5</th><th>Zone 6</th><th>Zone 6</th></tr><tr><td>Equipment</td><td>Simplified Water level Gauge</td><td>Simplified Rain Gauge</td><td>Simplified Water level Gauge</td><td>Simplified Rain Gauge</td><td>Automatic Rain Gauge</td><td>Automatic Water Level Gauge</td></tr><tr><td>Installed</td><td>Aug 2011</td><td>Aug 2011</td><td>Aug 2011</td><td>Aug 2011</td><td>Aug 2011</td><td>Aug 2011</td></tr><tr><td>In Charge</td><td>Mr. Roko Paulin Pani Mata</td><td>Mr. Ludovic</td><td>Mr. Vincent</td><td>Mr. Vincent</td><td>Mr. Francis</td><td>Mr. Francis</td></tr><tr><td>Solar Panel</td><td>-</td><td>Provided by the team</td><td>-</td><td>Provided by the team</td><td>Included in the equipment</td><td>Included in the equipment</td></tr><tr><td>Status as of 10 Aug 2013</td><td>Switched off</td><td>Temporarily taken off for reconstruction of Mr.Ludovic house</td><td>Switched off</td><td>Temporarily taken off for the pole was destroyed by a truck</td><td>In operation</td><td>In operation</td></tr></table>・Shared responsibility for the maintenance of the installed hydrological equipment was verbally agreed among NDMO, SIMS and WRD at the JCC in October 2011.
・<u>The maintenance manual of the hydrological equipment</u> was prepared
・<u>Annual reports of hydrological observation for Umasani River</u> were issued for 2011 (Jul 2011-Jun 2012) and 2012 (Jul 2012-Jun2013), using the display system and the template.
・C/P discussed the necessary vehicle and budget for the periodical maintenance work with the Director of WRD.</td><td>Achieved</td></tr>
</table>

<table>
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<td>
・Preparation of annul reports of hydrological observation other than Umasani River is considered, taking advantage of the template and the manual

・Simplified rain/water level gauges were assembled at the workshop on 28-30 September 2011, which followed the International Workshop on 27 September 2011 in Fiji. The equipment assembled was installed by NDMO, WRD, SIMS at other areas (Turarana, Rate, New Birao and Selwyn)
<table>
<tr><th>Place</th><th>Turarana</th><th>Rate</th><th>New Birao</th><th>Selwyn</th></tr>
<tr><td>Equipment</td><td>Simplified Rain Gauge, Simplified Water Level Gauge</td><td>Simplified Rain Gauge</td><td>Simplified Water Level Gauge</td><td>Simplified Rain Gauge, Simplified Water Level Gauge</td></tr>
<tr><td>River name</td><td>Matepona</td><td>Ngali Biu</td><td>Ngali Biu</td><td>Kochuku River</td></tr>
<tr><td>Installation date</td><td>Nov 2012</td><td>Jul 2012</td><td>Jul 2012</td><td>Nov 2012</td></tr>
<tr><td>Solar Panel</td><td>Solar panel to the WL gauge provided by the Project. Solar panel to the Rain gauge provided by the team</td><td>Provided by the Team</td><td>Solar panel to the WL gauge provided by the Project.</td><td>Solar panel to the Rain and WL gauges provide by the Team</td></tr>
</table>
All equipment was installed at school.
</td>
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<td>1-2. Number of validation calculation for the formulated flood forecast models (2 times per year)</td>
<td>
・Verification calculation of the runoff model was conducted 7 times at C/P of WRD based on input data, which is composed of observed rainfall data (such as 10-minite rainfall data and 1-hour rainfall data) and model parameters (such as runoff ratio and saturation rain)
・Manual of Basics of Run-off Analysis + Hydraulic Analysis was compiled by binding several manuals.
・Template were developed for preparing input data and runoff analysis.

・Continuous hydrological observation for data is required to conduct verification calculation as well as updating the runoff model.
</td>
<td>Achieved</td>
</tr>
<tr>
<td></td>
<td>1-3. Number of inspection and maintenance of the installed Rainfall gauge and Water Level Gauge (more than 6 times per gauge per year)</td>
<td>
・Inspection and maintenance was conducted by C/P of WRD as follows.
<table>
<tr><th>Year</th><th>Times</th><th>Date</th></tr>
<tr><td>FY 2011</td><td>6 times</td><td>8/24, 8/26, 2/4,2/6,2/10,2/15</td></tr>
<tr><td>FY 2012</td><td>7 times</td><td>6/7, 6/22, (7/16), (7/27), 8/25, (11/5), (11/22)
JICA experts accompanied on the days in the bracket.</td></tr>
<tr><td>FY 2013</td><td>3 times</td><td>2/21, 6/12,7/17</td></tr>
</table>
・There is a concern for the shortage of manpower for inspection and maintenance; total staff of WRD is six and limited to look over all equipment spread across the country.
</td>
<td>Partially Achieved (Not in 2013 as yet)</td>
</tr>
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<td>1-4. Established Warning Standard.</td>
<td>
・Rating Curve was calculated with Non-uniform flow model of Umsani River, showing the discharge capacity at each cross section.
・Warning Standard was established for simplified water level gauges at Umsani River, and modified based on the flood water level and warning situation in February 2012 in Tamboko village.

・Primary warning standards have also been set for simplified water level gauges installed at other areas (Turarana, New Birao, Selwyn)
</td>
<td>Achieved</td>
</tr>
<tr>
<td></td>
<td>1-5. Number of radio contact with Tamboko village through HF Radio (the same number of the National Warnings)</td>
<td>
・Letter of consent on quarterly hydrological data exchange between SIMS and WRD was singed on 1st August 2012.
・Both WRD and SIMS were eager for the hydrological data sharing, but this will take time to become a routine work.

・NDMO is responsible for issuing a national warnings for Tsunami (July 2012, Feb2013) and a flood precautionary safety
</td>
<td>Not Achieved</td>
</tr>
</table>

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<tr><td></td><td></td><td>message (Dec 2012, Mar 2013) for flood. These warning and safety message were issued though HF radio or SIBC.

・As for a flood warning, no agencies in Solomon are cable of issuing a flood warning. At present, neither WRD nor SIMS have facilities or equipment for real-time hydrological observation on specific river.
・During the project period, no flooding events as big as requiring a warning have not taken place.</td><td></td></tr>
<tr><td rowspan="4">Output 2
NDMO's disaster management capacity is developed.</td><td>2-1. Number of meetings for formulating or revising the Provincial Disaster Management Plan of Guadalcanal (2 times per year)</td><td>・NDMO held weekly meetings to formulate Guadalcanal Province Flood Disaster Management Plan as well as the preparation/revision of sectoral disaster SOP (disaster response manuals for each counterpart organizations) which started in August 2012
<table><tr><td>Year</td><td>Date</td></tr><tr><td>FY 2011 (11times)</td><td>9/2, 9/9/, 9/16,9/23,9/30, 10/7,10/9,10/14,10/16,10/21,2/22</td></tr><tr><td>FY 2012 (12 times)</td><td>8/8 (3 times) , 8/10,8/14,8/16,8/17,8/22,8/23, 12/17 (SOP joint presentation)</td></tr></table>・Appendix of SOP is under improvement as of August 2013 (Education, Health, Agriculture).
・In the course of developing the Guadalcanal Province Disaster Management Plan, Operation Manual for Disaster Management was prepared in August 2013.
・Ownership of Guadalcanal Province Flood Disaster Management Plan shall be NDMO and Guadalcanal Provincial Government (Premier of Guadalcanal)</td><td>Achieved</td></tr>
<tr><td>2-2. Number of the simulation exercise conducted by NDMO (1 times per year)</td><td>・NDMO held simulation exercise
<table><tr><td>Year</td><td>Date</td><td>Participants</td><td>Based Scenario</td></tr><tr><td>FY 2010</td><td>11 Mar2011</td><td>the Guadalcanal Provincial Government, NGO, Church</td><td>2009 flood</td></tr><tr><td>FY 2011</td><td>21 Oct 2011</td><td>Education, Health, Agriculture, Finance, Works etc</td><td>1986 Cyclone "NAMU"</td></tr><tr><td>FY 2012</td><td>12, 13 Dec 2012</td><td>To test SOP of Education(12 Dec) and Health (13 Dec)</td><td>1986 Cyclone "NAMU"</td></tr></table>In F2013, the simulation exercise plans to be conducted in Oct for the year 2013.</td><td>Partially Achieved (Not in 2013 as yet)</td></tr>
<tr><td>2-3. Number of workshops or seminars to share good practices and information with both countries and other donor agencies (2 times per year)</td><td>・International workshop has been held to share good practices and information gained from the activities between both countries and among other donors.
<table><tr><td>Year</td><td>Date and Venue</td><td>Comments</td></tr><tr><td>FY 2010</td><td>2/2 in Honiara</td><td>Explanation of project activities</td></tr><tr><td>FY 2011</td><td>9/27 in Nadi</td><td>Progress of Guadalcanal Disaster Management Plan Development</td></tr><tr><td></td><td>2/22-23 in Honiara</td><td>Progress of Disaster Management Plan Development</td></tr><tr><td>FY 2012</td><td>11/21 in Suva</td><td>Presentation of Guadalcanal Disaster Management Plan.
Leaflet and DVD for project promotion distributed</td></tr><tr><td></td><td>2/27 in Honiara (canceled)</td><td>Canceled due to earthquake on 6 Feb 2013</td></tr><tr><td>FY 2013</td><td>Planned in October 2013</td><td>-</td></tr></table>・Project Seminar
1) 2 Feb 2011 (Presentation of activities in Fiji) at Kitano Hotel
2) 11 Mar 2011 (Development of Guadalcanal Disaster Management Plan) at Honiara Hotel
3) 14 Dec 2011 (Progress of Guadalcanal Disaster Management Plan Development) at the facility of CYP (commonwealth youth program)
・Due to a request of NDMO, the Project was invited to make a presentation at the Pacific Platform .
1) 17-21 September 2012 (the director of NDMO gave a presentation on JICA project)
2) 8-12 July 2013 (project leaflet and DVD distributed)
・Project newsletter Vol 1. (Feb 2011), Vol 2 (Nov 2011), Vol 3 (Feb 2012), Vol 4 (Jun 2012)</td><td>Partially Achieved (Not in 2013 as yet)</td></tr>
<tr><td>2-4. The Provincial/Community Disaster Management Plan formulated by NDMO for other area</td><td>・Masi Village in Moli Ward, Guadalcanal Province, was selected by NDMO (PDO) among the flood prone areas in April 2012 and a workshop to develop a village disaster response plan, safety map , and disaster meeting was held on 5-8 June 2012 in order to test the procedures of Tamboko village facilitated by NDMO and PDO. (This is one-time activity)</td><td>Not achieved</td></tr>
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<td>
・At present, a project of PHRD (Policy and Human Resource Development Fund) on community risk reduction is starting at NDMO; a project manager will be in the office next month and pilot sites are currently under selection. Director of NDMO recommended a "JICA model" from the Project - combination of early warning system and evacuation – to the PHRD project.

・Guadalcanal Provincial Disaster Management Plan has been developed in 2012 and revised in 2013. At present, appendix are being prepared, plan to be completed in October 2013. Appendix includes disaster management resource such as facility list, and contact list.
・Provincial Disaster Management Plan will be disseminated in CDROM form to stakeholders in October 2013
</td>
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</tr>
<tr>
<td><u>Output 3</u>
The target community's awareness on disaster preparedness is enhanced.</td>
<td>3-1. Number of the Community Disaster Committee meetings for revising the Evacuation Plan (more than 2 times per year)</td>
<td>
・Tamboko village was selected as the pilot site based on a discussion with NDMO at the beginning of the Project. VDRC (Village Disaster Risk Committee) was established in July 2011.

・Member of VDRC
<table>
<tr><th>No</th><th>Name</th><th>Position in the Committee</th><th>Zone</th></tr>
<tr><td>1</td><td>Mr. Nasarero Sam</td><td></td><td>1</td></tr>
<tr><td>2</td><td>Mr. Paulyn Upa</td><td>Simplified Water Level Gauge</td><td>1</td></tr>
<tr><td>3</td><td>Mr. Albert Tanimana</td><td></td><td>1</td></tr>
<tr><td>4</td><td>Mr. Ludovic Kaulake</td><td>Chairman / Head of Chief / Simplified Rain Gauge</td><td>2</td></tr>
<tr><td>5</td><td>Ms. Vitaline Labule</td><td></td><td>2</td></tr>
<tr><td>6</td><td>Mr. Claypod Tova (Cliford)</td><td></td><td>2</td></tr>
<tr><td>7</td><td>Mr. Ben Tovo</td><td>Vice Chairman / Tribal Leader</td><td>3</td></tr>
<tr><td>8</td><td>Mr. Edwin Chitani</td><td></td><td>3</td></tr>
<tr><td>9</td><td>Mr. Alosio Doko</td><td></td><td>4</td></tr>
<tr><td>10</td><td>Mr. Charles Tada</td><td></td><td>5</td></tr>
<tr><td>11</td><td>Ms Polyn Chia</td><td>Secretary</td><td>5</td></tr>
<tr><td>12</td><td>Mr. Leonsio Chia</td><td></td><td>5</td></tr>
<tr><td>13</td><td>Mr. Francis Pulo</td><td>Landowner of Rain / Water Gauge Station</td><td>6</td></tr>
<tr><td>14</td><td>Mr. Patleone Mata</td><td></td><td>6</td></tr>
<tr><td>15</td><td>Mr. Mareell Tada</td><td></td><td>6</td></tr>
<tr><td>16</td><td>Mr. Joseph Maneugu</td><td>Chief</td><td>-</td></tr>
<tr><td>17</td><td>Mr. Sebastine Lumale</td><td>Teacher</td><td>-</td></tr>
<tr><td>18</td><td>Mr. John Wesley Chawguri</td><td>Teacher</td><td>-</td></tr>
<tr><td>19</td><td>Mr. Vincent Tome</td><td>Simplified Rain Gauge and Water Level Gauge</td><td>5</td></tr>
</table>
・Meetings of VDRC have been held 9 times including the preparation and revision of evacuation plan.
<table>
<tr><th>Year</th><th>Date</th><th>Agenda</th></tr>
<tr><td>2011</td><td>27 Jul</td><td>Explanation of activities and schedule of VDRC</td></tr>
<tr><td></td><td>30 Aug</td><td>Preparation of Safety Map</td></tr>
<tr><td></td><td>21 Sep</td><td>Preparation of <u>Evacuation Plan</u> and Evacuation Drill
(Evacuation Drill was conducted on 23 October 2011)</td></tr>
<tr><td>2012</td><td>29 Feb</td><td>Preparation of Village Disaster Response Plan</td></tr>
<tr><td></td><td>30 Mar</td><td>Preparation for community action plan for improvement of community road and community hall.</td></tr>
<tr><td></td><td>29 Apr</td><td>Explanation of community action plan for the improvement of community road</td></tr>
<tr><td>2013</td><td>6 Jan</td><td>Revision of Response Plan and <u>Evacuation Plan</u>
Preparation for Evacuation Drill (scheduled on 28 February 2013)</td></tr>
<tr><td></td><td>27 Jan</td><td>Explanation for Evacuation Drill</td></tr>
<tr><td></td><td>28 Apr</td><td>Explanation of the construction of Community Hall</td></tr>
</table>
</td>
<td>Achieved</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
・Guidebook for Village Disaster Risk Management was developed by Japanese expert and NDMO staff in November 2012, including:
1) Procedure to develop a safety map, response plan, and evaluation plan
2) Manual for the Simplified Rainfall Gauge (Ver 1.0 Feb 2012)
3) Manual for the Simplified Water Level Gauge (Ver.1.0 Feb 2012)
4) Village Disaster Risk Plan (Ver. 1.0 November 2012)

・The ownership of the Guidebook for Village Disaster Risk Management will be NDMO.
・The ownership of the Village Disaster Risk Plan will be Tamboko VDRC.

・NDMO, as their own activity, conducted a damage assessment and compiled a report on the flood in December 2012 in west and north Guadalcanal.

・The villages which already have Village Disaster Risk Plan will be listed using the Ward/Village inventory, and the expansion of pilot village will be considered in line with NDMO Corporate Plan (2010-2015) and Annual Work Plan.
</td><td></td></tr>
<tr><td></td><td>3-2. The participation rate of the target community residents for the Evacuation Drill (more than 1 person from each household)</td><td>
・Evacuation drill was conducted in Tamboko as follows.
<table>
<tr><th>Date</th><th>Focus</th><th>Participation</th><th>Population according to survey</th><th>Participation rate</th></tr>
<tr><td>23 Oct 2011</td><td>1st Evacuation Drill to test the evacuation plan</td><td>more than 150</td><td>157 (Household) (Survey in 2009)</td><td>N/A</td></tr>
<tr><td>28 Feb 2013</td><td>This was postponed on the request from NDMO because of an earthquake and tsunami occurred in Temotsu Province on 6 Feb 2013.</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>22 Sep 2013</td><td>2nd Evacuation Drill</td><td>430</td><td>696 (Population) (Government Statistics 2012)</td><td>62%</td></tr>
</table>
・According to a village survey in June 2012 conducted by the Project, out of the surveyed 57 households, 44% (25 households) had attended an evacuation drill before. This is 41 points increase from the last village survey conducted in February 2011, when only 3% (2 households out of surveyed 60 households) had attended a drill.
</td><td>Partially Achieved</td></tr>
<tr><td></td><td>3-3. Number of inspection and maintenance of the Simplified Rainfall Gauges and Water Level Gauges in cooperation with Water Resource Division or Guadalcanal Province (more than 3 times per gauge per year)</td><td>
・Simplified Gauges were set up at Tamboko in Aug 2011.
・(Simplified Gauges were set up at Rate and New Birao in July 2012 and Tuararana and Selwyn November 2012)

・Japanese experts along with the WRD conducted the inspection and maintenance of the simplified gauges as follows
<table>
<tr><th>Year</th><th>Date</th></tr>
<tr><td>2011</td><td>14-20 Aug,</td></tr>
<tr><td>2012</td><td>30-31 Jan, 14-31 Jul, 4-10 Nov</td></tr>
<tr><td>2013</td><td>30-31 Jan, 14-20 Jul</td></tr>
</table>
・At the meeting on 13 February 2013 among NDMO, WRD, Guadalcanal Province (Education), and JICA expert, the dates were agreed to conduct the inspection and maintenance.
1) 15 Feb 2013: Turarana
2) 18 Feb 2013: Selwyn College
3) 19 Feb 2013: Rate & New Birao
4) 20 Feb 2013: Tamboko
・Following the meeting above, at Tamboko village, the simplified gauges and laud hailer has been so far checked 2 times by villagers in cooperation with WRD
1) 21 Feb 2013
2) 12 Jun 2013
</td><td>Achieved</td></tr>
</table>

		3) Scheduled in September 2013 before the evacuation drill. ・Also see Indicator 1-3. WRD inspected the simplified gauges, too, when they visited and checked the automatic gauges in Tamboko village. The number of inspection, therefore, is far more than 3 times per year. ・Manuals (for the Simplified Water Level Gauge and Rainfall Gauge) were revised in December 2012 and provided to the VDRC member, whose house the gauges were set up at.	
	3-4. Number of the community activities, such as village walkabout, evacuation drill and hazard mapping, conducted by NDMO/PDO for the target community (more than 1 time per year)	・Community activities were conducted in Tamboko village as follows: 1) An event of village walkabout was organized on 2 March 2011 with the participation of 9 VDRC member and more than 40 villagers. 2) 1st evacuation drill was conducted on 23 October 2011 with the participation of more than 150 people. 3) An event of road improvement was conducted on 8 – 10 May 2012. Total 40 villagers participated in the event with labor contribution. 4) 2nd evacuation drill was conducted on 22 September 2013 with the participation of about 430 people. ・Community activities were conducted by NDMO/PDO such as the development of Safety Map, Disaster Response Plan, and evacuation drill with the support of Project. Project supported the activity in terms of expenses and provision of materials. 1) Buara village (28 November 2011) and Horara village (1 December 2011) in Isabel Province 2) Masi village (5-8 June 2012) Moli ward, Guadalcanal province	Achieved

Annex 12: List of documents developed in the Project

1) Fiji

Output 1	1) WL-2250F Data Logger Reference Manual [WL-2250F-Data Acquisition Program]	-	Sep 2012
	2) Ba River Hydrological Information System - Website Maintenance Manual -	Edition 1.00	1/7/2013
	3) Ba River Hydrological Information System - Reference Manual -	Edition 1.03	19/11/2012
	4) Ba River Hydrological Information System - Maintenance Manual -	Edition 1.00	19/11/2012
	5) Instruction Manual for Hydrological Data Logger Model:WL-2250F	-	June 2011
	6) Ba River Hydrological Information System - Install Manual -	Edition 1.01	-
	7) Ba River Hydrological Information System -Data Logger File Format –	Edition 1.00	1/7/2013
	8) Annual Report of Hydrological Observation 2012	-	-
Output 2	1) Ba District Flood Disaster Management Plan	Second Edition	July 2013
	2) Operation Manual for Flood Disaster Management	-	July 2013
	3) Sectoral Standard Operational Procedure for Flood Disaster Risk Management (19 Sectors)	First Edition	November 21, 2012
Output 3	1) Guidebook for Community-Based Disaster Risk Management in the Western Division	Version 1.0	July 2013
	Appendix 5.1 Questionnaire		
	Appendix 5.2 Community Disaster Plan (Nawaqarua)		
	Appendix 5.3 Manual for Simplified Gauges		
	Appendix 5.4 DVD		
	2) Community Disaster Plan (Nasolo)	Version 2.0	July 2013
Promotion	1) Project Leaflet [2012]	-	
	2) Project Leaflet [2013]	-	

2) Solomon

Output 1	1) Annual Report of Hydrological Observation 2012 Umasani River [Rainfall]	-	-
	2) Annual Report of Hydrological Observation 2013Umasani River [Water Level]	-	-
	3) Manual of Basics of Run-off Analysis + Hydraulic Analysis	Edition 1.00	
	Runoff Analysis Manual I	Version 2.00	
	Hydraulic Analysis Manual	Version 1.00	
	Runoff Analysis Manual II	Version 1.00	
	Manual for River Works in Japan Survey		
	Establishing of Flood Warning Standards Manual	Version 1.00	
	Manual of Assembling of Hydrological Equipment for Community Based Flood Warning (Simplified flood warning system)	Edition 1.00	
	Manual of Maintenance Work for Simplified Gauges	Edition 1.10	
	4) Letter of Consent (between Water Resources Division and Meteorological Division)	-	August 1st, 2012
Output 2	1) Guadalcanal Province Flood Disaster Management Plan	Second Edition	August 2013
	2) Operation Manual for Flood Disaster Management in Guadalcanal Province	-	August 2013
	3) Sectoral Standard Operating Procedure for Flood Disaster Risk Management (Education, Health, Agriculture)	First Edition	December 17,2012
Output 3	1) Guidebook for Village DRM for sustainable resilient Villages	-	July 2013
	Appendix 5.1 Questionnaire		
	Appendix 5.1 Survey Data		
	Appendix 5.2 Village Disaster Risk Plan		
	Appendix 5.3 History of Cyclones in the Solomon Islands		
	Appendix 5.4 Manual for the Simplified Rainfall Gauge		
	Appendix 5.4 Manual for the Simplified Water Level Gauge		
Promotion	1) Project Leaflet [2012]	-	
	2) Project Leaflet [2013]	-	

3) For both countries

Booklet	1) Be Ready for Cyclone and Flood	-	June 2013

Annex 13: Evaluation Grid in accordance with the 5 Criteria

11 Aug 2013

Evaluation Criteria	Evaluation Question	Information to be Collected	Data Source and means
1. Relevance	1.1 Developments of policies/strategies at the national or region level associated with disaster management.	・Are there any new changes on the National Disaster Risk Management Plan which was revised in 2009 ? 1) Disaster Management Plan to be developed at the province and community level 2) Provincial Disaster Committee to be established at each province 3) Provincial Disaster Officer to be in place. 4) Disaster Risk Committee to be established at the village and ward level.	NDMO interview
	1.2 Alignment of the Project with the needs and expectation of the implementing organizations.	・Is the in line with the Corporate Plan (2010-2015) of NDMO ・Do work plan of counterpart agencies incorporate project activities?	NDMO Interview NDMO, SIMS, WRD interview Relevant Document, website
	1.3 Appropriateness of target municipalities and communities (e.g. cases of recent disasters)	・How did villagers respond when the alarm went off on 30 January 2012 due to the increased river water? ・Is there any difference of response between the 30 Jan 2012 and previous floods (Feb 2009and Jan 2010)? ・How was the participation of Tamboko villagers in the evacuation drill conducted in October 2011? ・Does the preceding Malaria Project of JICA at Tamboko village have any influence on the current JICA project? ・Why those four villages (Tuararana, Rate, Selwyn, New Birao) were selected for extended project activities?	Tamboko VDC hearing Tamboko VDC hearing Guadalcanal PDC Interview NDMO Interview Tamboko VDC hearing Tamboko VDC hearing Tamboko VDC hearing
	1.4 Changes of structure or staff of implementing organizations that may affect the Project implementation	・Are there any changes of the implementation arrangement of the Project? ・Has the change of the Deputy Director of NDMO any influence on the project implementation?	NDMO, SIMS, WRD interview
	1.5 Priority areas of the Government of Japan for the development cooperation with Solomon	・Is the project included in the prioritized areas of Japan's development cooperation policy to Pacific Regions, Fiji and Solomon?	JICA Japanese Embassy
2. Effectiveness	2.1 Progress of Output 1 - A flood warning system is in place and appropriately managed by the NDMO in cooperation with the Met Service and Water Resources Division, and the target community/ residents understood and respond accordingly.	The level of achievement and activity progress is summarized in the Result Grid. The documents with underline are collected. ・Is the Maintenance Manual of Hydraulic Equipment required further improvement? ・How many visits for the inspection and maintenance of equipment by WRD? ・Has the vehicle and budget to conduct the inspection secured in WRD? ・Is the letter of consent among NDMO, SIMS and WRD realistic and viable? ・Has hydrological observation data to conduct the verification calculation of the runoff model being accumulated? ・Is the Manual for run-off analysis and the maintenance useful and in use? ・Is the Agreement between SIMS and WRD for quarterly data sharing adhered to? How often data has been shared? ・Who is responsible to maintain the Maintenance Manual of the Simplified Water Level Gauge for residents? Is the manual is easy to understand? ・Are the templates (for making annual reports of hydrological observation, HQ curve, operation of simplified gauge) are in use? ・Are the hydraulic equipment and siren well recognized by residents ? ・Are the budget for spare parts of the hydraulic equipment set aside by responsible agencies? ・How many radio contacts have been given to Tamboko village? 1) Mobile phone, 2) SIBC, 3) Radio	Expert Interview WRD Interview WRD Interview WRD Interview NDMO, SIMS, WRD Interview WRD Interview WRD Interview WRD and SIMS interview WRD Interview Tamboko VDC hearing WRD, SIMS Interview Tamboko VDC hearing WRD Interview NDMO Interview
	2.2 Progress of Output 2 - NDMO's disaster management capacity is developed.	The level of achievement and activity progress is summarized in the Result Grid. The documents with underline are collected. ・What is the progress of Guadalcanal Province Flood Disaster Management Plan and Village Disaster Risk Plan are completed?	Expert Interview NDMO interview

		・Has the communication between Provincial Disaster Coordinator and NDMO improved? ・Are sectoral SOP (disaster management plan of each organization) realistic and practical? ・Which part of each counterpart organization is responsible for the preparation of Disaster Response Manual (Sectoral SOP?) ・How the simulation exercise conducted based on the SOP contributed to the improvement of SOP? ・Participants' response to the presentation at Pacific Platform (17-21 Sep 2012). DVD and prop materials.	Guadalcanal PDC interview NDMO interview NDMO interview NDMO, Min of Education, Min of Health, Ministry of Agriculture interview NDMO interview
	2.3 Progress of Output 3 - The target community's awareness on disaster preparedness is enhanced.	The level of achievement and activity progress is summarized in the Result Grid. The documents with underline are collected. ・The Guidebook for Village Disaster Risk Management (July 2013) is completed? Its contents are based on the reality of villagers? ・How many times the Village Disaster Committee has eonvene? ・What was learned from the evacuation drill in Tamboko on 23 Oct 2011? ・Is the Activity Plan for Maintenance of the Simplified Gauges adhered to? ・Is the peripheral equipment managed properly during the dry season (May to December)? ・Is the Operation and Maintenance Manual for Simplified Gauges practical? ・Are the equipment in Tuararana, Rate, Bew Birao, Selwyn maintened? ・Hazard map (safety map) is well recognized among villagers? ・Is the evacuation plan recognized and remembered among villagers? ・Is the maintenance of the gauges too much for villagers who have that responsibility? ・Are Activities in the Tamboko village (Disaster Committee, Village Disaster Risk Plan) are in line with what is written in the Guidebook for Village Disaster Risk Management? ・Who is responsible for keeping the Project leaflet(???)	Expert Interview NDMO interview Tamboko VDC hearing NDMO Interview Guadalcanal PDC Interview Tamboko VDC hearing WRD, Tamboko VDC interview WRD, Tamboko VDC interview WRD interview Tamboko VDC hearing Tamboko VDC hearing Tamboko VDC hearing NDMO interview WRD (???) hearing
	2.4 Prospect of the Project Purpose to be achieved by the end of project period	The level of achievement of Project Purpose is summarized in the Result Grid. ・Level of achievement of output indicators ・Level of achievement of Project Purpose Indicator	NDMO, SIMS, WRD interview Expert Interview
	2.5 Follow-up actions to the recommendation of Mid-term Review	1) Improve the system of transmitting rain and water level data immediately. (Fiji) 2) Solve the land issues regarding the installation of water level gauge in the lower part of Ba River. (Fiji) 3) Strengthen the coordination within/among the Task Force teams. 4) Support the implementation of trainees' action plan. 5) Develop capacities of organization through the process of developing manuals and implementing drills. 6) Establish effective monitoring activities within implementing organization; retaining transferred technologies taking into consideration the transfer of counterpart. 7) Examine the collaboration with other initiatives/actions of schools, NGOs, churches for communities. 8) Enhance public relations activities.	Progress report NDMO, SIMS, WRD interview Expert interview
3. Efficiency	3.1 Clarity and understanding of the overall plan of the Project (PDM) among people concerned	・R/D was signed on 23 July 2010 ・Is the view on the level of achievement of the Project discrepant between expert and counterpart? ・Is there any signifieant difference between plan of operation and actual implementation?	Expert interview NDMO, SIMS, WRD interview
	3.2 Dispatch of Japanese experts	・Assignment schedule ・Area of expertise ・Number of experts, duration and timing	Progress Report NDMO, SIMS, WRD interview
	3.3 Provision of equipment	・Quality and quantity ・Timing of delivery	Progress Report NDMO, SIMS, WRD interview
	3.4 Counterpart Training	・Subject/curriculum ・duration/timing ・selection of trainees	Progress Report NDMO, SIMS, WRD interview

	3.5 Services of the counterpart personnel (number of staff, role and responsibility, time and effort)	・JCC (Chairperson is the PS of Ministry of Home Affairs; Members involve Ministry of Lands, Home Affairs, SIMS, NDMO, Assistant Commissioner of Police, Ministry of Infrastructure and Development, Ministry of Provincial Government, Ministry of Education and Human Resource Development, Ministry of Mines, Energy and Rural Electrification) ・Sense of ownership ・Number of counterpart involved ・Alignment of project activities and their daily duties ・Level of attendance in project meeting and activities.	Progress Report NDMO, SIMS, WRD interview Expert Interview
	3.6 Counter-budget for the project implementation (share of operational costs)	・Items and amount of expenditure	Progress Report NDMO, SIMS, WRD interview
	3.7 Communication (periodical and daily) for project coordination between implementing organizations and the Japanese experts	・JCC meeting ・Any regular meeting held for the management and coordination of the Project ・Communication when experts don't stay in Solomon	Progress Report NDMO, SIMS, WRD interview
	3.8 Communication (periodical and daily) for project coordination among Solomon organization.	・Invitation letter and report of the meetings ・Frequency of the information shared	Progress Report NDMO, SIMS, WRD interview
	3.9 Methods and contents of technology transfer from Japanese experts to counterpart personnel.	・On the job training and Learning through processes ・Advantage of technology in Japan (in comparison with those of third countries)	NDMO, SIMS, WRD interview
	3.10 Promoting/hindering factors that may have affected the Project implementation	・Cases of the influence of important assumptions	NDMO, SIMS, WRD interview Expert Interview
4. Impact	4.1 Prospect of the Overall Goal to be achieved 3-5 years after the project end.	・Are there any obvious hindering factors? ・Isn't the Overall Goal far-reaching to realize in 3-5 years considering the current level of achievement? ・Is the Overall Goal is still appropriate?	NDMO, SIMS, WRD interview Expert Interview
	4.2 Next actions for project outputs/effects to be disseminated beyond the Project area	・Are activities making progress beyond the target village (Turarana, Rate, New Birao, Selwyn)?	NDMO, SIMS, WRD interview Expert Interview
	4.3 Ongoing/possible collaborations, if any, with multi/bi-lateral development partners.	・Any positive synergies between the Project and the community Hall which is under construction with Grass-root grant of Japanese embassy. ・JOCV arrived on 5 August 2013 to be attached to NDMO. ・UN agencies and NGO 1) World Bank (Pacific Disaster Risk Financing and Insurance Program, Resilience to Climate Change) 2) AusAID (Awareness raining through NGO) 3) Red Cross (Vulnerability Assessment, Risk Reduction, Disaster Response Plan, etc. targeting villages) 4) UNDP Solomon Office (CBDRM) 5) World Vision (CBDRM) 6) Joint activities of Oxfam, Red Cross, Save the Children (Local Communities Adapting to Climate Change)	NDMO, SIMS, WRD interview Expert Interview
	4.4 Any positive/negative impact brought about by the Project	・Poverty reduction ・Environmental protection ・Gender equality ・Any other impacts	NDMO, SIMS, WRD interview Expert Interview Tamboko VDC hearing
Sustainability	5.1 Prospect from institutional viewpoint	・Reflection of the National Disaster Risk Management Plan into the revision of National medium-term Development Program ・Input from the Project into the National Disaster Risk Management Plan ・Observation of NDMO's commitment (reference in document/plan, speech and remarks at meetings/seminar, activities on their own budget, etc.) ・Arrangement among relevant organizations on project activities (MOU, role and responsibility to issue alert, responsible section of evacuation drill)	NDMO Interview NDMO Interview NDMO Interview NDMO, SIMS, WRD Interview

		• Preparation of TOR for regular meeting among relevant organizations • Establishment of Protocol to issue alert and its sustenance. • The establishment of Village Disaster Committee (Contents of Villager Disaster Risk Plan) is consistent with the instruction of the Guidebook?	NDMO Interview NDMO, SIMS, WRD Interview Expert Interview
	5.2 Prospect from technical viewpoint	• Maintenance of equipment installed in the fields 1) Responsibility of WRD, Village Disaster Committee, NDMO 2) Transportation and allowance of WRD's officer to visit Tamboko village for inspection 3) Checklist, filing of the records 4) Procedures when the equipment is damaged or stole, affordability of spare parts 5) Procedures is consistent with the Guidebook 6) Coordination with the JOCV attached to NDMO • The ownership of all the document prepared in the Project (responsible section, management of original file, budget to duplicate the copy, agreement of cooperation in case of revision, etc) • Schedule towards the completion of Guadalcanal Province Disaster Management Plan (including attachment such as the list of provincial resources) • Technical capacity to sustain flood forecast model run-off model • Training opportunities to refresh and update skills/knowledge	NDMO, WRD Interview Expert Interview Expert Interview NDMO, SIMS, WRD Interview Guadalcanal PDC Interview NDMO Interview WRD Interview NDMO, SIMS, WRD Interview
	5.3 Prospect from Human Resource viewpoint	• Continued assignment of responsible persons 1) Current NDMO's staff is 18 2) Current SIMS's staff is 45 3) Current WRD's staff is 5 (?) • Development of human resources through the Project activities (counterpart, community leader) • Possibility of staff increase • Collaboration with other organizations	NDMO, SIMS, WRD Interview
	5.4 Prospect from Funding viewpoint	• Yearly budget allocation • Possibility of external financing from donor/private sector	NDMO, SIMS, WRD Interview

添付資料8：プロジェクトセミナー及び国際ワークショップ発表資料

The Strengthening Community-Based Disaster Risk Management Project In The Pacific Region

Project Seminar

Suva

21 January, 2011

National Disaster Management Office,

Ministry of Provincial Development, Multi Ethnic Affaires, National Disaster Management and Sugar

Japan International Cooperation Agency (JICA)

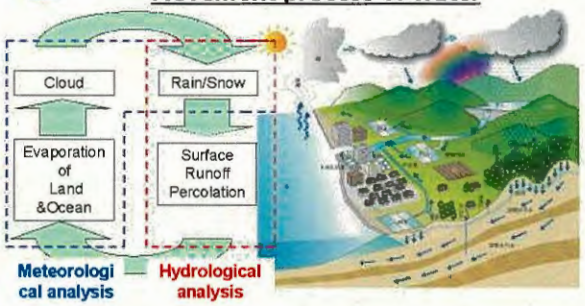
National Disaster Management Office,
The Republic of Fiji Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

Runoff Analysis

'Hydrological analysis' on hydrologic Cycle

Movement process of water



An activity program of Hydrological Analysis

Hydrological Analysis

- Collection of observation data for runoff analysis
- *Rainfall Analysis*
- *Runoff Analysis*
- *Hydraulic Accounting*
- *Evacuation standard*

Contents of today's presentation

- **How to collect observation data for runoff analysis.**
- **About 'Rainfall Analysis'**
- **About 'Runoff Analysis'**
- **Outlook for the future**

Collection of Observation data for runoff analysis

3 points of how to collect **Rainfall data** for using runoff analysis

Point 1 How to choice rainfall st. 1

It is necessity to choice rainfall stations in large numbers and well-balanced.

Point 2 How to choice rainfall st. 2

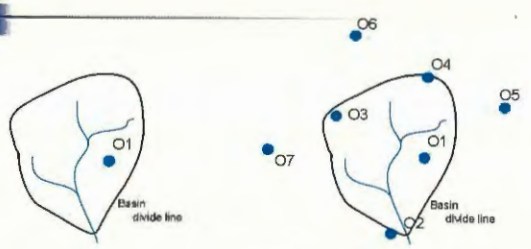
It is necessity to collect data from rainfall station recorded in long terms.

Point 3 How to search Flood term

Using 'daily data' , Searching past floods term.

Collecting 'hourly data' during flood term for analyze flood runoff.

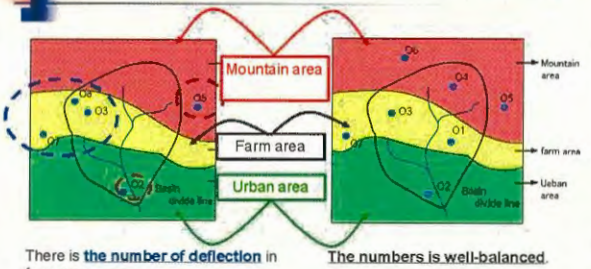
Point 1 (How to choice rainfall st. 1)



Using only one station's data, **not duplicate** actually surface rainfall in catchment area.

Choosing as much as stations include outside stations nearby basin divide line(O5,O6,O7), **duplicate** actually surface rainfall and **be prehension of average rainfall** in catchment area.

Point 1 (How to choice rainfall st. 1)



There is **the number of deflection** in farm area.

There is **distance deflection**.

The numbers is well-balanced.

The **distance between stations is well-balanced**.

Point 2 (How to choice rainfall st. 2)

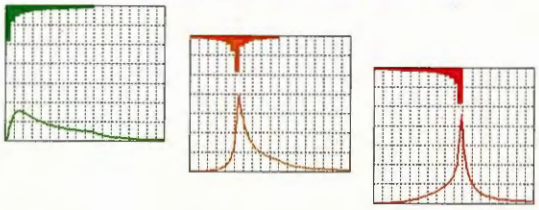
As using the stations' data which recorded for long terms, ...

Get climate of rainfalls' **volume** or **wave shape** at every station.

Point 2 (How to choice rainfall st. 2)

If **rainfall volume is same** but rainfall **shape is different**,

hydrograph shape and peak discharge is different.



Point 3 (How to search Flood term)

Step1

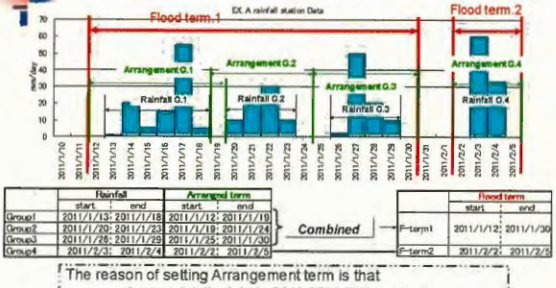
Using collected **daily data**, survey starting date and ending date of flood as one 'Group',

→ 'Flooding Term' is arranged by 'Group'

Step2

Collect **hourly data** during each **'Flooding Term'**

Point 3 (How to search Flood term)



The reason of setting Arrangement term is that observed daily data is 9AM-9PM (24hr=1day)
And
flood concentration time is about 6hour in Ba river

2 points of how to collect **Waterlevel** data for using runoff analysis

Point 1 How to choice waterlevel st.

Choice important point in order to hydraulics or flood defense.

Point 2 How to search Flood term

Flood term or higher level term than usually water level.

Flood is occurrence about 2 or 3 time per 1year.

Point 1 (How to choice waterlevel st.)

What is importance in order to hydraulics?

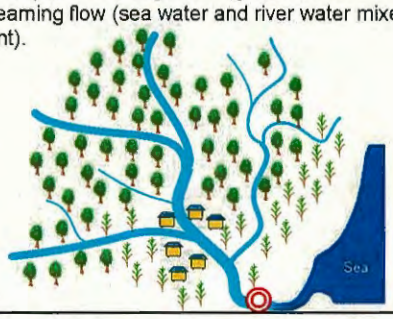
1. Big tributary junction section.
2. The point of change to Diagonal flow or Streaming flow (sea water and river water mixed point).
3. The important place for flood defense.

Point 1 (How to choice waterlevel st.)

1. After big tributary junction section.

Point 1 (How to choice waterlevel st.)

2. The point of change to Diagonal flow or Streaming flow (sea water and river water mixed point).



Point 1 (How to choice waterlevel st.)

3. The important place for flood defense.

Rainfall Analysis

Objective of rainfall analysis

When a flood control plan or water utilization program, Rainfall Analysis is given basis of flood force.

- Step1

  Average depth of rainfall over area

  →Data for calculation of the design discharge

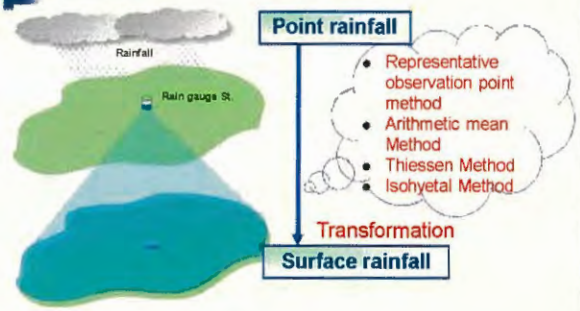
- Step2

  Probable rainfall

  →Measure of past flood damage scale

  →Basis for lowering flood force or damage

Step1 Average depth of rainfall over area Calculation Objectives and Methods

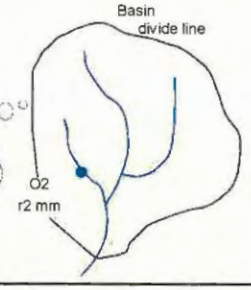


Step1 Average depth of rainfall over area Calculation (1)-Representative observation point method

$r = r_2$

r: Average rainfall(mm)

Only if case as one observation point in catchment area!



Step1 Average depth of rainfall over area Calculation (2)-Arithmetic mean Method

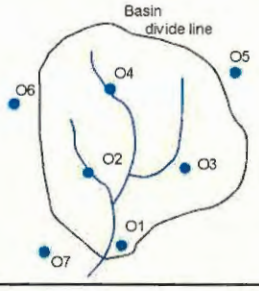
$$r = \frac{r_1 + r_2 + \ldots + r_N}{N}$$

☆ Only use O1 ~O4 at figure

r: Average rainfall(mm)

r_i: Amount of rainfall in each observation point(mm)

N: Number of rainfall observation points in catchment area



Step1 Average depth of rainfall over area Calculation (3)-Thiessen Method

$$r = \frac{a_1 r_1 + a_2 r_2 + \ldots + a_N r_N}{A}$$

$$A = a_1 + a_2 + \ldots a_N$$

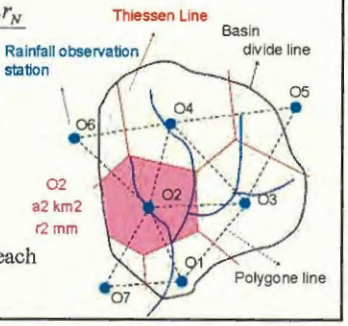
r: Average rainfall(mm)

A: All Basin areas(km^2)

N: Number of rainfall observation points

a_i: Polygonal area(km^2)

r_i: Amount of rainfall in each observatio n point(mm)



Step1 Average depth of rainfall over area Calculation (4)- Isohyetal method

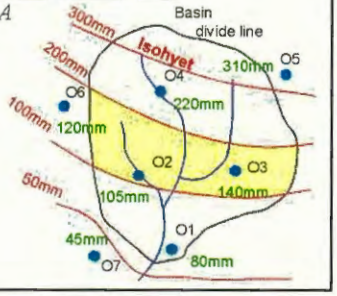
$$r = \frac{b_1(\frac{r_0 + r_1}{2}) + b_2(\frac{r_1 + r_2}{2}) + \ldots + b_M(\frac{r_{M-1} + r_M}{2})}{A}$$

r: Average rainfall(mm)

A: Basin areas(km^2)

b_i: Area of part enclosed by isoneph (km^2)

r_i: Isoneph value(mm)



Step2 Objectives of Probable Rainfall

(1) Average depth of rainfall over area

(2) Flood concentration time (=Tc)

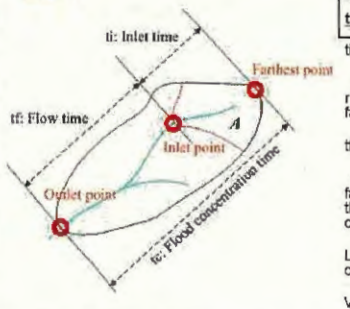
(3) Analysis of Probable Rainfall using annual maximum value about average rainfall for period of Tc

Step2 Probable Rainfall – (1) Average depth of rainfall over area

Using a method mentioned below, make average depth of rainfall over area by observation rainfall data.

- Representative observation point method
- Arithmetic mean Method
- Thiessen Method
- Isohyetal Method

Step2 Probable Rainfall – (2) Flood concentration time



Flood concentration time (tc)

tc = ti + tf

ti =inlet time

time it takes for flow from the remotest point to the inlet point or farthest point of river channel

tf = flow time = L / V

time it takes from the inlet point or farthest point of the river channel to the outlet point or point under consideration

L: Length of river channel from its outlet point to its farthest point (m)

V: flow velocity (m/s)

Step2 Probable Rainfall – (3) Analysis of Probable Rainfall

Rainfall is nature event

Occurrence (return period) of rainfall is accordance with normal distribution

Prehensible of flood scale or flood force is from rainfall's return period

Step2 Probable Rainfall – (3) Analysis of Probable Rainfall

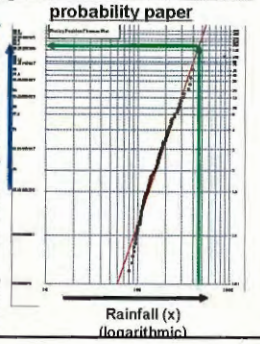
Definement

The relation of Annual maximum rainfall data (X) and Return period (T) roughly become Linear Regression in 'logarithmic-normal distribution probability paper'

(Graph Character)

- **U=0 → F=0.5 → T=2 (return period)**
- **Liner regression (red line in figure)**
- **Reading rainfall (flood) scale change to return period (flood force) in order to red line**

logarithmic-normal distribution probability paper



Runoff Analysis in River

About method of runoff analysis in Ba river

The method of runoff analysis in Ba river is used

'Storage function method'

- Almost occupied mountain area and farm area in Ba river catchment area
- Be able to acquire hydrograph
- Confirmed method

About the model of storage function method

Making new model changed model from 'The Study on Watershed Management and Flood Control for the major VITI LEVU river in the REPUBLIC OF FIJI ISLAND (FINAL report Oct. 1998)'

That why,

- Main points is inundation area in downstream in Ba river
- Reflection of upstream catchment area be wide extend east and west

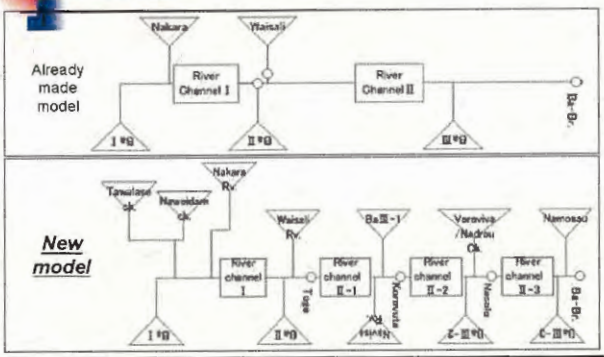
About the model of storage function method

5 watersheds

New model

12 watersheds

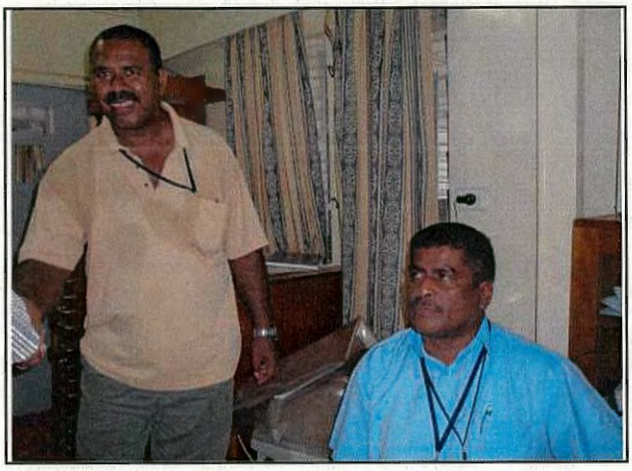
About the model of storage function method



Outlook for the future

Outlook for the future

- **Calculation of discharge and make adjustments to runoff model**
- **Hydraulic Accounting**
- **Calculation of standard water level and standard rainfall for evacuation of flood**



Vinaka Vaka-levu!

Kece tamata

Tetsuhiro Imagawa

Progress in DRM plan component

The strengthening community-based disaster risk management project in the pacific region

January 21, 2011 Suva

Yoshitaka Yamazaki
JICA Project Team

Outline

- Achievement since Nov. 2010
- Findings
- What's next

Achievement 1/4

- Data collection
  - Disaster profile in Fiji
  - Historical flood catalog in Fiji
  - Flood response record
  - Cyclone database
  - Present DRM plan
  - Interviews for capacity assessment
  - Interview on flood experience

Available data

Source	Contents	Period
BOM	Cyclone track	1944-2010
Wikipedia	Cyclone document	1900-2010
FMS	Daily rain	????
Rarawai mill	Daily rain	1905-2008
McGree et.al.	Flood, peak water level	1840-2009
Reliefweb	Response log	1985-2010
NDMO	Situation report	2009?-
Fiji Times	Articles	19xx-2010
EMDAT	Casualty, Affected, Loss	1931-2010

Available data

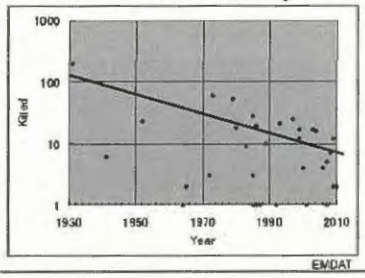
Source	Contents	Period
SOPAC	Post disaster survey	1993-2009
Dr. S. Yeo	Papers on flood in Ba	2000-
Ba DISMAC	Response record	2009-
Ba officers	Response memory	2005-
Ba residents	Flood memory	1965-
You Tube	Flood video	2009
Google earth	Aerial photo	

Disaster profile of Fiji

Type of disaster	# of Events	Killed	Total Affected	Damage (000 US$)
Drought	2	-	147,228	15,000
Earthquake (seismic activity)	2	-	-	-
Flood Unspecified	3	10	77,667	5,500
Flood Flash flood	2	2.5	300	3,500
Flood General flood	4	4.3	2,920	18,437
Flood Storm surge/coastal flood	1	4	-	-
Storm Unspecified	1	1	3,369	25,000
Storm Tropical cyclone	33	15.5	24,952	12,345

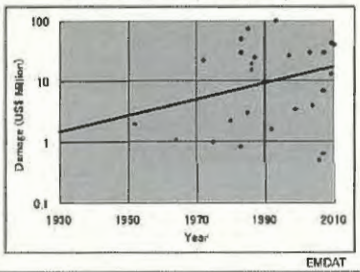
(EMDAT 1900-2010)

Number of killed by natural disaster in Fiji



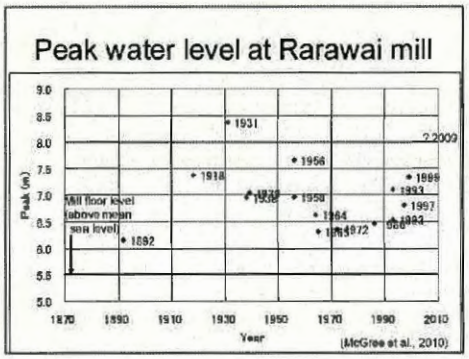
EMDAT

Amount of damage by natural disaster in Fiji



EMDAT

Peak water level at Rarawai mill



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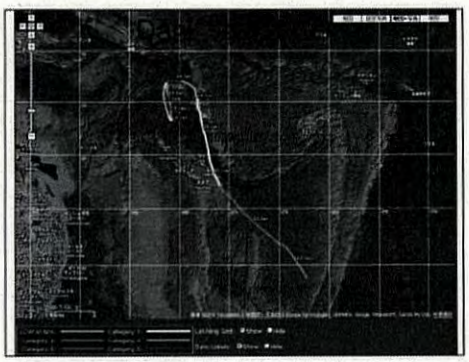

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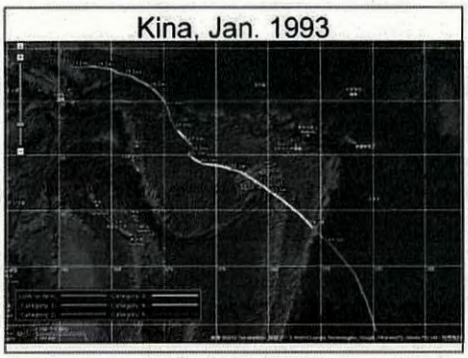
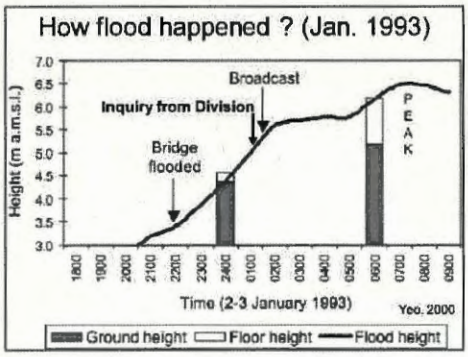
Kina, Jan. 1993

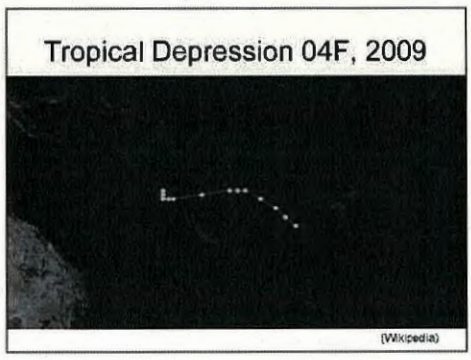


Flood monument at Ba Mill

How flood happened ? (Jan. 1993)



Tropical Depression 04F, 2009



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Ba, Jan. 2009

8

Achievement 2/4

- Manual development
  - Ba flood DRM plan
  - Community flood DRM plan
  - Flood early warning (included in DRM plan)
  - Flood hazard map

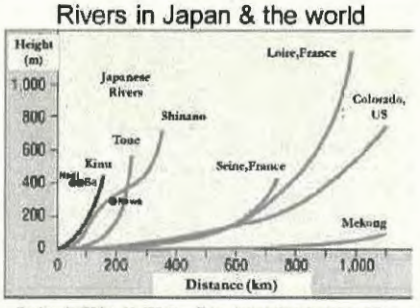
What's new about plan ?

- DM Plan for LOCAL government
  - Reflecting local conditions
- Disaster specific plan with time line
  - Flood disaster, white, yellow, red, & green
- Better use of information
  - Early warning, hazard map, resource map
- Comprehensiveness
  - Including community, lifelines, business

Profile of Ba district

- Steeper river in Viti Levu island
- Ba river divides district
  - Ba bridge disconnected during flood
- Dominant sugar industry
  - Sugar cane suffers major damage
  - Rainfall & water level observation
- Demography
  - Up to 19 year... 36%, 60+ year...7%
  - Indian...54%, Fijian 42%

Rivers in Japan & the world



Ba river: D=70 km, H=400 m ...Even steeper than Japanese rivers

Comparison of rivers

	Fiji	Japan	US
Rain (mm)	(Nadi)1800	1700	760
River	Steep	Steep	Gentle
Land (10^3 km^2)	18	377	9,826
Pop. (million)	0.85	127	293
Pop. Dens /km^2	46	337	30

Who were victims ?

Age	Female	Male	Total
0–18	6	2	8
19–40	4	3	7
41–	2	2	4
	12	7	19

Source: "Report on tropical cyclone Ami", NDMO, March, 2003

Age	Female	Male	Total
0–18	1	2	3
19–40	1	2	3
41–	1	0	1
	3	4	7

Source: "Report on January 2009 Flood ", NDMO, 2009

Flood hazard map

- Basic information
  - Topography, River, Road
- Disaster resources
  - School, hospital, church, mosque
  - Police, Fire station, town council
  - Market, shops
  - Evacuation route
- Inundated area
  - Historical flood

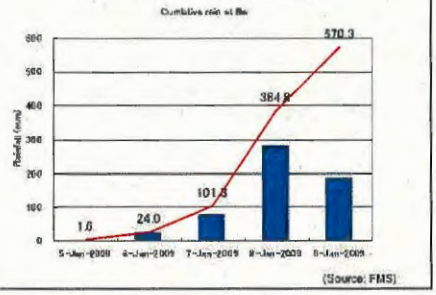
Achievement 3/4

- Disaster resource listing
  - 31 Schools
    - Capacity, contact, structure, No. of floors
  - 5 Health facilities
    - No. of bed, contact, structure, No. of floors
  - ? Police stations
    - No. of police, vehicles

Achievement 4/4

- Tabletop disaster exercise
  - Scenario...2009 flood
  - Base map...2009 flood map (1/50,000)
  - Members ... Ba gov't, community, business
  - Planned on Jan. 13 at Ba DISMAC, but
  - Canceled due to approaching flood

Rainfall in Jan. 2009



Strength

- NDMO is in Min. provincial development
- Well documented disaster response
- DM plan exists in Health & Red Cross
- Drafted Ba district DM plan exists
- Long term observation data in Ba mill
- Flood study & catalog by Dr. Yeo
- Inundation map by SOPAC

What's next

- Further analysis of past disaster
  - Case study of major floods
  - Categorization of disaster
  - Survivors' story
- Improvement of manuals
  - Opinions from Ba residents
  - Early warning mechanisms
- Compilation of disaster resources
  - Location, safety against flood
  - Designation to community
- Simulation exercise
  - Testing manual & hazard map

Your comments to: yamazaki@oyointer.com

Thank you !

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Issues

- Flood warning mechanism yet to define
- Weather information not fully used
- Weak in preparation in DRM
- Charm process not used for DRM
- Resource not interconnected
- Large scale map unavailable

Issues in flood warning

- When to issue ?
  - Threshold level ?
  - Warning stage
  - Evacuation stage
- Who will issue ?
  - Suva ? Lautoka ? Ba ?
  - PWD ? DISMAC ? FMS ?
- How to issue ?
  - Radio, TV, mobile, Police, NFA, church etc...
- Informal warning vs Formal warning ?

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Annex one:
List of Participants: Project Seminar Jan. 21st, 2011 Suva, Fiji

	Name	Organization	Position	Contact
1	Rajendra Prasad	UNESCO/IOC & SOPAC	National Programme Officer	Phone: 3381377
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25	Ashork Kumar	Water Authority of Fiji	Team Leader	
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The Strengthening Community-Based
Disaster Risk Management Project
In
The Pacific Region

Info-Sharing Seminar

Kitano Mendana Hotel, Honiara

2nd February 2011

National Disaster Management Office

Ministry of Environment, Climate Change,
Disaster Management and Meteorology

National Disaster Management Office,
The Solomon Islands

Japan International Cooperation Agency (JICA)

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

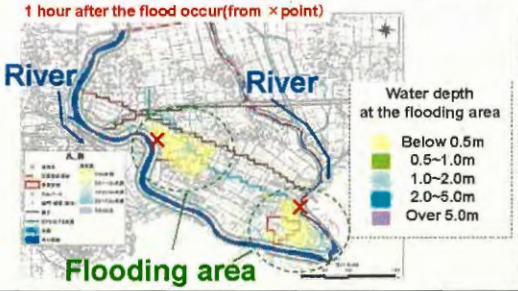
Run-off Analysis

Tomohiro Umeki

Case Study in Japan

➢ **Real Time Flood Forecasting using rainfall prediction by Lader rainfall**

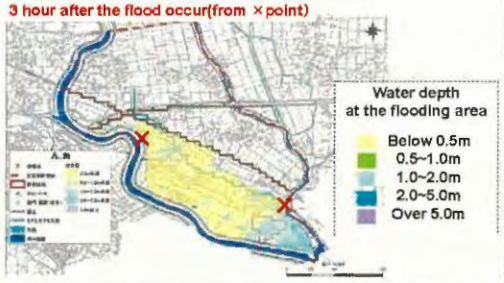
1 hour after the flood occur(from × point)



Case Study in Japan

➢ **Real Time Flood Forecasting using rainfall prediction by Lader rainfall**

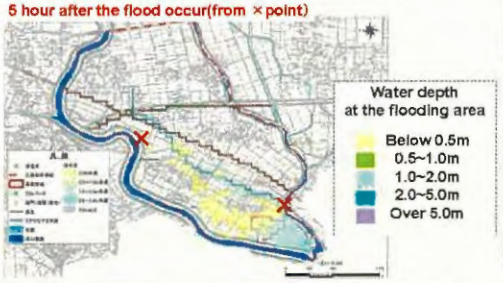
3 hour after the flood occur(from × point)



Case Study in Japan

➢ **Real Time Flood Forecasting using rainfall prediction by Lader rainfall**

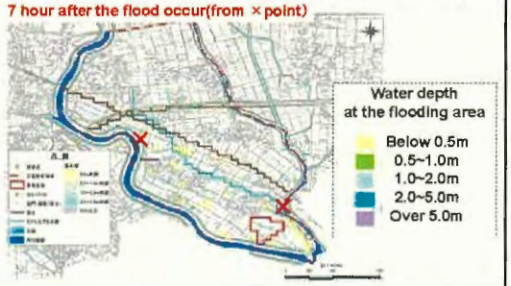
5 hour after the flood occur(from × point)



Case Study in Japan

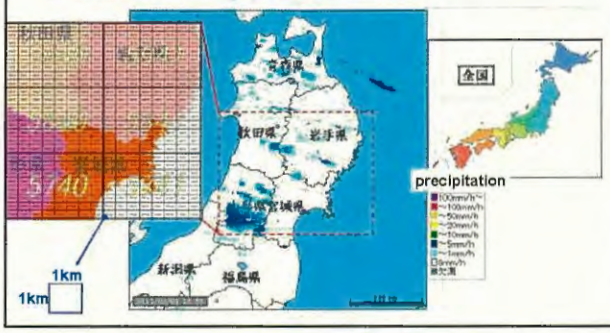
➢ **Real Time Flood Forecasting using rainfall prediction by Lader rainfall**

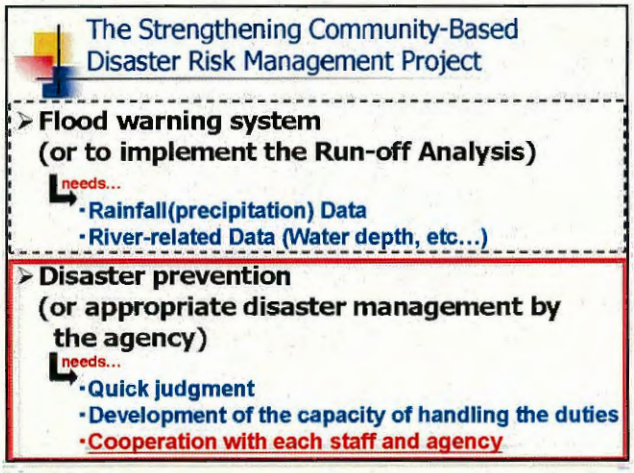
7 hour after the flood occur(from × point)



Case Study in Japan

➢ **What is "Lader rainfall"...??**




The Strengthening Community-Based
Disaster Risk Management Project
Flood warning system
(or to implement the Run-off Analysis)
needs...
・Rainfall(precipitation) Data
・River-related Data (Water depth, etc...)
Disaster prevention
(or appropriate disaster management by
the agency)
needs...
・Quick judgment
・Development of the capacity of handling the duties
・Cooperation with each staff and agency

Japan International Cooperation Agency (JICA)

National Disaster Management Office,
The Republic of Fiji Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

Background of the Project

* Due to geographical and topographical factors, the Pacific region is vulnerable to natural disasters
* Insufficient telecommunications links
* Flood forecasting in specific areas and rivers, not yet
* Transmitting disaster information and warnings not perfect
* Lack of infrastructures and poor means of warnings, the community is still vulnerable

Improvement of Early Warning System

One of the Project Objective

- NDMO
- Ministry of Provincial Development
- Multi Ethnic Affairs
- National Disaster Management &Sugar
- Ministry of Works
- Transport & Public Utilities

District Office

TV
Radio
Newspaper
Internet

COMMUNITY

Fiji Meteorological Service & Water Authority Fiji
Early Warning Information

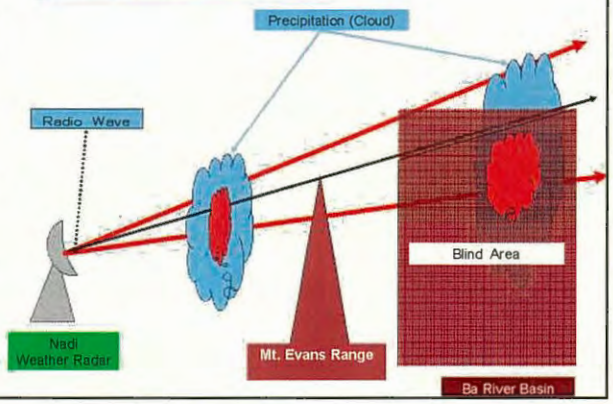
To Improve Weather Information

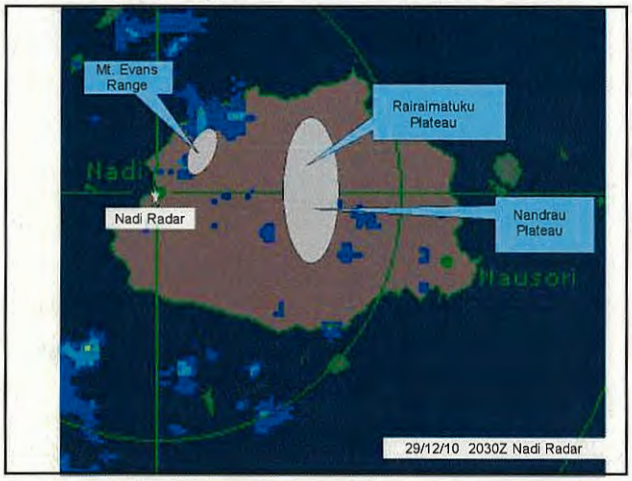
▸ Accurate Weather Forecast and Exact Early Warning are requested ◂

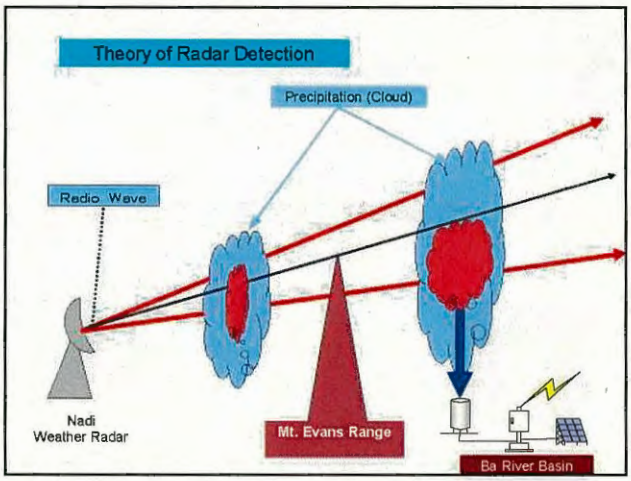
To realize

Improved Real Time Observation system is indispensable

Theory of Radar Detection





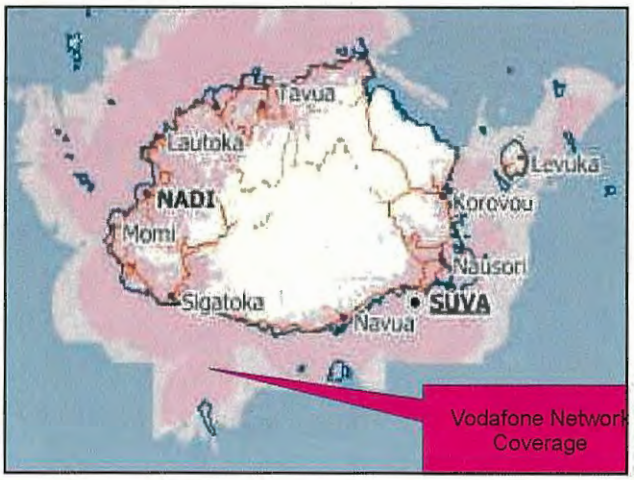


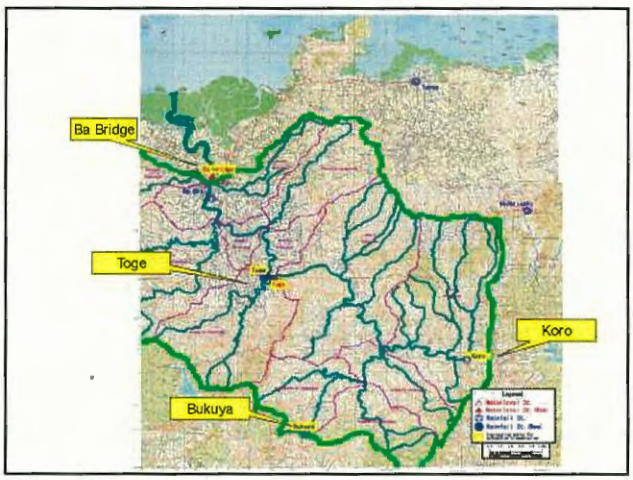
TO REALIZE RELIABLE
REAL TIME OBSERVATION SYSTEM

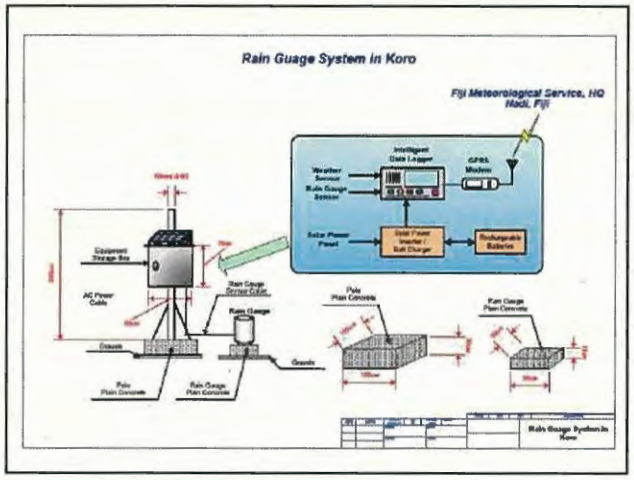
Reliable Observation Instruments and Reliable Communication System are Required

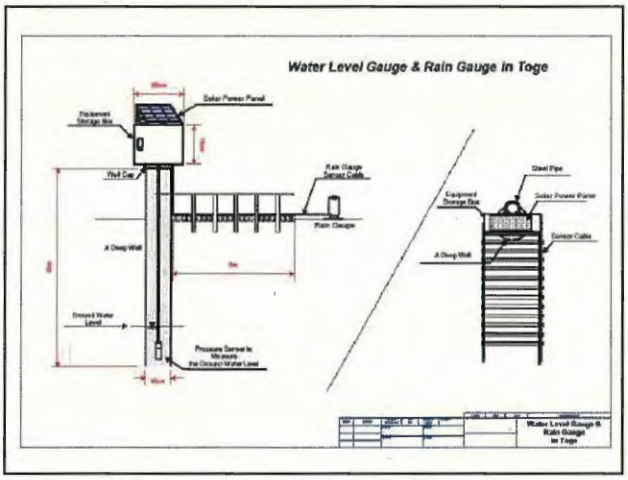
FMS and WAF are now employing Vodafone Network for Real Time data transmission system of Rain Gauge and of Water Level Gauge.

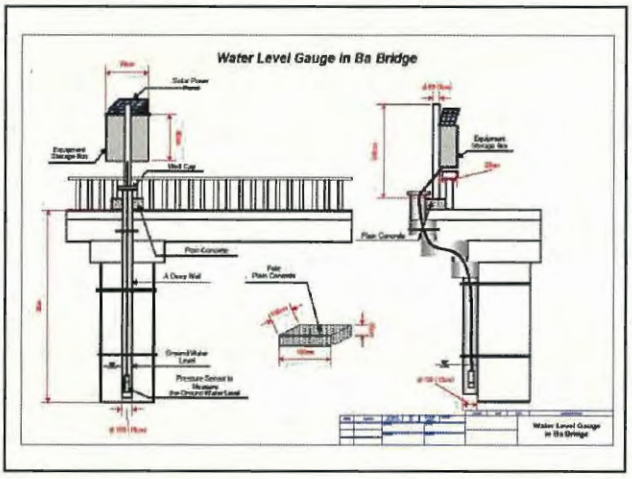
The quality of the Vodafone network is good but there is limitation of Network Coverage.

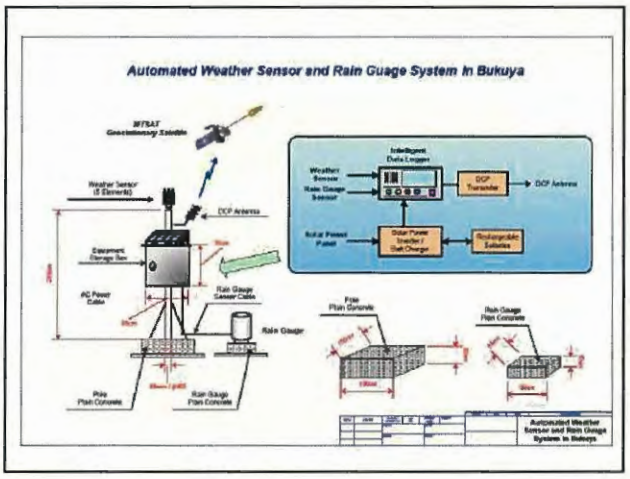


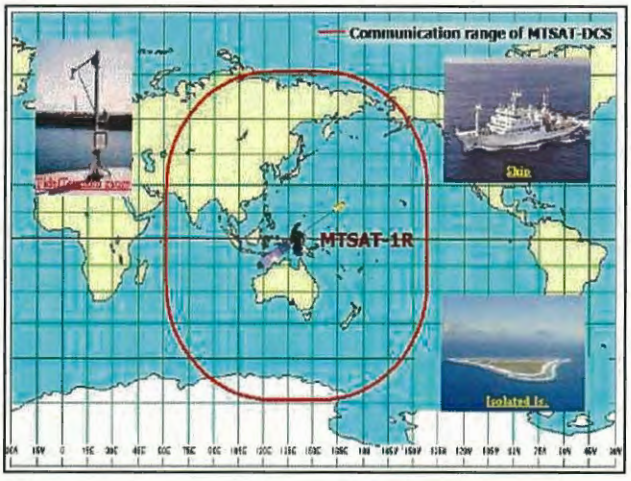


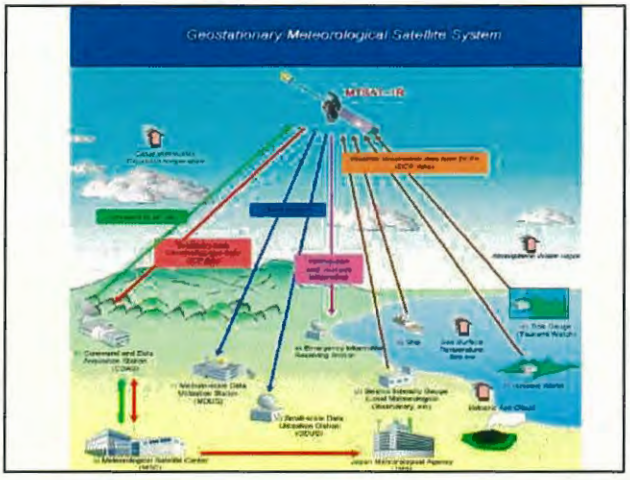

Rain Guage System in Koro
Fiji Meteorological Service, HQ
Nadi, Fiji

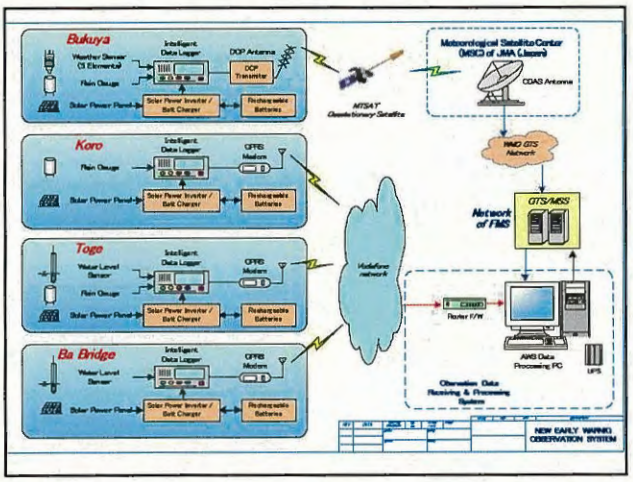

Water Level Gauge & Rain Gauge in Toge


Water Level Gauge in Ba Bridge


Automated Weather Sensor and Rain Guage System in Bukuya


Communication range of MTSAT-DCS
MTSAT-1R
Ship
Isolated Is.


Geostationary Meteorological Satellite System
MTSAT-1R



Establishment of Simplified Warning System In Target Community

Nawaqarua and Nasoro

Objective

- Promote greater awareness prior to flooding
- Complementary warnings from government agencies
- Teaching the principles of hydrological monitoring to young engineers

Simplified Water Level Gauge Simplified Rain Gauge

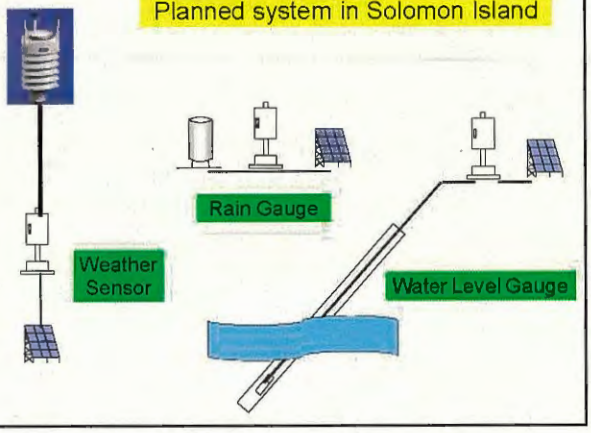
Expected Fruits

The Quality of Early Warning Information Will be Improved.

The Communication Structure between Government and Community Will be Improved.

Contribution to Disaster Damage Mitigation

Planned system in Solomon Island



AUTOMATIC WEATHER MEASUERMENT SENSOR

WIND SPEED/DIRECTION	
SPEED	0 – 60 m/S
DIRECTION	0° - 360°
PRECIPITATION	
AMOUNT(RESOLUTION)	0.01mm
INTENSITY	mm/h,etc
PRESSURE	600 — 1100hPa
TEMPERATURE	-52 — +60° C
HUMIDITY	0 — 100%

Thank you

Arigatou

Tetsuro Fukui

Progress in DRM plan component in Fiji

The strengthening community-based disaster risk management project in the pacific region

February 2nd, 2011 Honiara

Yoshitaka Yamazaki
JICA Project Team

1

Available data

Source	Contents	Period
BOM	Cyclone track	1944-2010
Wikipedia	Cyclone document	1900-2010
FMS	Daily rain	????
Rarawai mill	Daily rain	1905-2008
McGree et.al.	Flood, peak water level	1840-2009
Reliefweb	Response log	1985-2010
NDMO	Situation report	2009?-
Fiji Times	Articles	19xx-2010
EMDAT	Casualty, Affected, Loss	1931-2010

2

Achievement 1/4

- Data collection
  - Disaster profile in Fiji
  - Historical flood catalog in Fiji
  - Flood response record
  - Cyclone database
  - Present DRM plan
  - Interviews for capacity assessment
  - Interview on flood experience

Available data

Source	Contents	Period
SOPAC	Post disaster survey	1993-2009
Dr. S. Yeo	Papers on flood in Ba	2000-
Ba DISMAC	Response record	2009-
Ba officers	Response memory	2005-
Ba residents	Flood memory	1965-
You Tube	Flood video	2009
Google earth	Aerial photo	

3

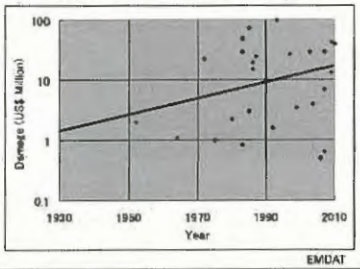
Disaster profile of Fiji

Type of disaster	# of Events	Killed	Total Affected	Damage (000 US$)
Drought	2	-	147,228	15,000
Earthquake (seismic activity)	2	-	-	-
Flood Unspecified	3	10	77,667	5,500
Flood Flash flood	2	2.5	300	3,500
Flood General flood	4	4.5	2,920	18,437
Flood Storm surge/coastal flood	1	4	-	-
Storm Unspecified	1	1	3,369	25,000
Storm Tropical cyclone	33	15.5	24,952	12,245

(EMDAT 1900-2010)

4

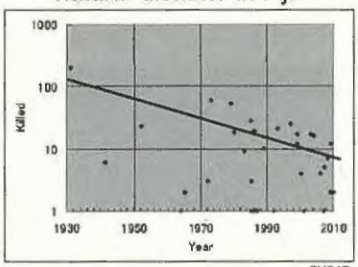
Amount of damage by natural disaster in Fiji



EMDAT

5

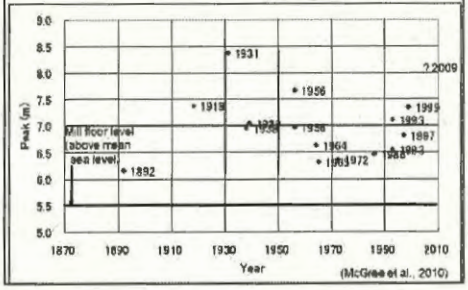
Number of killed by natural disaster in Fiji



EMDAT

6

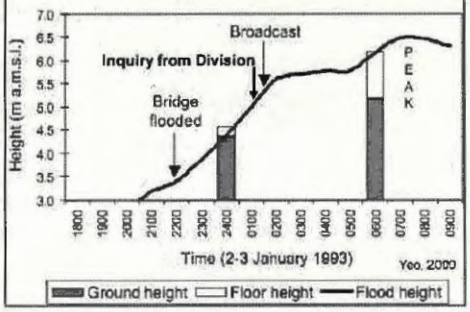
Peak water level at Rarawai mill



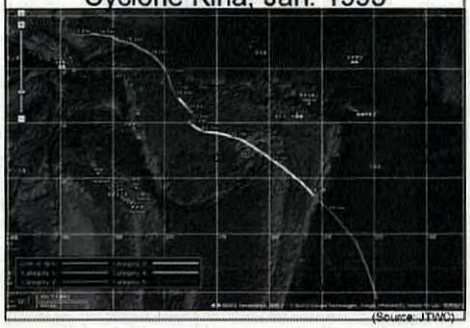
(McGree et al., 2010)

1931 Flood monument at Ba Mill

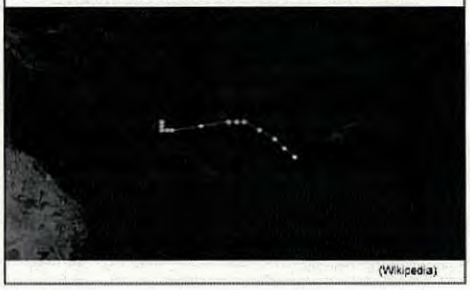
How flood happened ? (Jan. 1993)



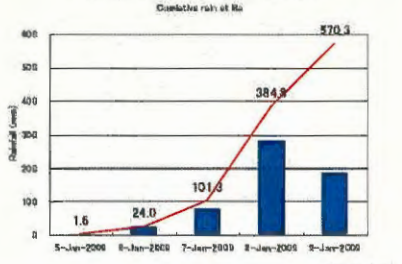
Cyclone Kina, Jan. 1993



Tropical Depression 04F, 2009



Rainfall in Jan. 2009



Achievement 2/4

- Manual development
  - Ba flood DRM plan
  - Community flood DRM plan
  - Flood early warning (included in DRM plan)
  - Flood hazard map

Ba, Jan. 2009

What's new about plan ?

- DM Plan for LOCAL government
  - Reflecting local conditions
- Disaster specific plan with time line
  - Flood disaster, white, yellow, red, & green
- Better use of information
  - Early warning, hazard map, resource map
- Comprehensiveness
  - Including community, lifelines, business

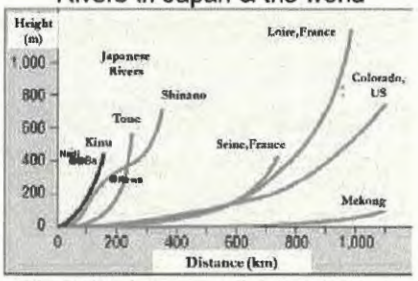
Profile of Ba district

- Steeper river in Viti Levu island
- Ba river divides district
  - Ba bridge disconnected during flood
- Dominant sugar industry
  - Sugar cane suffers major damage
  - Rainfall & water level observation
- Demography
  - Up to 19 year... 36%, 60+ year...7%
  - Indian...54%, Fijian 42%

Comparison of rivers

	Fiji	Japan	US
Rain (mm)	(Nadi)1800	1700	760
River	Steep	Steep	Gentle
Land (10^3 km^2)	18	377	9,826
Pop. (million)	0.85	127	293
Pop. Dens /km^2	46	337	30

Rivers in Japan & the world



Ba river: D=70 km, H=400 m ...Even steeper than Japanese rivers

Who were victims ?

Age	Female	Male	Total
0–18	6	2	8
19–40	4	3	7
41–	2	2	4
	12	7	19

Source: "Report on tropical cyclone Ami", NDMO, March, 2003

Age	Female	Male	Total
0–18	1	2	3
19–40	1	2	3
41–	1	0	1
	3	4	7

Source: "Report on January 2009 Flood ", NDMO, 2009

Flood hazard map

- Basic information
  - Topography, River, Road
- Disaster resources
  - School, hospital, church, mosque
  - Police, Fire station, town council
  - Market, shops
  - Evacuation route
- Inundated area
  - Historical flood

Achievement 4/4

- Tabletop disaster exercise
  - Scenario...2009 flood
  - Base map...2009 flood map (1/50,000)
  - Members ... Ba gov't, community, business
  - Planned on Jan. 13 at Ba DISMAC, but
  - Canceled due to approaching flood

Achievement 3/4

- Disaster resource listing
  - 31 Schools
    - Capacity, contact, structure, No. of floors
  - 5 Health facilities
    - No. of bed, contact, structure, No. of floors
  - ? Police stations
    - No. of police, vehicles

Strength

- NDMO is in Min. provincial development
- Well documented disaster response
- DM plan exists in Health & Red Cross
- Drafted Ba district DM plan exists
- Long term observation data in Ba mill
- Flood study & catalog by Dr. Yeo
- Inundation map by SOPAC

Issues in flood warning

- When to issue ?
  - Threshold level ?
  - Warning stage
  - Evacuation stage
- Who will issue ?
  - Suva ? Lautoka ? Ba ?
  - PWD ? DISMAC ? FMS ?
- How to issue ?
  - Radio, TV, mobile, Police, NFA, church etc...
- Informal warning vs Formal warning ?

Synergy with donors ?

- Health
- Education
- Environment
- Infrastructure

Your comments to; yamazaki@joyointer.com

Thank you !

Question and Answers

for the Seminar on
the Strengthening Community-based Disaster Risk Management Project
in the Pacific Region
(2nd February at Kitano Mendana Hotel)

1. Hydrological Analysis (Mr. IMAGAWA Tetsuhiro)

- Involves a lot of Infrastructure. What will JICA do to ensure operations and maintenance of the Infrastructure after the project?

Answer: We think a technical transfer is different from a supplying constructed material even both are required. The important purpose of our project is that the Engineers in Solomon Islands by own shall be able to analyze a flood discharge or administrate necessary structural measures. We hope them to have done so after the project.

- Understood basics, but still wasn't sure about exact ways of measuring and analyzing runoff and how this forms a basis for program interventions.

Answer: Our project includes a technical transfer to CP. The technical transfer requires long time for its success, and shall translate CP from basic knowledge about runoff analysis. In the future we will arrange the program through CP meeting.

- Good case study and good explanation of processes needed for Solomon Islands case.
- Presentation is satisfactory except that is a bit too fast. Was the establishment in Fiji a success?

Answer: Both of Solomon Islands and Fiji are 'island's country', and the physical feature has also same trend. I think the technical transfer of runoff analysis in Solomon Island will take the same process as Fiji.

- Is there data available on rainfall patterns in Tamboko village? Can you rely on oral history for information about rainfall patterns and flood events?

Answer: I have no rainfall data in Tamboko village. There is no rainfall observation station at Tamboko village in the River basin of Umasani, we will install a new one in this project.

- Very technical presentation. If the definition can be more clear i.e. all the analysis speaker is clear to hear.

Answer: It is difficult showing easily about technical contents in short time. We will work together with the Counterparts in Solomon Islands for the technical transfer of runoff analysis, paying attention to your advice.

2. **Water Level Monitoring (Mr. UMEKI Tomohiro)**

- This was a good presentation to answer the questions I had from previous presentation.

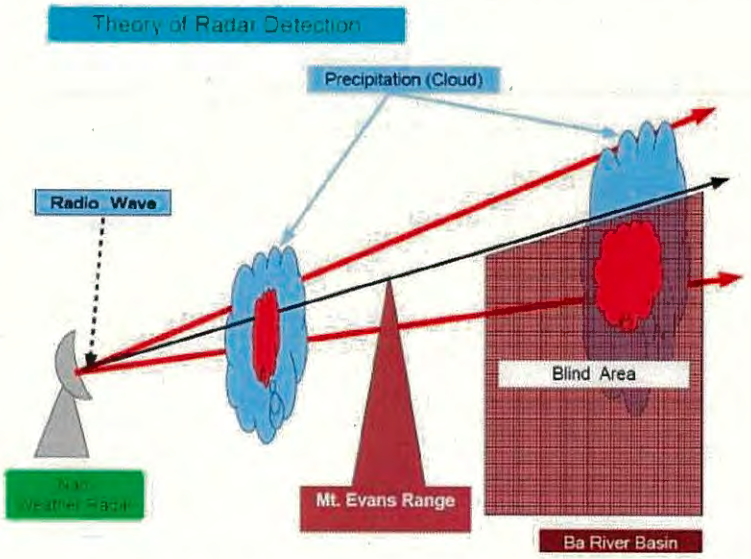
Answer: Thank you for the comment.

- Good system- however, it would be good if the local targeted community is aware well to ensure this project is successful.

Answer: Thank you for the comment. We'll try our best to conduct our project with our counterparts and the local targeted community all together.

- What is Lader Rainfall? Is it Radar Based? Is it a Global Model? Can it be used in Meteorological service in Solomon Island?

Answer: Yes, Radar Rainfall means "Observed rainfall by Radar". I misspelled on my presentation slides, it was supposed be "Radar", not "Lader"... Mr. Fukui explained how the Radar observes the rainfall (refer to the figure below). Radar must be installed at each site and no Radar for observing rainfall is installed in Solomon Islands so far.



- Do Solomon Islands have sufficiently detailed rainfall forecasting to allow flood prediction on river by river bases? How can communities forecast flooding without relying on data from central offices?

Answer: I think, someone answered for this question and he answered that Solomon Islands can forecast the rainfall. Reliability of forecast flooding will increase, if we can use the high-tech equipments and systems and reliable data, however we can forecast the flooding using simplified Water Level Gauge and Rain Gauge, too.

- If you can speak a bit loudly. Presentation is easy to follow and is clear to follow.

Answer: Thank you for your advice. I'll try to speak louder next time.

3. **Real Time Observation system (Mr. FUKUI Tetsuro)**

- It looks like the quality of this project requires infrastructure in communication and metrology services that are way above current levels of Solomon Island infrastructure. Will you rely on satellite system? How will JAICA improve this- or use existing infrastructure to get good project results?

Answer: Based on the preliminary survey which was conducted by JICA, the project team planed to install "Stand alone type observation instruments". These are consisting of a Weather Sensor, a Rain Gauge and two Water Level Gauges. These instruments are installed automatic data recorders, then we have to go the observation stations to collect these data periodically. To realize the reliable warning system, **accumulated correct** data are indispensable for analysis. This is the first step in Solomon Island.

- Radar forecasting would be ideal, if system is installed in Solomon Islands.

Answer: This theme shall be considered.

- What is the range of the Radar? How durable are the Simplified Rain gauge and Water level gauge?

Answer: The standard Weather Radar can observe 250 ~ 300 km. The life time of the gauges depend on the maintenance.

- This system seems to be very technology dependent- do Solomon Islands have the necessary technological capacity? What are the running costs of using mobile/satellite networks for communicating real time data?

Answer: The answer is same as above.

- Very clear presentation and easy to follow.

4. **Regional disaster Management Plan (Mr YAMAZAKI Yoshitaka)**

- This was an excellent presentation with great information. Thank you.
- It would be good if local knowledge is captured in this.

Answer: NDMO staff in Suva is trying to collect traditional knowledge.

- What is the general threshold level for issuing of flood warnings?

Answer: Threshold will be on the basis of rainfall and water level. However, it depends on the geology, vegetation, topography of the river. Besides there are several indexing for rainfall, daily, hourly, and cumulative. It will be evaluated using past available data by our technical staffs.

- If you don't have detailed historic flooding data for Temoko. Will it be possible to plot a timeline for flooding risk? What specific capacity building has been done with NDMO? Is the DRM Methodology transferable by NDMO staff to other regions?

Answer: I am trying to explore historic flooding data in Tamboko, if any, by various ways. NDMO staffs now understand profile of disaster, flood, and district. They will be

discussing draft district flood disaster management plan until June. I believe our DRM methodology can be applied to other regions as well, if sufficient data collection and analysis distributed elsewhere is made.

- Excellent and very clear.

5. **Community-based Disaster Mgt (Mr KANAYA Masaaki)**

- Communities have limited resource that limits their participation in effective CBDM. What is the project doing to address this resource constraint?

Answer: At first, we go into their community to collect their needs and information about not only disaster also other issues they face. Then we will elaborate the disaster management plan harmonized with their lifestyle at maximum in cooperation with the communities. We may take much time to spend with them in the first half of the Project to grasp their real needs, which would be an origin at a series of changing.

- Another great presentation which explained the project well. Thank you.
- Good information to be shared with stakeholders.
- Has a baseline study been held in Tamboko.
- It would be interesting to know how you have worked with communities to develop CBDRM and whether the community's expecting of a CBDRM are consistent with the NDMO's. Is any adaptation to minimize risks part of the project? Overall, very interesting presentations, but perhaps the workshop would have been better after several months of implementation in the Solomon Islands, Particularly as it seems that Fiji is more technologically advanced then Solomon Islands.

Answer: As per adaptation, we need to be careful to make any change to nature. But small scale structural measures may be considered for the community activities.

- Clear to follow.

End

Participants Attenting the Info-Sharing Serminar on SCBDRM Project, Feb. 2nd 2011, Honiara, Solomon Islands

No.	Organisation	Title	First Name	Last Name	Position	Phone	email
1	NDMO	Mr	Loti	Yates	Director	27936	directorndc@solomon.com.sb
2	NDMO	Ms	Janet	Prakash	Chief Administration Officer	27936	chiefadminndc@solomon.com.sb
3	Met Service	Mr	Freddy	Ferah	Chief Forecaster	7499165	
4	Water Resource Division	Mr	Charlie	Bepapa	Director	21522	bepapa_charlie@hotmail.com
5	Water Resource Division	Mr	Michael	Maehaka	Senior Hydrologist	21522	Maehaka_Michael@yahoo.co.uk
6	UNDP	Mr	Caxton	Etii	Programme Analyst	7509907	caxton.etii@undp.org.
7	UNDP	Mrs	Stella	Tuhaika	Programme Analyst	7473783	stella.delaiverata-@undp.org
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9	UNICEF	Ms	Martha	Misake		27446	mmisake.unicef@gmail.com
10	UNICEF	Ms	Anika	Kingmele		27446	akingmele.unicef@gmail.com
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12	AUSAID	Ms	Judy	Tarailopo	Assistant Program Manager	25161	judy.tarailopo@ausaid.gov.au
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14	Oxfam, Australia	Ms	Katie	Greenwood	Deputy Country Representative	7445096	katieg@oxfam.org.au
15	Save the Children, Australia	Ms	Niamh	Murnaghan	Country Director	22400	cd@savethechildren.org.sb
16	YEC	Mr	Tetsuhiro	Imagawa	JICA Expert		
17	YEC	Mr	Testuro	Fukui	JICA Expert		
18	YEC	Mr	Tomohiro	Umeki	JICA Expert	7556218	tompirot@yahoo.co.jp
19	OYO	Mr	Yoshitaka	Yamazaki	JICA Expert	7563899	yamazaki@oyointer.com
20	JICA	Mr	Masaaki	Kanaya	JICA Expert		

National Disaster

Management Office

Solomon Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

Project Seminar

March 11, 2011

National Disaster Management Office
Solomon Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

"Project Seminar"

March 4, 2011

Dear Sir/Madam,

National Disaster Management Office (NDMO) together with the Expert Team dispatched by Japan International Cooperation Agency (JICA) would like to invite you to Project Workshop on March 11th, from 9AM to 12PM at Flamingo conference room in Honiara Hotel. This is a part of a program in "Strengthening community-based disaster risk management project in Pacific region", sponsored by JICA.

Our counterparts from NDMO, Meteorological Service and Water Resource Division would like to make a presentation about the outcomes of the project activities we have conducted in the first year at the seminar. As for the time schedule of the day, please check the attached schedule. Please kindly reply your attendance to our secretary Ms. Yvonne (TEL: 7429009) or mail to:Yvonne.Aitorea@gmail.com.

Your cooperation on this matter will be highly appreciated.

Sincerely Yours,

Loti Yates
Director, NDMO

KAMEYAMA Tsutomu
Chief advisor, JICA Project

Project Seminar

for The Strengthening Community-Based Disaster Risk Management Project

Flamingo Conference Room
Honiara Hotel
March 11, 2011

Program

TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
0900-0930	**Registration**		*NDMO*
0930-0940	**Opening Remarks**	Welcome Greeting	*Mr. Loti Yates, Director of NDMO* *Mr. Yoshinobu Takishita* *Representative of JICA Honiara*
0940-1000	**Session 1:** **Meteorological Activity** **for Outcome 1**	(1) Meteorological Events & Flood Disaster (2) Weather Forecast/Warning	*Mr. Festus Ahikau* *Mr. Freddy Ferah* *Solomon Meteorological Service*
1000-1020	**Session 2:** **Hydrological Activity** **for Outcome 1**	Rainfall Analysis Flood Runoff Model River Survey	*Mr. Michael Maehaka* *Water Resources Division*
1020-1040	**Tea Break**		
1040-1100	**Discussion**		*All Participants*
1100-1120	**Session 3:** **DM Plan Preparation** **for Outcome 2**	Provincial Flood Disaster Management Plan	*Ms. Janet Prakash,* *Deputy Director of NDMO*
1120-1140	**Session 4:** **Action at Tamboko** **for Outcome 3**	Social Survey Public Awareness for Preparedness	*Mr. Herrick Savusi* *Guadalcanal* *Provincial Disaster Coordinator*
1140-1200	**Discussion**		*All Participants*
1200-1210	**Session 5:** **Closing Remark**	General Evaluation of Presentation	*Mr. Yoshinobu Takishita* *Representative of JICA Honiara*
1210-1300	**Lunch**		*All Participants*

Activity for Outcome 1

(1) Develop Flood Forecasting Capacity of Met. & W.R.D

- ✓ strengthen the capacity to collect flood runoff data
- ✓ set a flood runoff model, calibrate the model and conduct training for C/Ps personnel

(2) Strengthen a system for issuing a flood warning

- ✓ establish flood warning code based on flood runoff model
- ✓ improve the system for sending flood forecast data from Met. Service and W.R.D to NDMO
- ✓ improve the system by which NDMO informs residents of warning information

Page	SESSION	FOCUS	RESOURCE AGENCY/PERSON
p.4 – p.9	Session 1: Meteorological Activity for Outcome 1	(1) Meteorological Events & Flood Disaster	*Mr.Festus Ahikau Solomon Meteorological Service*
p.10 – p.13		(2) Weather Forecast / Warning	*Mr. Freddy Ferah Solomon Meteorological Service*
p.14 – p.17	Session 2: Hydrological Activity for Outcome 1	Rainfall Analysis / Flood Runoff Model /River Survey	*Mr. Michael Maehaka Water Resources Division*

Japan International Cooperation Agency (JICA)

National Disaster Management Office,
The Republic of Solomon Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

Meteorological Activity for Outcome 1

Meteorological Event and Flood Disaster

11 March 2011
Mr. Festus Ahikau
Chief of Climate department
Solomon Meteorological Service

Outline

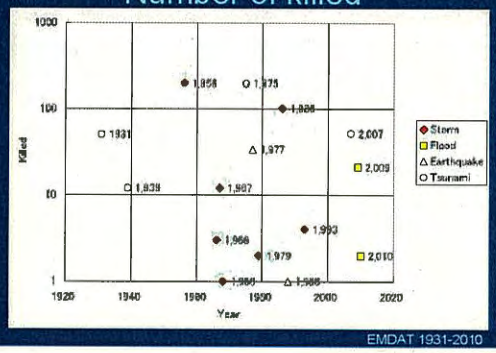
- Disaster profile in Solomon Is.
- Meteorological events in Solomon Is.
  - Cyclone
  - Rain
  - Flooding in 2009 & 2010
  - Thunderstorm
  - Wind
  - Temperatures

Disaster Profile of Solomon Is.

	# of Events	Damage / event		
		Killed	Total Affected	Damage (000 US$)
Drought	2	-	190	-
Earthquake (seismic activity)	3	11.7	875	-
General Flood	2	11.5	11,509	-
Storm surge/coastal Flood	1	-	-	-
Flood unspecified	1	-	-	-
Tropical cyclone	13	24.8	21,421	1538.5
Tsunami	4	78.5	596	-
Volcano	1	-	6,000	-

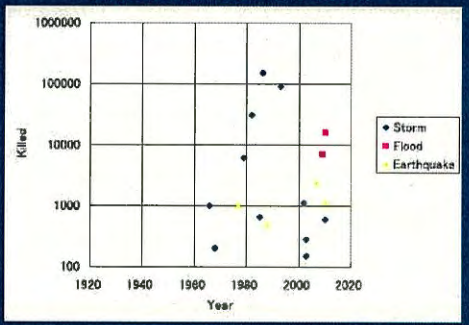
EMDAT 1931-2010

Number of killed



EMDAT 1931-2010

Number of affected



EMDAT 1931-2010

Meteorological Events

	Month												
Event	1	2	3	4	5	6	7	8	9	10	11	12	?	Total
Cyclone	7	6	7	3	3					1	2	9	8	46
Flood	2		2		1	1	1	2	1		1			11
Storm	3	1				1			2			2	1	10
Dought									1				3	4

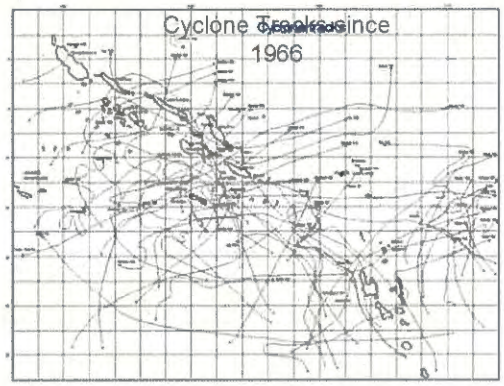
Period: 1568 – 1990
After Radford et al. 1993

Tropical Cyclones

- Cyclones occur between November and May but can be late as in the month of June
- Cyclones are accompanied by heavy rain causing rivers to swell which can result in flooding to low lying areas

Storm surge – piling of sea water by the frictional effect of strong winds persistently blowing on coastal areas

- inundate low lying coastal plains



Tropical Cyclone Classifications

Classifications in SW Pacific	Warning type	10-minute mean wind		Beaufort scale	Central pressure (hPa)
		km/h	knots		
Tropical Depression		<52	<28	0-6	
		52-61	28-33	7	
Tropical Cyclone Category 1	Gale	63-87	34-47	8-9	985 +
Tropical Cyclone Category 2	Storm	88-117	48-63	10-11	970-985
Tropical Cyclone Category 3	Cyclone	117-157	64-85	12	945-970
Tropical Cyclone Category 4		157-196	86-106		910-945
Tropical Cyclone Category 5		198-	107-		-910

(FMS, Wikipedia)

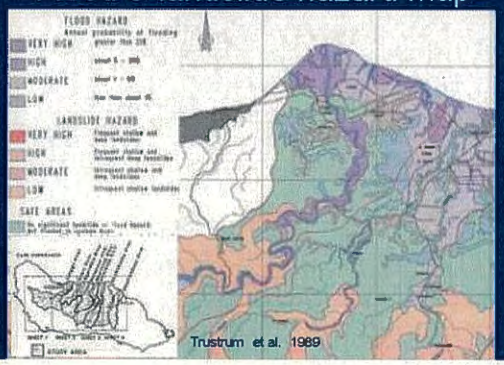
Cyclones which affected Solomon Is.

	Month												
Category	1	2	3	4	5	6	7	8	9	10	11	12	?	Total
1		1	2	4	2						1	1		11
2	2		3		2						1	1		9
3	3	2	2	1							2	1		11
4	1		1									2		4
5	1													1
?	11	4	10	4	3	2					2	5	9	50
Total	18	7	18	9	7	2	0	0	0	0	6	10	9	86

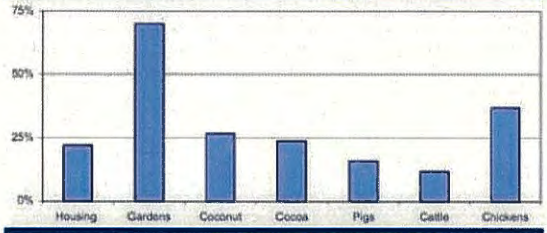
Period: 1586 – 2010
Source: JTWC, Radford et al. 1993, EMDAT, Reliefweb

Cyclone Namu 1986

Flood & landslide hazard map



Loss by Cyclone Namu



Provincial profile 2001

Casualties by Namu

- Most of the dead found by the 23 May (total 71) were aged or women and children unable to escape landslides and floods. [The Age, May 23 1986.]
- These mud slides caused major damage and were the major contributing factor in the death of over 100 people, the injuries of more than 1,000 people and the 90,000 homeless people. Only minor damage was caused by wind. [Kingston, G. 1986.]

Meteorological stations

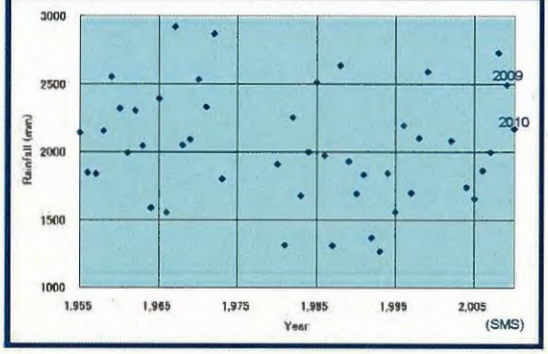
Rainfall in Solomon Is.

- Average annual rainfall is within the range of 2000 mm – 4000 mm on coastal areas. (An increase of up to 10000 mm can be expected within higher altitude)
- Heavy rainfall occur when equatorial trough (low pressure area) is above or close to the islands.

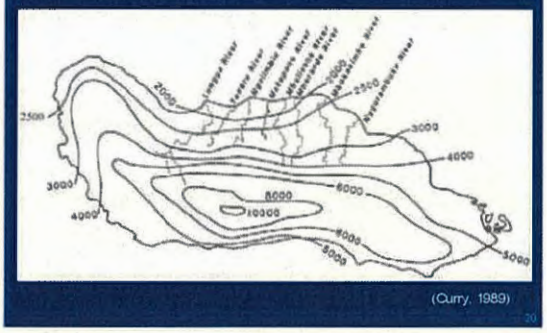
Rainfall in Solomon Is. Cont..

- Heavy rainfall occur in the months of December to April during the northwest monsoon season
- Areas on the southern sides of the larger islands can also have a maximum rainfall between June and September
- High rainfall during La Nina period

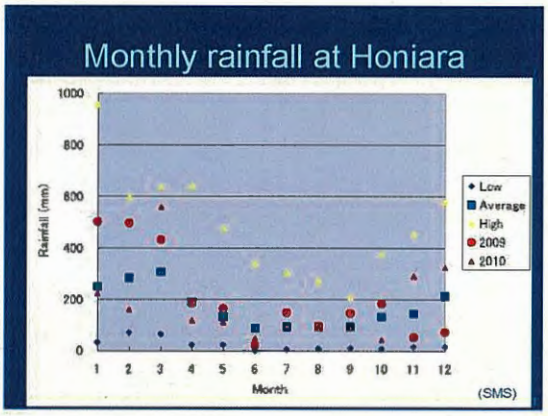
Annual rainfall at Honiara



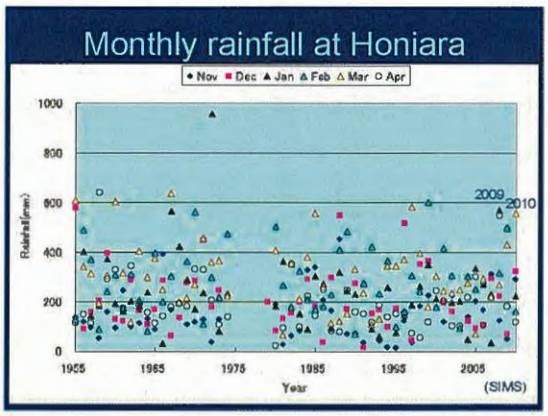
Rainfall distribution



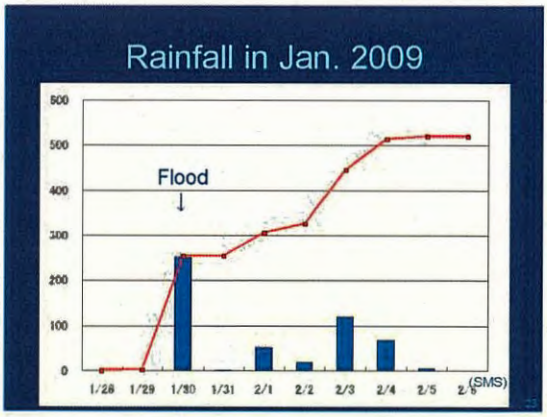
Monthly rainfall at Honiara



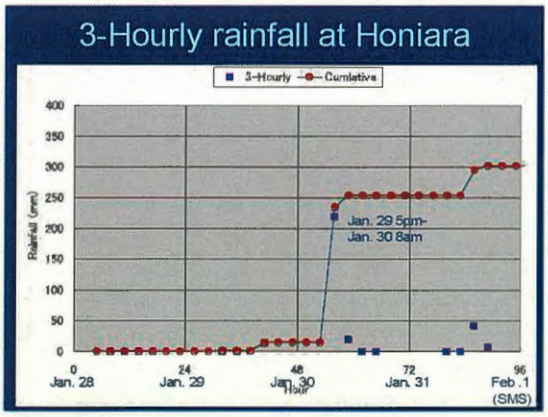
Monthly rainfall at Honiara



Rainfall in Jan. 2009



3-Hourly rainfall at Honiara



Hourly rainfall at WRD Honiara

Date	Time	Hourly	Cumlative
29-Jan-09	13:00:00	0	
29-Jan-09	14:00:00	1	1
29-Jan-09	15:00:00	12	13
29-Jan-09	16:00:00	3	16
29-Jan-09	17:00:00	0	16
29-Jan-09	18:00:00	1	17
29-Jan-09	19:00:00	0	17
29-Jan-09	20:00:00	4	21
29-Jan-09	21:00:00	11	32
29-Jan-09	22:00:00	40	72
29-Jan-09	23:00:00	50	122
29-Jan-09	24:00:00	39	161
30-Jan-09	1:00:00	39	200
30-Jan-09	2:00:00	19	219
30-Jan-09	3:00:00	9	228
30-Jan-09	4:00:00	6	234
30-Jan-09	5:00:00	0	234
30-Jan-09	6:00:00	7	241
30-Jan-09	7:00:00	1	242
30-Jan-09	9:00:00	1	243
30-Jan-09	9:00:00	5	248
30-Jan-09	10:00:00	11	259
30-Jan-09	11:00:00	2	261

Heavy rain ←started

←Flood happened

Rainfall intensity

Rainfall (mm) /hr.	Term used in forecast	Public perception
10-20	Rather strong rain	Noisy rain
20-30	Strong rain	Cats and dogs
30-50	Heavy rain	Bucket overturned
50-80	Very heavy rain	Like a waterfall
80-	Violent rain	Horrible, oppressive

(Japan Meteorological Agency)

When to issue flood advisory

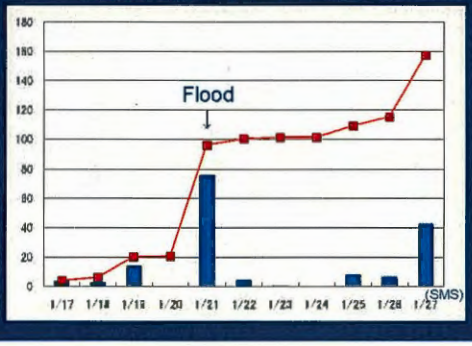
- when rain is heavy as indicated in the computer model
- when the threshold is 100 mm or more
- when trough/cyclone accompanied with heavy rain persist over the islands

2009 daily rainfall

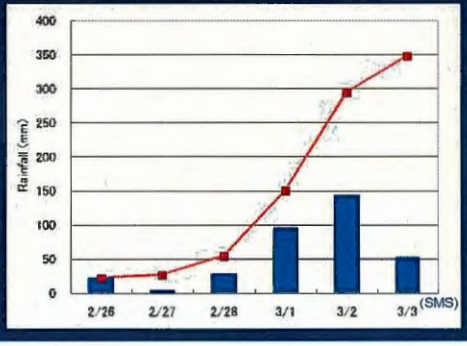
Date	Jan Daily	Jan Cumlative	Feb Daily	Feb Cumlative	Mar Daily	Mar Cumlative
1	1.8		51.6	305.3	0.0	
2	6.7		18.8	324.1	4.6	
3	0.4		120.2	444.3	3.0	
4	0.0		68.1	512.4	tr	
5	8.0	8.0	6.4	518.8	0.0	
6	9.8	17.8	0.1	518.9	6.6	
7	5.9	23.7	0.0		17.6	
8	31.2	54.9	0.0		1.2	
9	9.2	64.1	0.0		0.0	
10	21.3	85.4	33.0		0.0	
11	8.7	94.1	25.3		15.4	
12	19.5	113.6	0.0		3.2	
13	0.1	113.7	21.6		0.0	
14	1.3	115.0	0.0		1.4	1.4
15	35.9	150.9	7.4	7.4	15.2	16.6
16	8.3	159.2	0.1	7.5	11.6	28.2
17	0.0		45.0	52.5	4.9	33.1
18	25.8		5.0	57.5	1.8	34.9
19	2.0		26.2	83.7	90.2	125.1
20	0.0		3.7	87.4	43.6	168.7
21	0.0		0.0		5.2	173.9
22	3.4		0.0		22.5	196.4
23	0.0		0.0		21.8	218.2
24	1.0		0.8		5.8	224.0
25	41.8		15.4		9.4	233.4
26	5.2		16.2		26.2	259.6
27	0.0		25.8		22.2	281.8
28	0.4	0.4	6.7		45.7	327.5
29	0.7	1.1			31.4	358.9
30	251.8	252.9			20.2	379.1
31	0.8	253.7			0.0	

(SMS)

Rainfall in Jan. 2010

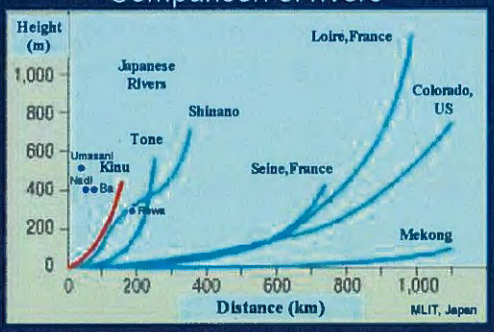


Rainfall in Mar. 2010



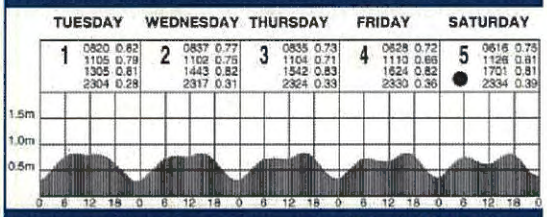
Rivers in Guadalcanal

Comparison of rivers



Unasami river: D=20 km, H=500 m ....Even steeper than Japanese rivers

Tide at Honiara



Bureau of Meteorology, Australia

Thunderstorms

- These are relatively frequent occurrence over the large and more mountainous islands building up inland on many afternoons.
- Over the warm ocean, storms are more likely to occur in the night or early morning
- There is a low thunderstorm activity during the southeasterly season and high from December to March

Seasonal Winds

- West to northwest winds (Jan. to May)
- East to southeast winds (June to Nov.)
- Very destructive wind during cyclone can cause extensive damages to properties and human life

Temperatures

- Heating from increased greenhouse gases enhances the hydrological cycle and increases the risk for stronger, or more intense droughts and heavier rainfall events and flooding
- An increase in sea surface temperature will enhances the conditions suitable for tropical depressions and therefore increasing the frequency and the intensity of tropical cyclones

Japan International Cooperation Agency (JICA)

National Disaster Management Office,
The Republic of Solomon Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

Meteorological Activity for Outcome 1

1

Weather Forecast and Warning

11 March 2011
Solomon Meteorological Service
Mr. Fredy Ferah

2

Improvement of Early Warning System

One of the Project Objective

- NDMO
- Ministry of Provincial Development
- Ministry of Lands,housing
- Police
- Ministry of Infrastructure and Development
- Ministry of Education & Human resources Dev.

Provincial Office

Radio
Internet
(TV)
(Newspaper)

COMMUNITY

Solomon Meteorological Service &
Water Resources Division
Early Warning Information

3

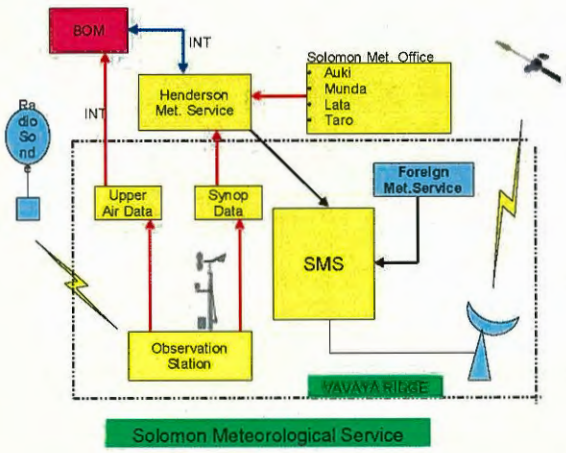
Improved Weather Information

► Accurate Weather Forecast and Early Warning are requested ◄

To realize

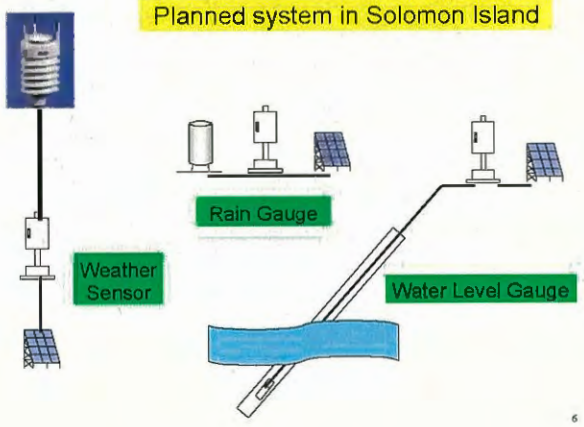
Improved Observation system and Systematically archived data are indispensable to analyze the sever weather

4



5

Planned system in Solomon Island



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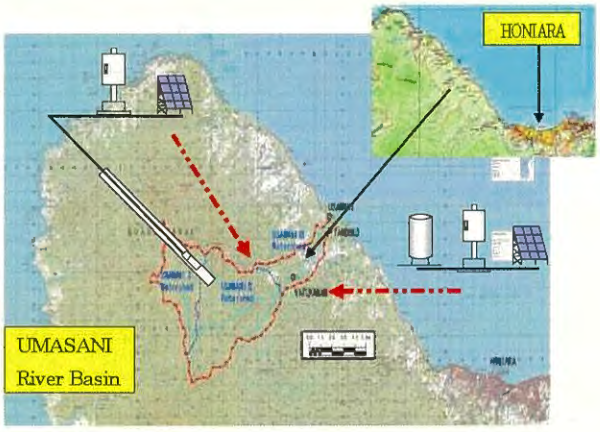

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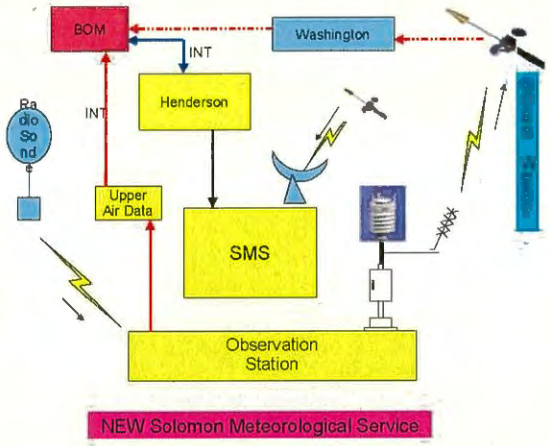

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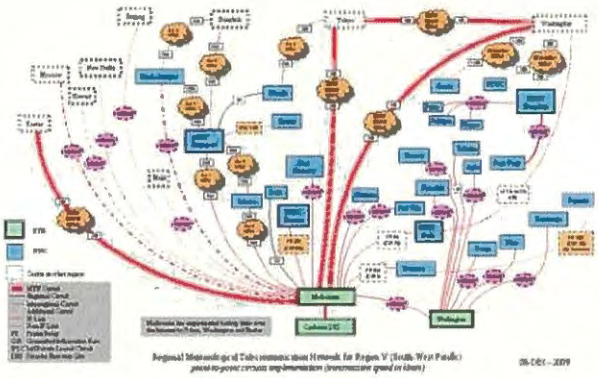
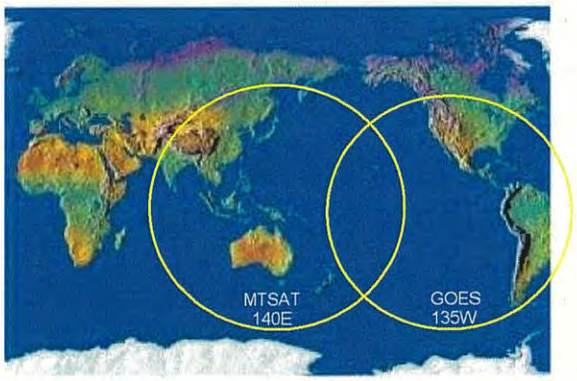


9

Geostationary Satellite Coverage



10

TROPICAL CYCLONE FORMATIONS

Tropical cyclones only form over the ocean, which provide the necessary energy for development.

Six general factors are necessary to make tropical cyclone formation possible:

1) Water temperature of at least 26.5C(80F) down to a depth of at least 50 meters;

2) Rapid cooling with height. This allows the release of latent heat which is the source of energy in a tropical cyclone;

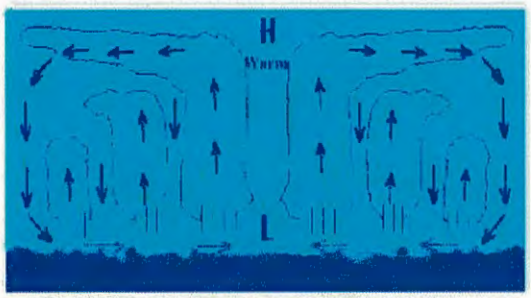
3) High humidity, especially in the lower to mid troposphere.

4) Low wind shear: When wind shear is high, the convection in a cyclone or disturbance will be disrupted, blowing the system apart.

5) Distance from the equator. This allows Coriolis force to deflect winds blowing towards the low pressure centre, causing a circulation. The approximate is 05 degrees.

6)A pre-existing system of disturbed weather. The system must have some sort of circulation as well as a low pressure centre.

SCHEMATIC OF A TROPICAL CYCLONE



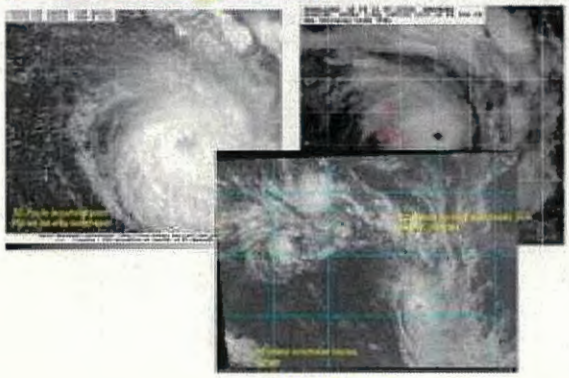
13

TROPICAL CYCLONE WARNING CATEGORIES

Category	Strongest Gust (km/h)	Typical Effects
1 (Tropical Cyclone)	Less than 125 (Gales)	Negligible house damage. Damage to some crops, trees and caravans. Craft may drag moorings.
2 (Tropical Cyclone)	125-169 (Destructive winds)	Minor house damage. Significant damage to signs, trees and caravans. Heavy damage to some crops. Risk of power failure. Small craft may break moorings.
3 (Severe Tropical Cyclone eg. Ilona)	170-224 (Very destructive winds)	Some roof and structural damage. Some caravans destroyed. Power failure likely.
4 (Severe Tropical Cyclone eg. Yasi)	225-279 (Very destructive winds)	Significant roofing loss and structural damage. Many caravans destroyed and blown away. Dangerous airborne debris. Widespread power failures.
5 (Severe Tropical Cyclone eg. Larry)	More than 280 (Very destructive winds)	Extremely dangerous with widespread destruction.

14

Satellite Images



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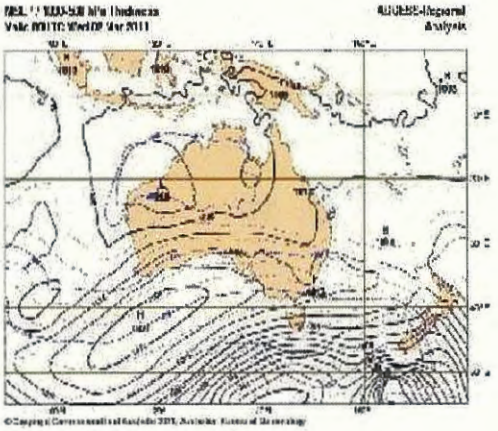

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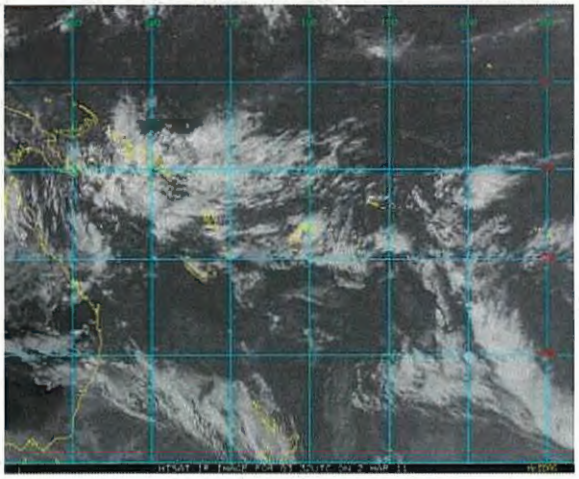

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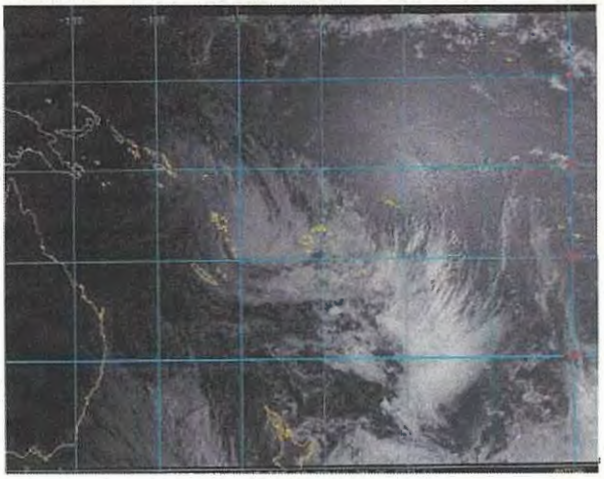
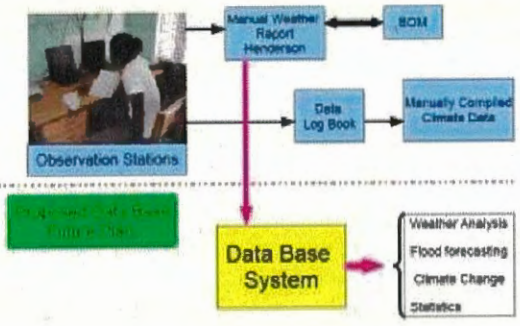
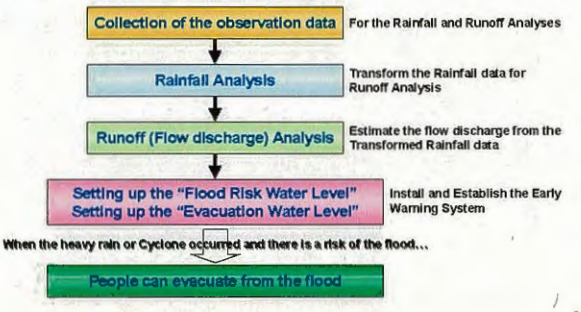


DATA ARCHIVING SYSTEM



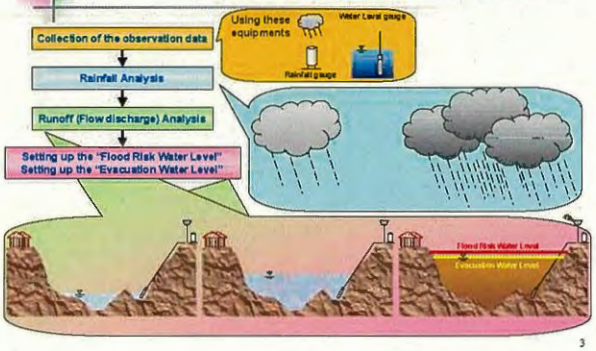
20

Flow Chart of Establishing Early Warning System



2

Flow Chart of Establishing Early Warning System



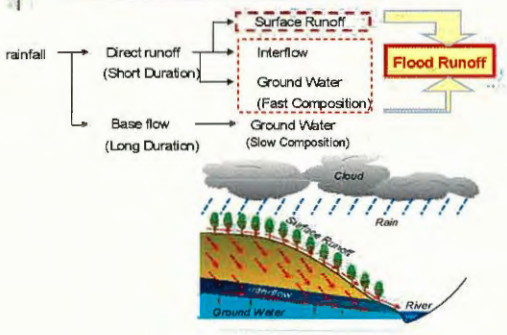
3

Hydrologic Cycle

Movement process of water

4

Flood Runoff in Hydrologic Cycle



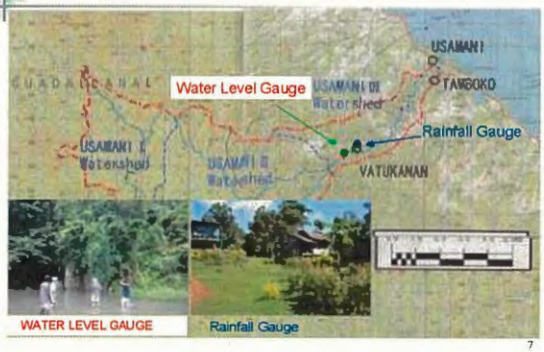
5

DIFFICULTIES FACED WITH DATA COLLECTION

	Problem	Solution	Defficulty in solving (○: not difficult, △: difficult)
1	Data collection with the different equipment	Using the same equipment to collect the data (re-installation)	△
2	Vandalism	Explaining to the people the importance of the data collection	○
3	Financial problem	More understanding from the government on the importance of Hydrological data collection	○
4	Logistics (No vehicle)	Installing the telemetory system for data transfer or Vehicle available	△
5	Shortage of man-power	Recruiting more personel	△

6

SITE SELECTED FOR WATER & RAINFALL GAUGES.

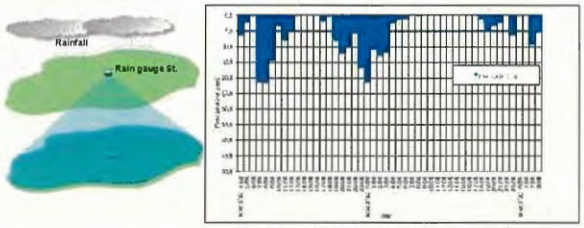


7

Outline of the Rainfall Analysis

Transformation

Point rainfall → Surface rainfall



Observed hourly rainfall data at Honiara Station (Mar.1st to Mar. 3rd in 2010)

8

What is Rainfall Analysis?

To estimate the precipitation in the catchment area during the flood term and to calculate probable rainfall for the basis of the flood damage reduction.

Rainfall data → (Transformation) → Data for runoff analysis

=

Rainfall Analysis

9

What is Runoff Analysis?

To estimate the flow discharge at the various point of the river from the rainfall data

Data for Rainfall analysis → (Transformation) → Flow Discharge

=

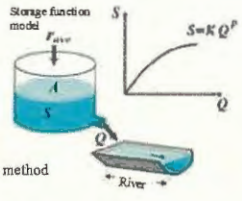
Runoff Analysis → Flood Flow Analysis, Low Flow Analysis

10

Storage function model - Basic formula

$$S = K \cdot Q^{p}$$

$$\frac{dS}{dt} = \frac{1}{3.6} \cdot f \cdot r_{ave} \cdot A - Q$$



f : Runoff coefficient

K,p : Constants for Storage function method

S : Storage in basin area (m^3)

Q : Direct run - off from basin area (m^3/s)

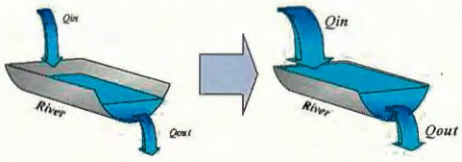
R_{ave} : Average depth of rainfall in basin area

A : Basin areas(km^2)

11

Storage function model - River channel storage

●River bed slope is high or river width is narrow ....

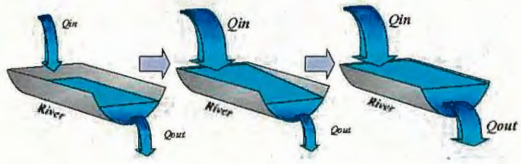


●When Q_{in} discharge increases, Q_{out} discharge immediately increases

12

Storage function model - River channel storage

- River bed slope is low or river width is wide....

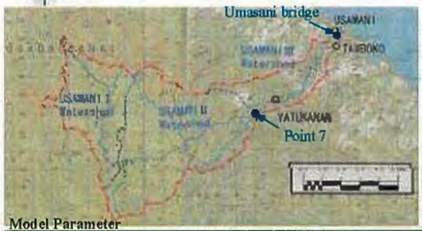


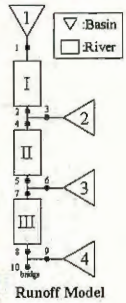
- When Q_{in} discharge increases, Q_{out} discharge increases slowly

Channel storage

13

Tentative Runoff modeling at Umasani River basin (using Storage Function Model)





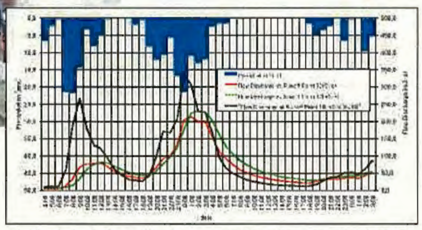
Model Parameter

Model	Catchment Area No.	Catchment Area (km2) A	[illegible]	Basin Roughness / Equivalent Roughness C	Basin Gradient I		Highest point at river (m)	Lowest point at river (m)	Length of River Channel (km) L	Constants K	P	Delay time (min) TL	River width (m) B
Basin	1	17.0	43.400	0.120	52.677	1/57	777.0	190.0	9.9	28.678	0.300	0.000	-
	2	24.0	43.400	0.120	9.430	1/48	190.0	100.0	4.3	30.730	0.300	0.000	-
	3	14.0	43.400	0.120	11.900	1/62	100.0	45.0	4.5	37.327	0.300	0.000	-
	4	10.5	43.400	0.120	3.720	1/257	45.0	15.0	7.7	66.357	0.300	0.000	-
River	Umasani I	-	0.186	0.036	9.430	1/48	190.0	100.0	4.3	1.847	0.600	1.213	50.0
	Umasani II	-	0.186	0.036	11.900	1/62	100.0	45.0	4.5	2.212	0.600	1.797	50.0
	Umasani III	-	0.186	0.036	3.720	1/257	45.0	15.0	7.7	7.642	0.600	5.446	100.0

14

Tentative Runoff modeling at Umasani River basin (using Storage Function Model)

Exercise for setting model parameter



Calculated flow discharge using observed rainfall data at Honiara Station

15

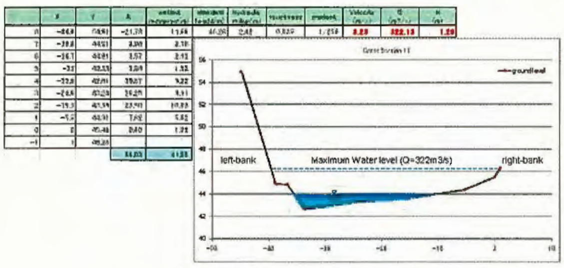
River Survey

cross section survey at Umasani river

Distance of survey	7km
Number of cross-section	18stations
survey interval	500m (and some river bend)
survey from	Umasani Bridge
survey to	candidate site for WL gauge

16

River Survey



This cross section is at the water level gauge site (looking down stream)

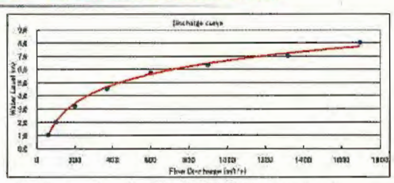
17

Setting up the "Flood Risk Water Level"
Setting up the "Evacuation Water Level"

Using collected data, estimated flow discharge and the cross-sectional data of the river, water level is calculable

$Q = V \bullet A$

Q:flow discharge
V:velocity
A:cross-sectional area



And then, set up the Flood Risk Water Level and Evacuation Water Level considering the evacuation time for local community

18

RUNOFF MODEL ONLY TENTATIVE

THE RUNOFF MODEL WHICH WAS DEVELOPED FOR UMASANI RIVER BASIN IS ONLY TENTATIVE.

THIS IS BECAUSE OF THE VERY LIMITED OR NOT AT ALL ANY RECORDED DATA FOR UMASANI RIVER.

HOWEVER, AS SOON AS THE RIVER AND RAINFALL GAUGES ARE INSTALLED, WE WILL START COLLECTING RECORDED DATA AND FROM THE RECORDED DATA VERIFICATION OF THE MODEL WILL CONTINUE, THIS IS TO DETERMINE THE ACCURACY OF THE MODEL.

19

Activity for Outcome 2

(1) To strengthen the implementation system of CBDM plans for the target community

- ✓ prepare disaster management plans for the target community (awareness program, installation of simplified rain gauge and water gauge, hazard maps, evacuation drill)
- ✓ prepare the manuals for the formulation of the CBDM plans
- ✓ conduct workshops to strengthen the C/P capacity to operate the manuals
- ✓ reflect any lessons learned from awareness program activities to the manuals and CBDM plans

(2) To enhance relevant organizations capacity in emergency response

- ✓ prepare the manual for C/P agencies in emergency response
- ✓ conduct simulation exercise
- ✓ share good practices gained from the activities with target countries
- ✓ share good practices gained from the activities with other donors

Page	SESSION	FOCUS	RESOURCE AGENCY/PERSON
p.19 – p.23	Session 3: DM Plan Preparation for Outcome 2	Provincial Flood Disaster Management Plan	Ms. Janet Prakash, Deputy Director of NDMO

Flood DRM plan for Guadalcanal Province

March 11, 2011, Honiara
Janet Prakash
NDMO

1

Outline

- Needs for local flood plan
- Plan contents by time line
- Tools for preparedness
  - 1. Flood hazard map
  - 2. Flood early warning
  - 3. Evacuation center
  - 4. Communication network
  - 5. Disaster resource database

2

Why local flood plan ?

- Disaster is local phenomena
  - Disaster happens locally
  - Damage reflects local conditions
- Local gov't is primary responder
  - Organized & bottom up approach needed
  - Communication disruption in initial stages
- Different response for different disaster

3

Issues & solutions

Issues	Solutions
Weak local government	NGOs & churches
Limited communication	HF radio
No evacuation center	Schools & churches
Limited disaster records	International resources
Limited resource data	Existing data collection
Slow top down approach	Bottom up approach

4

Cluster system

N-DOC	P-DOC	RCC
Logistics & support	Response initial assessment & logistics	Damage & hazard mapping
Response & initial assessment		
Welfare/IDP	Welfare/IDP	Shelter & welfare
Livelihood	Public services & livelihood	Livelihood
Public services		Public services & facilities
Infrastructure	Infrastructure	

National Disaster Management Plan, 2009

5

Relation to Current DRM plan

- National DRM plan
  - Tsunami disaster plan
  - (Flood disaster plan)
- Guadalcanal Provincial DRM plan
  - Annex 1 Flood disaster plan

6

Preparation phase (White)

- Understanding features of past floods
- Preparation of basic information
- Preparation of resources
- Preparation of early warning & evacuation
- Public education

7

Stand by phase (Yellow)

- Condition for gathering
- Monitor weather update
- Issuing alert
- Issuing evacuation order

8

Emergency response phase (Red)

- **Response initial assessment & logistics cluster**
  - Gathering initial information
  - Rescue
  - Avoidance of secondary damage
  - Operation of evacuation centers
  - Maintenance of social order and price of goods
  - Damage assessment
  - Management of accepting external help
  - Treatment of dead body

9

Emergency response phase (Red)

- **Welfare/IDP cluster**
  - Operation of evacuation centers
- **Public services & livelihood cluster**
  - Health care for victims
  - Garbage clearance & disposal
- **Infrastructure cluster**
  - Emergency repair of infrastructure

10

Stand down phase (Green)

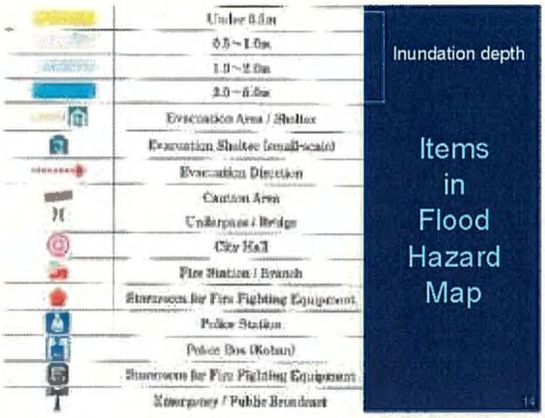
- Defining principle of recovery
- Set priority of recovery
- Receiving support from government
- Receiving support from external help
- Supporting recovery of community
- Supporting recovery of business
- Documentation & reporting

11

1. Flood hazard map

- Basic information
  - Topography, River, Road
- Disaster resources
  - School, health facility, police, church
  - Police, Fire station
  - Market, shops
- Inundated area
  - Historical flood
  - Simulation

12



2. Flood early warning

- Monitoring
  - Weather…SIMS
  - Rainfall…rain gauge by JICA
  - Water level…water gauge by JICA
- Interpretation
  - When, how much, where ?....WRD+JICA
- Message construction
- Communication
- Protective behavior
  - Listen, understand, decide, act

15

Sample message

CHIME and SIREN

"This is your local Toyooka City Disaster Warning Main Office"

Announce on the_____, time_____.

This is your "Evacuation Preparedness Information".

Please prepare to evacuate. To people in_____block and_____block, please prepare to evacuate now. Please evacuate to higher locations of safety with your radio.

Please take clothes, medicine, food, drinks and other necessary items as you evacuate.

Evacuation places are Kominkans (community centers) etc. which are near your house.

SENIOR CITIZENS who need some time to evacuate, please evacuate NOW.

16

Interim arrangement of flood warning

Warning stage	Indicator	Monitoring organisation	Media for dissemination
Readiness	Cyclone season	NDMO	National Disaster Awareness Week
Alert	Cyclone/depression warning	FMS	Radio, television, newspaper
Warning I	Rain 100 mm/day	Police, PWD Water Supply, FSC	Radio, telephone
Warning II	Rain 25 mm/hour	Police, PWD Water Supply	Radio, telephone
Warning III	Nacrau bridge flooded	FSC	Radio, telephone, siren
Warning IV	Old Ba bridge flooded	District DISMAC, Police, Town Council	Radio, telephone, siren
Action	Flooding of Town environment	District DISMAC, Police, Town Council	Siren

(Yeo, 2000)

17

Evacuation principle

- People take time to start evacuate
- Warning should be
  - In advance
  - Many times
  - By many channels
  - Clearly stated

18

Difficulties in Flood EWS

- Appropriate index for flood ???
  - Hourly rainfall
  - Daily rainfall
  - Cumulative rainfall
- Condition differs by case …
  - River topography
  - Geology
  - Vegetation

19

Questions for flood warning

- When to issue ?
  - Threshold level ?
  - Warning stage
  - Evacuation stage
- Who will issue ?
  - NDMO ? PDMO ? Community ?
  - SIMS ? NDMO ? WRD ?
- How to issue formal warning ?
  - Radio, TV, mobile, Police
- Informal warning ?
  - Church, NGO etc …

20

3. Evacuation center

- Designate in safe place from flood
- List up contact person for emergency
- Register to Provincial DMO
  - Contact person
  - Contact number
  - Capacity
- Define teams in communities

21

Teams in community

- Early warning & communication
- Evacuation & rescue
- First aid & health
- Shelter management & logistics
- Relief & rehabilitation

22

4. Information collection

Community	Province	National
Village chief	PDMO	NDMO
Health facilities	Health dept.	Min. health
Schools	Ed. dept.	Min. Ed.
Police stations	Police dept.	RSIPF
Church	Church	SICA

23

Disaster info. management

- Monitoring
- Information collection (upstream)
- Information sharing
- Information dissemination (down stream)
  - Bulletin board ? Media ? Internet ?
- Information storage
  - NDMO, each organization

24

5. Resource database

Source	Resources
Health	Health facilities
Education	Schools
Police	Stations
Works	Road, bridge, port database
Churches	Schools, health facilities
NGO	Linkage with communities
MWYC	Community organizations

25

Activity for Outcome 3

(1) To implement the awareness program and evacuation drill at Tamboko

- ✓ arrange workshops in line with the manuals
- ✓ conduct evacuation drill at Tamboko

(2) To support residents at Tamboko to conduct risk assessment (installation of simplified rain gauges and water gauges, preparation of hazard maps)

- ✓ establish monitoring system for the installed rain gauge and water gauge and maintain by the residents
- ✓ support the residents in preparation of their own hazard maps

Page	SESSION	FOCUS	RESOURCE AGENCY/PERSON
p.25 – p.26	Session 4: Action at Tamboko for Outcome 3	Social Survey / Public Awareness for Preparedness	Mr. Herrick Savusi Guadalcanal Provincial Disaster Coordinator

Community-based Disaster Management

Herrick Savusi
Disaster Management Officer
Guadalcanal Provincial Office

1

What is CBDM?

- An approach for disaster management
- Focus on the mutual help in local community
- To enhance their capacity for disaster risk reduction

Community
→ the front line of disaster prevention efforts
Governmental Organizations
→ To ensure the safe evacuation for communities

2

Baseline Survey

1. To collect basic information / knowledge / needs
2. To consider appropriate measures

3

Result of BL Survey

Objective
1. To collect the baseline data for our indicator;
2. To hear their experiences, knowledge, needs and will;

Remarks
[General Information]

[Flood Experience]

[Preparedness]

4

Workshop

5

Record of WS

Objective
1. To notify our project activities to reduce the risks of flooding;
2. To collect their traditional knowledge to cope with a flooding;

Remarks
[Positive Points]
- The workshop was an eye opener to the community residents
>> The flood awareness movie was good for starter
- All zones' representatives attended the workshop
>> The head of chief in Tamboko is very cooperative

[Negative Points]
- Community needs to fully understand the aims and objectives of the Project
>> Our intention should be repeatedly explained to them

6

Evacuation Exercise




7

Record of Evacuation Exercise

Objective

1. To keep up their awareness of flooding;
2. To recognize the risks of flooding in the community;
3. To collect their knowledge and memories regarding flooding;

Remarks

- We walked from the school to the bridge
- Whole community was invited (including teacher and students of Tamboko school)
- Residents realized the risks around the bridge and safe route
- Residents told us their idea to reduce risks of flooding
- Residents including kids expressed their memories of flooding in drawings
- Not all community residents participated

>> The exercise will be continued

8

Community Based Disaster Management

Purpose: To enhance People's Awareness of Disaster Prevention

1. Preparation Stage
- Baseline Survey : Living standard, Resource, Experiences
- Workshop : Introduction of the Project

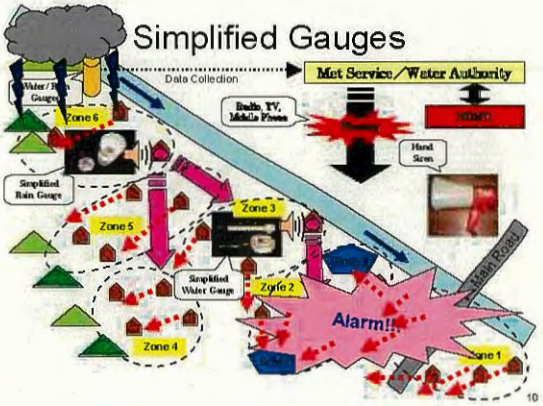
2. Practice Stage
- Risk Assessment : Handmade Risk Map
- Exercise : Evacuation Drill, Water Level / Rainfall Monitoring

3. Systematization
- Documentation : Community Disaster Management Plan
- Recording : Voice transfer, Radio Drama, Role Play

4. Extension
- National / International Events in Disaster Preparedness

9

Simplified Gauges



10

CADM Project

Community Operated Early Warning is essential for communities which are located in areas at risk of flash floods and landslides. Hydrological equipment suitable for community early warning have been developed (as seen below) and are being disseminated to communities within the Caribbean and other regions.

The advantages : (1) cheep in cost
(2) easy for assembly, operation and maintenance
(3) safe observation in the house
(4) short, heavy rainfall even in the mid-night will be measured without fail due to the alarm device



The observer and the rainfall equipment installed in his house, Speightstown, Barbados

Dr. Opadeyi assembling equipment in workshop, UWI/TT

11

Development of environment friendly technology

River bank protection using waste tires


Traditional River Works Method

12

Participants List for the Project Seminar on March 11, from 9am to 12pm Venue: Flamingo Conference Room at Honiara Hotel

No.	Attn.	Oganisation	Title	First Name	Last Name	Position	Phone	email
1	O	Solomon Island Broadcasting Corporation	Mr	Bart	Basia	Manager, Programs & Presentation	20051	bbasia@sibc.com.sb
2	O	Water Resource Division, MMERE	Mr	Michael	Maehaka	Senior Hydrologist	21522	maehaka@mines.gov.sb
3		Honiara City Council	Mr	Martin	Amehana	Assistant Disaster Coordinator	21133	
4	O	Solomon Island Red Cross	Mr	Clement	Manuri	Deputy Secretary	22682	c.manuri2@gmail.com
5	O	AUSAID	Ms	Judy	Tarailopo	Assistant Program Manager	25161	judy.tarailopo@ausaid.gov.au
6	O	Fire Station	Mr	Tony	Santa	Support Officer	23800	rodneykuma@gmail.com
7		Save the Children, Australia	Ms	Niamh	Murnagha	Country Director	22400	cd@savethechildren.org.sb
8	O	Church of Melanesia	Mr	Jasper	Bonie	Environment Officer	26101	
9	O	Ministry of Women, Youth & Children Affair	Mr	Charles	de Fox	General Secretary	23544	cdefox@gmail.com
10	O	NZAID	Ms	Nicci	Simmonds	First Secretary - Development	21502	
11	O	UNICEF	Ms	Martha	Misake	Assistant Program Officer	27446	mmisake.unicef@gmail.com
12		Ministry of Infrastructure & Development	Mr	John	Ta'aru	Permanent Secretary	28605	psmid@pmc.gov.sb
13	O	UNDP	Mr	Caxton	Etii	Programme Coordinator	27446	caxton.etii@undp.org
14	O	Solomon Island Development Trust	Mr	Usenio	Tadagao	Project Officer	23409	
15	O	Seventhday Adventist Church	Pastor	Samual	Panda	General Secretary	39267	SSPanda@adventist.org.sb
16	O	NDMO	Ms	Ruth	Timauku	PCIDRR	Ext-212	rutht734@gmail.com
17	O	NDMO	Mr	Loti	Yates	Director	27936	
18	O	NDMO	Mr	Jonathan	Tafiariki	Disaster Information Management Offic	Ext- 204	j4home@gmail.com
19	O	NDMO	Ms	Janet	Prakash	Deputy Director	27936	
20	O	NDMO	Ms	Anne	Saenemua	Project Manager	Ext- 212	asaenemua@gmail.com
21	O	Ministry of Lands, Housing & Survey	Mr	Peter	Fairamon	Assistant GIS	23365	pfairamoa@gmail.com
22	O	Catholic Church	Mr	Steven	Labu	Development Officer	22135	
23	O	Nazarene Church	Ms	Mary	Walle	Secretary	25109	nzarene@solomon.com.sb
24	O	Ministry of Police & Justice	Mr	George	Paikai	Director , Emergence	23048	gpaikai@ymail.com
25	O	Solomon Island Metorology	Mr	Festus	Ahikau	Director, Climate Department	23021	
26	O	Solomon Island Metorology	Mr	Freddy	Ferah	Chief Forecaster	27658	
27	O	East Rennell Council of Chiefs	Chief	Joses	Sau'eha	Tribal Leader	7464310	
28	O	Tamboko Community	Chief	Ludovic	Kaulake	Head of Chief		
29	O	Tamboko Community	Chief	Ben	Tovo	Tribal Chief		
30	O	Tamboko Community	Ms	Alice	Basile	Village Nurse		
31	O	Ministry of Education & Human Development	Mr	Creg	Taieha	Assistant Under Secretary	7464310	gtaieha3@gmail.com
32	O	Florance Young School	Mr	George	Saemane	Principle	23043	gsaemane@gmail.com
33	O	Guadalcanal Provincial Government	Mr	George	Gua	Provincial Police Commander	7449343	
34	O	Ministry of Health & Medical Services	Mr	Aron	Oritaimae	Director, Disaster Operation	23600	
35	O	World Vision, Australia	Mr	Jeramiah	Tabua	Project Coordinator	23092	jeramah.tabua@gmail.com
36	O	National Referral Hospital -MHMS	Mr	George	Lui	Occupational Health and Safety	23600	georgelui.lui13@gmail.com
37	O	National Referral Hospital -MHMS	Mr	John	Sa'ohu	Infection Control Officer	23600	jsrichardson1070@gmail.com
38	O	Guadalcanal Provincial Government	Mr	Victor	Tuou	Senior Administration Officer	20041	
39	O	Ministry of Health & Medical Services	Mr	Bobby	Pattarson	Cheif Health Inspection	28166	
40	O	Guadalcanal Provincial Government	Mr	Adrian	Manikera	Nurse Manager	30228	amanikera@gmail.com
41	O	Solomon Island Christain Association	Mr	James	Funa	General Secretary	23350	jamesfuna@yahoo.com
42	O	Ministry of Education & Human Development	Mr	Benedict	Esibaea	Director	20505	Primary@mehrd.gov.sb
43	O	Ministry of Health & Medical Services	Dr	Cedrie	Alependaua	Uder Secretary, Health Inspector	23404	alependaua@moh.gov.sb
44	O	JICA	Mr	Yoshibnobu	Takishita	Resident Representative	24170	Takishita.Yoshinobu@jica.go.jp
45	O	YEC	Mr	Tsutomu	Kameyama	JICA Expert	7594620	
46	O	YEC	Mr	Tomohiro	Umeki	JICA Expert	7556218	
47	O	JICA	Mr	Masaaki	Kanaya	JICA Expert		Kanaya.Masaaki@gmail.com
48	O	YEC	Mr	Tetsuro	Fukui	JICA Expert		Tetsuro.fukui@nifty.com
49	O	OYO	Mr	Yoshitaka	Yamazaki	JICA Expert	7563899	yamazaki@oyointer.com

The Strengthening Community-Based Disaster Risk Management Project In The Pacific Region

International Workshop

FMS, Nadi

27 September, 2011

National Disaster Management Office,

Ministry of Provincial Development and National Disaster Management

International Workshop Program

Venue: Training Room, Fiji Meteorological Service, Nadi

Date: 27th-30th, September

Sponsor: Japan International Cooperation Agency

Co-Sponsor: NDMO, FMS, WAF

Day 1 (27th, September)

TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
0830-0900	**Registration**		*All Participants*
0900-0910	**Opening Remarks**	*Welcome Greeting/ Key Note Speech*	*Mr.Inia、PS, MoPD&DM* *Mr. Hashimoto, JIICA Representative*
0910-0930	**Session 1 For FIJI Case**	Outcome 1	*Mr. Koroi/ Mr. Paula, WAF*
0930-0950		Outcome 2	*Mr. Vocea, CWD* *Mr. Mua, BDO* *Mr. Kolinio,CWD*
0950-1010		Outcome 3	*Mr. Ropate, NDMO*
1010-1030	**Discussion**		*All Participants*
1030-1050	**Session 2 For Solomon Case**	Outcome 1	*Mr. Jack/ Mr. Michel, WRD*
1050-1110		Outcome 2	*Mr. Joseph, Education GP*
1110-1130		Outcome 3	*Mr. Herrick, DMO GP,*
1130-1150	**Discussion**		*All Participants*
1150-1300	**Lunch**		*All Participants*
1300-1400	**Session 3-1 Result of Japan Training**	Country' s Action Plan	*Fiji Group (6 Person)*
1400-1430	**Coffee Break**		*All Participants*
1430-1530	**Session 3-2 Result of Japan Training**	Country's Action Plan	*Solomon Group (6 Person)*
1530-1540	**Closing Remark**		*Mr. Dobui, Director NDMO* *Mr. Alipate Director*

JICA: *Japan International Cooperation Agency*
MOPD&NDM: *Ministry of Provincial Development and Disaster Management*
NDMO: *National Disaster Management Office, Fiji*
DMO: *Disaster Management Office,*
CWD: *Commission Western Division*
WAF: *Water Authority Fiji*
BDO: *Ba District Office*
WAD: *Water Resources Department, Solomon Islands*
GP: *Guadalcanal Province, Solomon Islands*
SIMS: *Solomon Islands Meteorological Service*

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

(Technical Cooperation Project)

<For Outcome 1>

◎*Seremaia Koroi*	*Supervisor*
◎*Paula Tawakece*	*Technical Officer*
Water Authority of Fiji, The Republic of Fiji Islands	

1

Task for Outcome 1

(1) Develop Capacity of WAF Hydrology for Flood Forecasting

- ✓ Capacity development to collect flood runoff data
- ✓ To set and calibrate flood runoff model, training for C/Ps personnel

(2) Strengthen a system for issuing a flood warning

- ✓ To establish flood warning code based on flood runoff model
- ✓ To improve the system for data transmitting from FMS and WAF to NDMO
- ✓ To improve the system by which NDMO informs residents of warning information

2

Output in 1st Year

- ✓ To attend lectures on Hydrological Cycle and Flood Runoff
- ✓ To collect rainfall data during past floods
- ✓ To prepare the configuration under Flood Runoff Model
- ✓ To order Ba River cross section survey to local contractor
- ✓ To do reconnaissance survey on existing hydrological stations
- ✓ To prepare the specification and order of Ba hydrological network system
- ✓ To recommend data transmitting system from WAF/FMS to NDMO
- ✓ To enlighten communities on simplified warning system

3

Type of Floods in Fiji

- Flood results from heavy and prolonged rainfall when the rivers and streams levels bursts over the banks and inundates the surrounding areas.
- There are three types of flood:
- **Flash Floods**- occurs with a few hours of heavy rain with no warning. This is common in Fiji because of the steepness of the catchment area and short distance of the rivers or streams.
- **Rapid Onset Floods** – occurs with long period of heavy rain and this can last for few days depends on the size of their catchments.
- **Slow Onset Floods** – sometimes occurs to rivers with big catchment areas and with a long period of time.

4

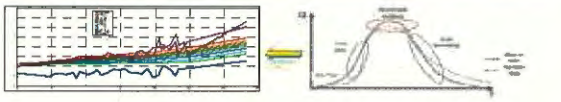
Concept of Flood Hydrology

Flood Runoff Image

Network in Storage Function Model

Hydraulic Calculation from Discharge

Parameter Calibration of Model



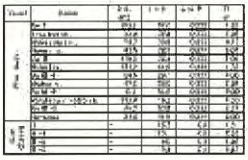
5

Flood Runoff Model (Storage Function Model)

$$\frac{dS}{dt} = \frac{1}{3.6} f_1 r_{ave} A - Q$$

f : Runoff coefficient
K_p : Constants for Storage function method
S : Storage in basin area (m^3)
Q : Direct run- off from basin area (m^3/s)
R_{ave} : Average depth of rainfall in basin area
A : Basin area(km^2)

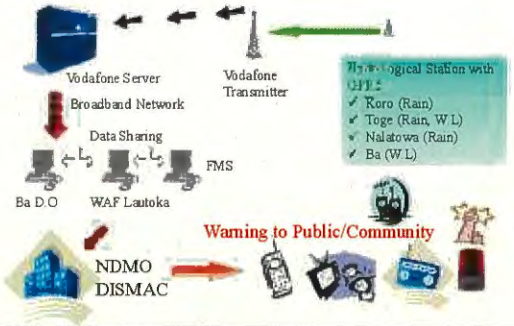
Constants of Catchment & River Channel



Sub Catchment Division

6

General Configuration of Ba Hydrological Network System



7

Ba Hydrological Network with New Equipment

- **Rain Gauge Station**
  - Toge
  - Koro
  - Nalatowa
- **Water Level Gauging Station**
  - Ba Bridge
  - Toge

Location of Hydrological Station

8

Preparation Work

Preparation work was smoothly done with a support of Hydrology staffs

Frame Work for Base Concrete Placing

Adjustment of Frame with Solar Panel

9

New Equipment Installation

Nalatowa station are identified through GPRS Frequency Test by WAF

Nalatowa Station (R)

⇨ WAF Staff, and Koro Station (R)

10

New Equipment Installation at Toge

Toge station is a base station for flood forecasting calculation

Assembling by WAF Staff

- ✓ Data logger, Flash Net, Battery in the box

Completed Toge Station with Rain gauge, W.L Gauging

11

Simplified Warning Gauge for Community

- Promote greater awareness for communities prior to flooding
- Complementary warnings from government agencies
- Teaching the principles of hydrological monitoring to young engineers

More detailed information and trial assembling coming tomorrow

12

Reducing Vulnerability in Community

- As we are all aware of that river flooding in Fiji is a frequent risk due to high rainfall, small river catchments and low lying coastal areas. With the frequent floods occurring in Fiji, the installation of the early warning system will help reduce the flood damages to towns and rural areas.
- Machines that are installed along the Ba River will be transmitting data into a server installed at Ba NDMO's office. During flood periods the river levels will be closely monitored by the NDMO officers and the levels will be sent to all the residents in Ba through text messages or by radio for early evacuation.
- For the critical levels along the Ba River, it will differ according to the geographical structures where people live. The JICA Engineers are looking at installing two critical level machines at **Nasolo** and **Nawaqarua** Village, that triggers a warning siren for early evacuation.

13

Installation of Simplified gauges in Nasolo (Water Level Gauge)



14

Installation of Simplified gauges in Nasolo (Rainfall Gauge)



15

Installation of Simplified gauges in Nawaqarua (Water Level Gauge)



16

Installation of Simplified gauges in Nawaqarua (Rainfall Gauge)




17

Installation of Electric Siren in Nawaqarua (at Community Leader's house)



18

Frequency test (Upper catchment of Ba river)

In Nadrugu

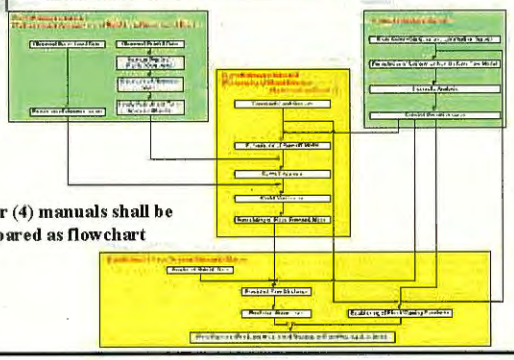
Nadrugu = Out of coverage

Halfway point between Toge and Navala

Halfway point = Out of coverage

19

Lecture and Drill, starting from October, 2011



Four (4) manuals shall be prepared as flowchart

20

Lecture and Drill from October 2011

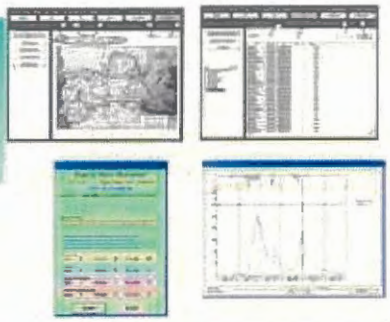
- Current Survey at Key Channel Section
- Preparation of observation, O&M manual
- Hydrological Data Arrangement and Detection of Abnormal Values
- Drill and Data arrangement of Average Rainfall Depth in the sub-Catchment
- Drill of Parameter and Constants for Flood Runoff Model (Storage Function Model)
- Lecture and Drill of Model Verification
- Drill of Hydraulic Calculation applying Non-Uniform Flow
- Rating Curve (H-Q) Estimation through Current Survey
- Lecture on Setting Flood Warning Code (Water Level)
- Preparation O&M Manuals on Simplified Warning Gauge
- Develop a Manual on Warning Transmitting, applying to Evacuation Drill

21

Establishment of Display System in Monitor

Item on Monitor

- Real Time Hydrological Data
- Flood Forecasting Hydrograph



22

Thank for your attention

23

Progress of Flood Disaster Management Plan in Ba district

The strengthening community-based disaster risk management project in the pacific region

September 27, 2011
Mua Metsuisela
Ba District officer

Background

- Fiji is located in cyclone belt, and is prone to cyclone & flooding disasters.
- The widespread of dispositions of cities and villages in the island has created insufficient transport and communication links which create inaccuracy in information dissemination during periods of disasters.
- Therefore there is a great need to strengthen community –based disaster countermeasures.
- For us here in the west the recent flood of January 2009 has posed to us great challenges in relation to the damages it brought and economic loss to the District of Ba.

Background

- The total cost of damage was $112m (FJD) and 11 causalities were sustained in that flood.
- Therefore due to this consequences , it has prompted the government to seek intervention from foreign agencies.
- In particular the Government of Fiji issued a request to the Government of Japan pertaining to the Strengthening of Community Based Disaster Risk Management Project in the Pacific Region.

Background

- In response to this the Government of Japan consigned Japan International Cooperation Agency (JICA) to implement the detailed plan formulation study from March to April 2010 to reach an agreement on the Project contents with the Government of Fiji, and to sign the R/D by August 2010.
- For Fiji the Ba District has been chosen as a pilot district and the National Disaster Management Office implements the project in cooperation with JICA.

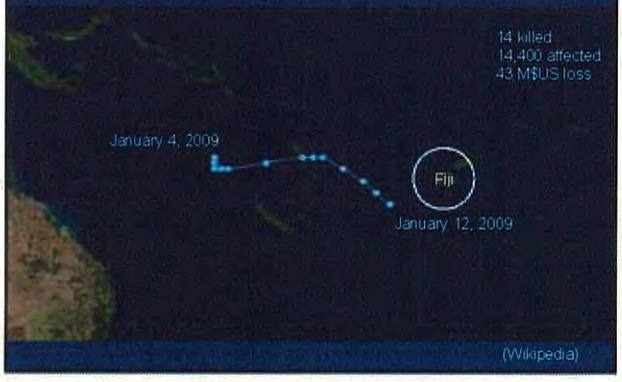
Introduction

- Project Site
- - Nawaqarua
- - Nasolo
- Existing Ba District Disaster Management Network

Notable floods in Western division (McGree et al., 2010)

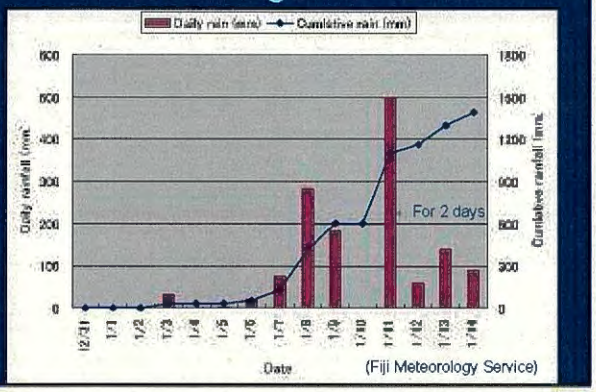
Year	Month	Day	Reason	Ba	Nadi	Rakiraki	Sigatoka
1871	3	20	Hurricane	x			x
1892	12	15	Cyclone	x			x
1914	12	24	Hurricane			x	
1919	2	7		4			
1929	12	11	Hurricane				x
1931	2	21	Hurricane	1	?		x
1933	3	27					x
1938	12	22		9			
1939	1	21	Hurricane	7	8	x	
1955	3	5			?		
1956	1	30	Minor cyclone	3		x	
1958	3	6	Minor cyclone	8			
1964	3	22	Storm	x	7		x
1965	2	9	Hurricane	x	4		x
1972	10	24	Cyclone Beba	x	5	x	
1983	2	28	Cyclone Oscar		9		x
1986	4	10	Cyclone Martin	x	10	x	
1993	1	3	Cyclone Kina	6			x
1993	2	26	Active trough linked with Polly	x	3		
1997	3	8	Cyclone Gavin	10	8		
1999	1	18	Trough	5	2	x	
2004	4	7	Tropical depression 10F			x	
2009	1	7	Tropical depression 04F	2	1		x
Total			23	17	12	7	10

Tropical Depression 04F, 2009



January 1999 Active Trough

Rain during 2009 flood



Tentative informal warning levels

Warning stage	Indicator	Monitoring organization	Media for dissemination
Readiness	Cyclone season	NDMO	Awareness week
Alert	Cyclone or TD nearing	FMS	Radio, TV, newspaper
Warning I	Rain 100mm/day	NFA, Police, WAF, FSC	Radio, telephone
Warning II	Rain 25mm/hour	NFA, Police, WAF, FSC	Radio, telephone
Warning III	Nadrau bridge flooded	WAF	Radio, telephone, siren
Warning IV	Ba tramline bridge flooded	DDMO, Police, Town council	Radio, telephone, siren
Action	Flooding in town imminent	DDMO, Police, Town council	Siren

(Yeo, 2000. Modified by consultation with Ba district)

Early Warning dissemination

- Formal warning
  - FMS
  - WAF
  - NDMO
  - ↓
  - Radio, TV, web
  - DDMO
  - ↓
  - Public
- Informal warning
  - Police, NFA, FSC
  - School, residents
  - ↓
  - DDMO
  - ↓
  - Police, NFA, FSC, town council, School
  - ↓
  - Public

Message for Warning II (example)

- Rainfall at upstream over past one hour exceeded 25mm at xx am today, in addition to 100 mm rainfall yesterday.
- This is second warning stage out of four stages.
- Residents in xxx Tikinas are advised to move properties to higher places, and prepare for evacuation with radio, food, & water.
- Children, women, elders, & handicapped should evacuate immediately.

Resource location

- Left bank
- NFA (RT)
- Police station (RT)
- Mission hospital
- Nailaga health center
- Dept. of road
- WAF
- Army from Lautoka
- Right bank
- DISMAC (RT w/o batt.)
- Police HQ (RT)
- Ba health center
- Education dept.
- Red cross
- Boat
- Army from Tabua

For faster response

- Check International response news.
  - www.reliefweb.int
- Check national media.
  - FBCL, Fiji Times, Fiji Sun, Fiji village, Fijiana times, Fiji today etc.
- Use of aerial survey at early stage.
- Bottom up reporting from police, village, school, health facilities.

Contact list for community

- FMS
- District
- Police
- School (evacuation center)
- Health center
- Red cross
- FBCL, News agencies

Annual SOP

	Month	Gov't	Community
Normal	Jun.-Aug.	Update info.	Update info.
Before	Sep.	Drill	Drill
During	Oct.-Apr.	Cyclone season	Cyclone season
After	May	Report, revise plan	Revise plan

Table top exercise report & Development of disaster resource inventory in Ba district

The strengthening community-based disaster risk management project in the pacific region

September 27, 2011
Kolinio Saukuru
Planning office, CWD

Objective

- To upgrade the capacity of preparedness of the key public and private sector agencies involved in disaster management.
- To ensure effective inter-operable understanding and avoid conflict of roles during disaster operations
- To strengthen the inter agency capabilities of building community resilience towards disaster management
- To factor the above as integral component of the district disaster management plan

Inter-Agency Coordination

- 4 groups in Table top Exercise
  - Early Warning (FMS ,NDMO, Media)
  - Response (Divisional Commissioner,Police RFMF,Provincial Council,
  - Recovery (Police,RFMF, Red Cross, DDOC
  - Reconstruction (Public Utilities, FEA,Telecom,Vodafone

Table top exercise

Lautoka Ba

Result of Table Top exercise

- FMS raised the importance of assigning a timeline to the disaster management plan so as to ensure effective and proper evacuation of the community members.
- Training to be conducted to the community leaders on Initial Damage Assessment which has been agreed in principle by NDMO and NDMO is currently conducting on that.

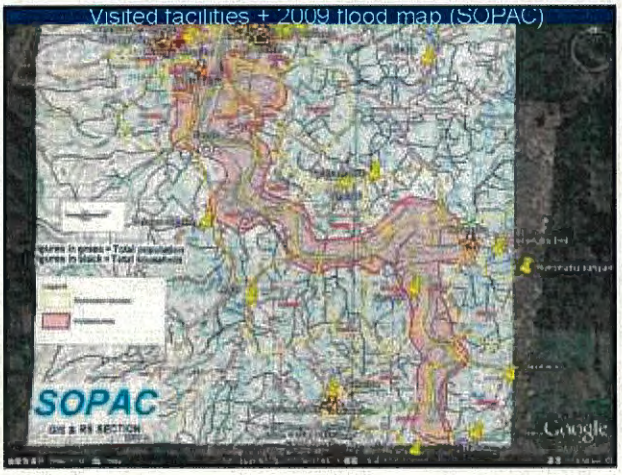
Result of Table Top exercise

- Communities to establish in-built mechanisms at community level , e.g. Community Disaster Committee to work with the community leaders. Local govt. authorities has to strengthen this at the municipal boundary communities
- Resource Plan to be properly documented by each agency to ensure effective inter-operable understanding in terms of resource allocation and manpower dispositions.

Disaster resource inventory

- Facilities visited
  - 30 Schools
  - 5 Police stations
  - 4 Health facilities
- Work
  - Interview
  - Location
  - Observation
- Period
  - 1st Aug. – 11th Aug.
- Members
  - CWD
  - WAF
  - Ba Police
  - JICA expert

Visited facilities + 2009 flood map (SOPAC)



Issues for schools

- Evacuation centers are not fully used.
  - Not informed to parents.
  - Residents are safe.
  - Re designation may be needed.
  - Police & health need to know centers.
- Tikina – school designation?
- Use of bus for evacuation?

Thank you !

Commitment of Western District to develop Flood Disaster Management Plan

The strengthening community-based disaster risk management project in the pacific region

September 27, 2011
Jovesa Vocea
Divisional Provincial Officer Western

Capacity Assessment

- Disaster resources
  - Staffs
  - Infrastructure
  - Communication
- Disaster experience
  - Experience
  - Response
  - Problems

Consultation meetings

Lautoka Ba

4 meetings were held at Commissioner's office in Lautoka and Ba district office.
Early warning procedures defined.
Tasks & lead agency for disaster response defined.

More use of information technology

Lautoka - Suva Web camera installed in Lautoka

New communication technology was installed and used.
Disaster information collection via net was introduced.

Table top exercise

Lautoka Ba

Developed disaster plan presented.
Major flood in Ba similar to 2009 was given as scenario.
30+ stake holders participated.
Disaster situation & response were discussed with maps.

Plan revision

Lautoka Ba

Disaster plan reviewed and revised.
Local NGOs will be included.
Disaster committee will be established in Western Division.

Advantage of Fiji in DRM

- Historical observation & basic data
  - Flood records since 1840
  - Rain data since 1905
  - Census, village population are kept updated
- Disaster management instruments
  - OHS plan are developed at every organization
  - Schools are defined as evacuation center
  - Operation center in division, district & police
- Communication Infrastructure
  - Mobile phone covers Vitilevu island
  - Affordable mobile internet connection
  - Government intranet established

Community-Based Disaster Management in The Republic of Fiji

Ropate Rakadi
Administrative Officer
Research and Risk Management Unit
National Disaster Management Office

Community Based Disaster Management

Purpose: To enhance People's Awareness of Disaster Prevention

1. Preparation Stage (October 2010 to March 2011)
   - Baseline Survey : Living standard, Resource, Experiences
   - Workshop : Introduction of the Project
2. Practice Stage (April 2011 to March 2012)
   - Risk Assessment : Water Level / Rainfall Monitoring
   - Exercise : Evacuation Plan & Drill
3. Systematization (April 2012 to March 2013)
   - Documentation : Village Awareness Programme / CDMP
   - Memorization : Voice Record, Radio Drama, Role Play, Museum
4. Extension (April to Oct 2013)
   - National Development Strategy : CBDM Promotion
   - Seasonal Event : National Day for Disaster Preparedness

2. Practice Stage (April 2011 to March 2012)

Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill

Rainfall Gauge

Water level Gauge

Community monitoring & action

		Rain gauge	
		Beep*	No beep
Water gauge	Beep	Evacuate	Evacuate**
	No beep	Alert	No action

*: 120mm/day (tentative)
**: Heavy rain in upstream

2. Practice Stage (April 2011 to March 2012)

Risk Assessment : Water Level / Rainfall Monitoring

Exercise : Evacuation Plan & Drill

Community Workshop

Evacuation Plan

Community Disaster Mgt Plan

Information collection

Community	Local gov't	National gov't
Village chief	DISMAC	NDMO
Health facilities	Health dept.	Min. health
Schools	Ed. dept.	Min. Ed.
Police stations	Police dept.	Police HQ
Church	Church	Church org.

2. Practice Stage (April 2011 to March 2012)

Risk Assessment : Water Level / Rainfall Monitoring

Exercise : Evacuation Plan & Drill

Evacuation Drill will be held on 18th and 19th Oct

Nawaqarua

Safer Evacuation Center?

Annual SOP

	Month	Gov't	Community
Normal	Jun.-Aug.	Update info.	Update info.
Before	Sep.	Drill	Drill
During	Oct.-Apr.	Cyclone season	Cyclone season
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Community Based Disaster Management

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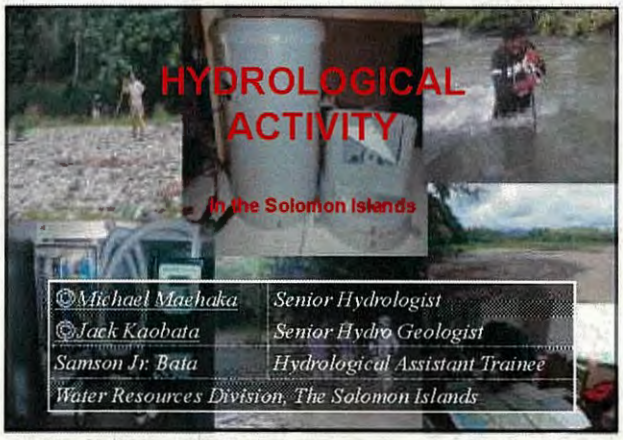
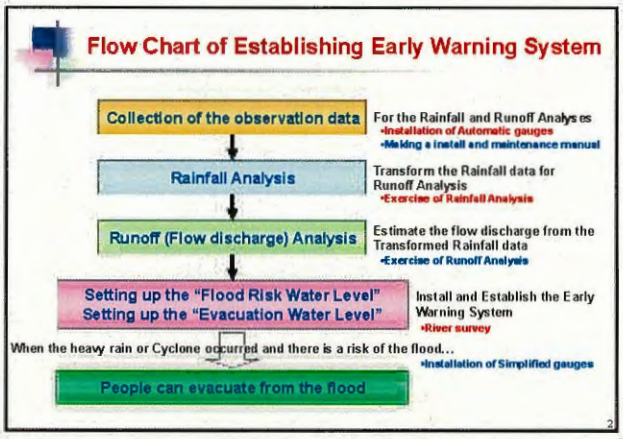
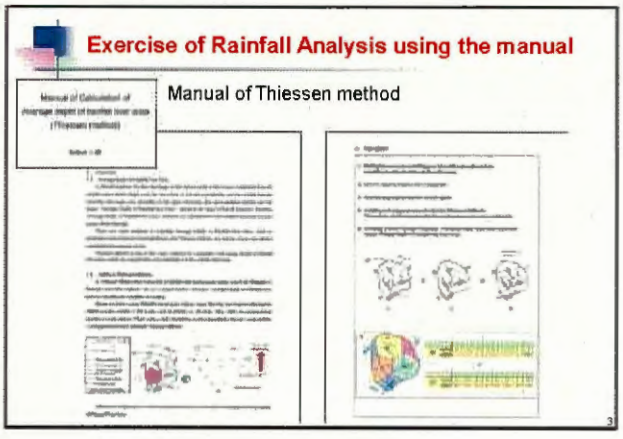
Community Based Disaster Management

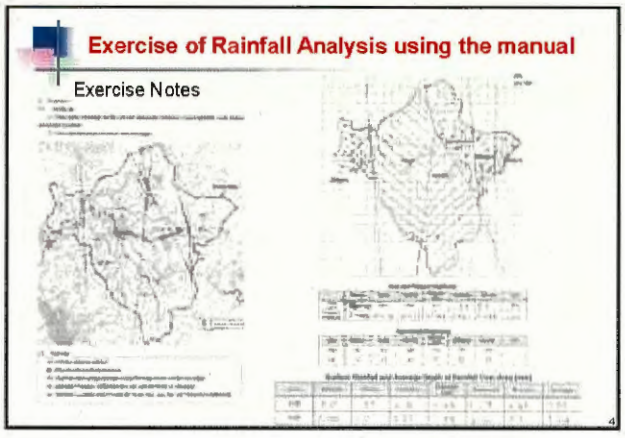
Problem Faced for 3rd Year

- Communication - Data
- Land Issue
- Coordination


HYDROLOGICAL ACTIVITY
In the Solomon Islands
Michael Maehaka | Senior Hydrologist
Jack Kaobata | Senior Hydro Geologist
Samson Jr. Bata | Hydrological Assistant Trainee
Water Resources Division, The Solomon Islands


Flow Chart of Establishing Early Warning System
Collection of the observation data
For the Rainfall and Runoff Analyses
•Installation of Automatic gauges
•Making a install and maintenance manual
Rainfall Analysis
Transform the Rainfall data for Runoff Analysis
•Exercise of Rainfall Analysis
Runoff (Flow discharge) Analysis
Estimate the flow discharge from the Transformed Rainfall data
•Exercise of Runoff Analysis
Setting up the "Flood Risk Water Level"
Setting up the "Evacuation Water Level"
Install and Establish the Early Warning System
•River survey
When the heavy rain or Cyclone occurred and there is a risk of the flood...
•Installation of Simplified gauges
People can evacuate from the flood
2

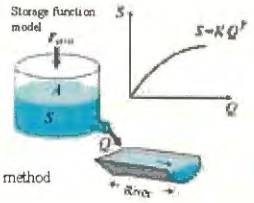

Exercise of Rainfall Analysis using the manual
Manual of Thiessen method
3


Exercise of Rainfall Analysis using the manual
Exercise Notes
4

Runoff Analysis (Storage function model)

$$S = K \cdot Q^{p}$$

$$\frac{dS}{dt} = \frac{1}{3.6} f \cdot r_{ave} \cdot A - Q$$



f : Runoff coefficient

K, p : Constants for Storage function method

S : Storage in basin area (m^3)

Q : Direct run - off from basin area (m^3/s)

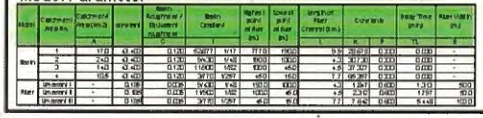
R_{ave} : Average depth of rainfall in basin area

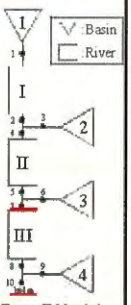
A : Basin areas(km^2)

5

Tentative Runoff modeling at Umasani River basin (using Storage Function Model)

Model Parameter



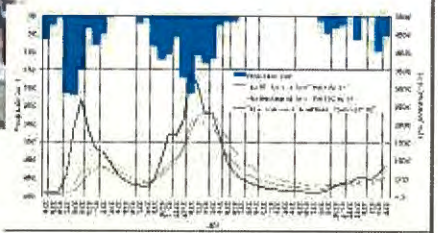


Runoff Model

6

Tentative Runoff modeling at Umasani River basin (using Storage Function Model)

Exercise for setting model parameter



Calculated flow discharge using observed rainfall data at Honiara Station

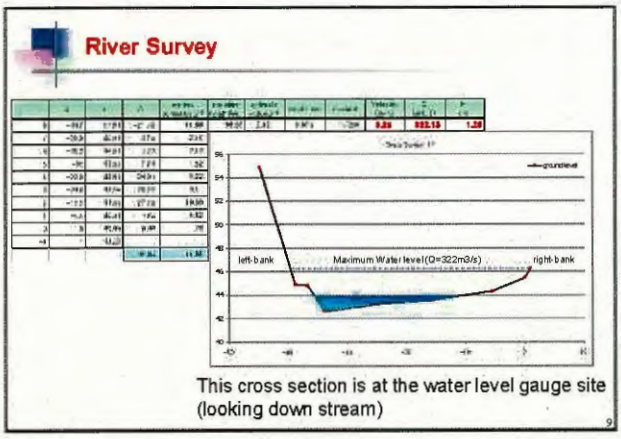
7

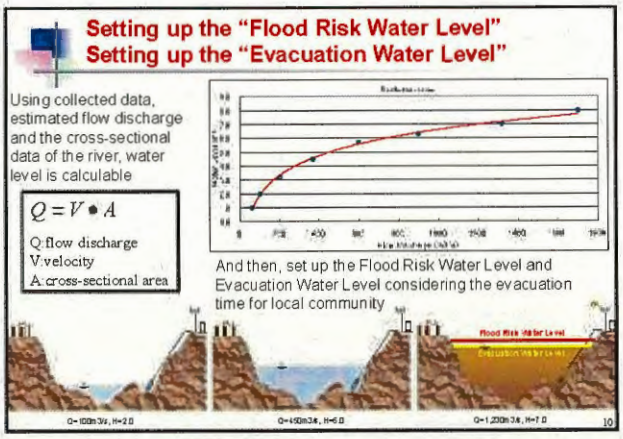
River Survey

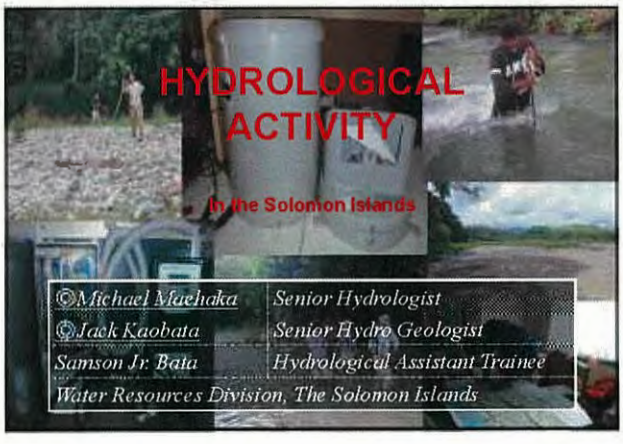
cross section survey at Umasani river

Distance of survey	7km
Number of cross section	18stations
survey interval	500m (and some river bend)
survey from	Umasani Bridge
survey to	candidate site for WL gauge

8


River Survey
left-bank
Maximum Water level(Q=322m3/s)
right-bank
This cross section is at the water level gauge site
(looking down stream)
9


Setting up the "Flood Risk Water Level"
Setting up the "Evacuation Water Level"
Using collected data, estimated flow discharge and the cross-sectional data of the river, water level is calculable
Q = V • A
Q:flow discharge
V:velocity
A:cross-sectional area
And then, set up the Flood Risk Water Level and Evacuation Water Level considering the evacuation time for local community
10


HYDROLOGICAL ACTIVITY
In the Solomon Islands
©Michael Maehaka Senior Hydrologist
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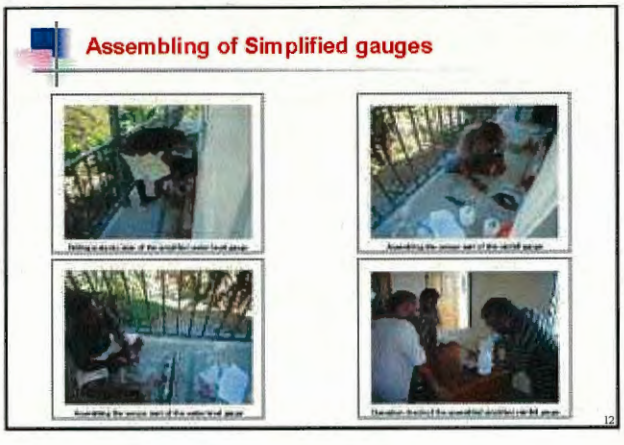
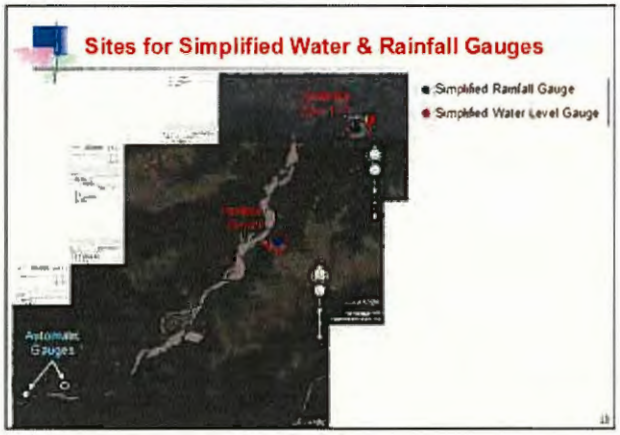
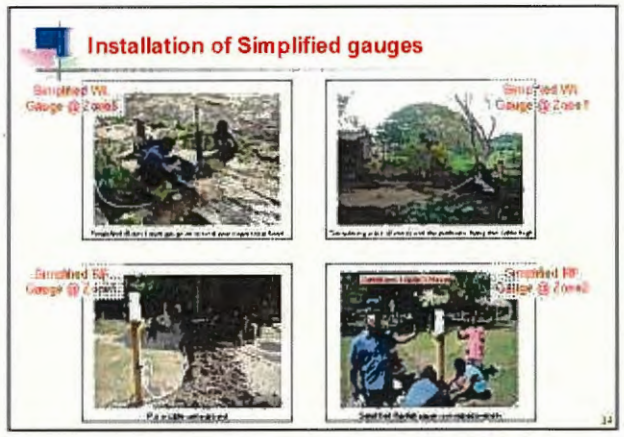
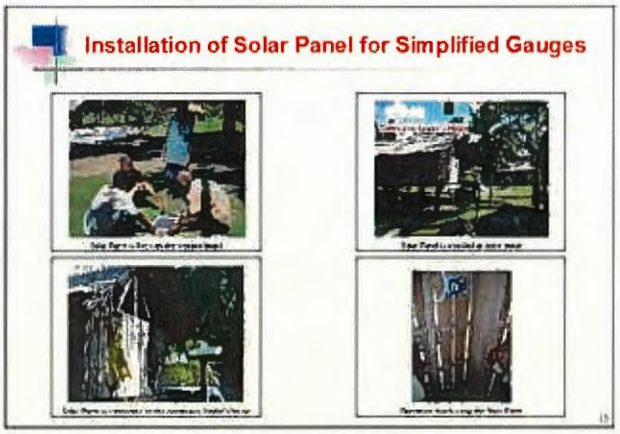
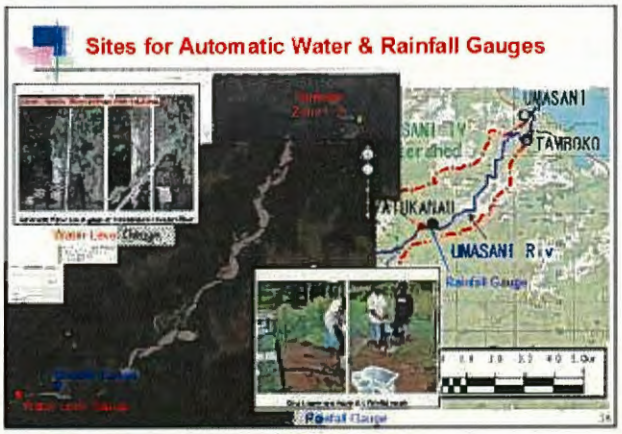
Water Resources Division, The Solomon Islands


Assembling of Simplified gauges
12


Sites for Simplified Water & Rainfall Gauges
Simplified Rainfall Gauge
Simplified Water Level Gauge
Automatic Gauges


Installation of Simplified gauges


Installation of Solar Panel for Simplified Gauges


Sites for Automatic Water & Rainfall Gauges
UMASANI
TAMBOKO
ATUKANAI
UMASANI Riv.
Rainfall Gauge

Installation of Automatic gauges (Water Level)

- For Collection of the observation data




17

Installation of Automatic gauges (Rainfall)

- For Collection of the observation data

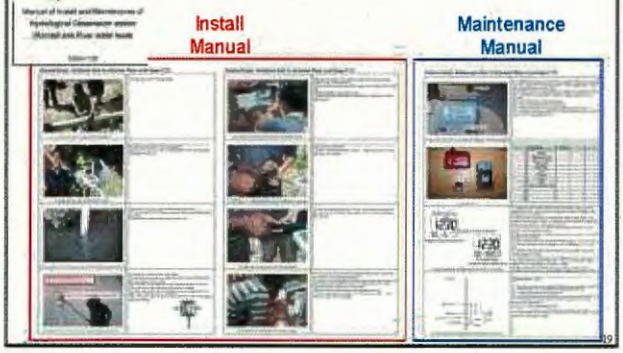



18

Making a install and maintenance manual

Install Manual

Maintenance Manual



19

Conclusion

- The runoff model which was developed for Umasani river basin is only tentative.
- Telemetry System is not available, so real time forecasting is not available so far. (Hopefully, it will be available in the near future)
- For the risk management and the disaster prevention, we will use the Simplified gauges. However, it just helps the residents to decide whether they should evacuate or not, not protect the residents against the flood.
- Evacuation plan, education and drill will be important for the residents to evacuate properly. Cooperation with Task Force 2 and 3 (Outcome2 and 3), we need to conduct the "Strengthening Community-Based Disaster Risk Management" continuously.

20

Development of Flood Disaster Management Plan for Guadalcanal Province

The strengthening community-based disaster risk management project in the pacific region

September 27, 2011
Joseph Tangi (tangi.joseph4@gmail.com)
Guadalcanal Education Department

1

1. Disaster in Guadalcanal

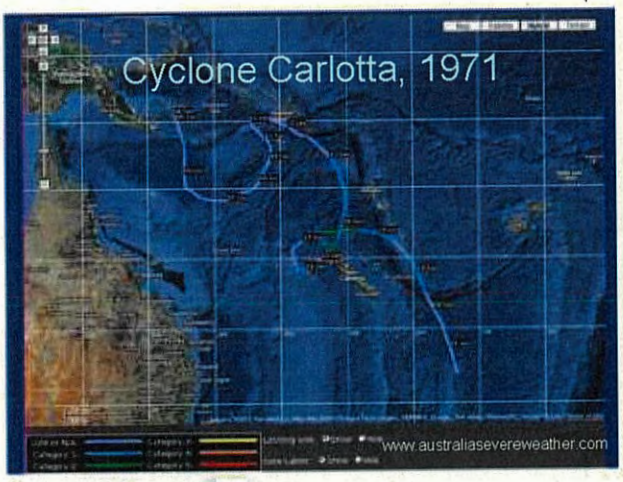
Date	Type	Killed	Affected
1931/10/03	Tsunami	50	
1966/11/14	TC Angela	3	1,000
1977/04/20	Earthquake	34	1,000
1986/05/19	TC Namu	101	150,000
2009/01/29	Flood	21	7,000
2010/01/12	Flood	2	16,017
2010/03/15	TC Ului		590

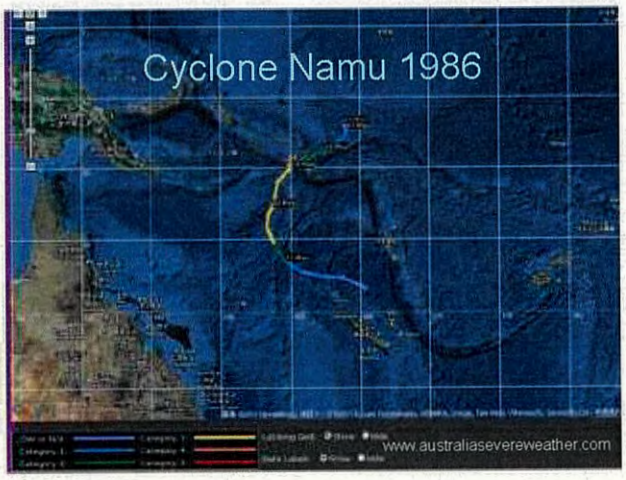
Source: www.emdat.be 3

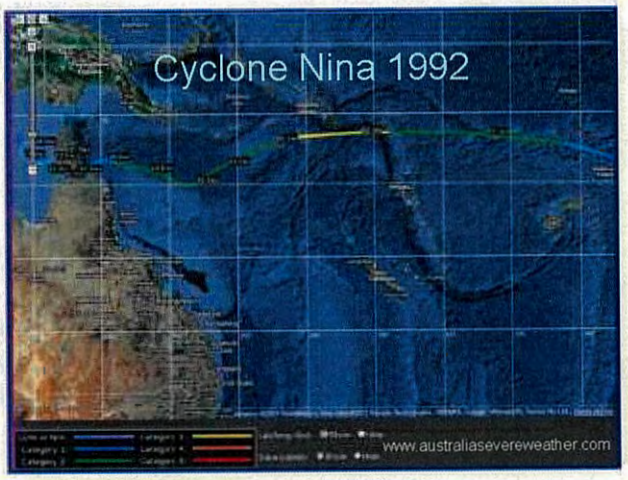
Outline

- 1. Hazard in Guadalcanal
- 2. Disaster planning meeting
- 3. Disaster resource inventory

2







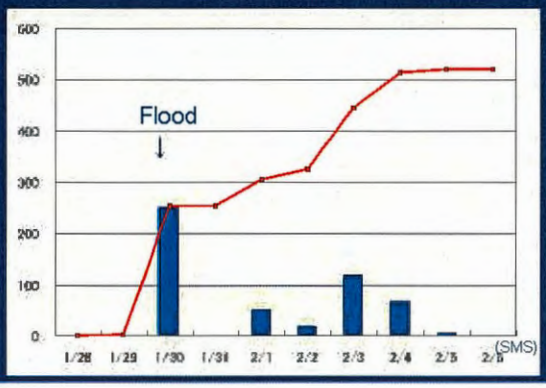
Casualties by Cyclone Namu

- Most of the dead found by the 23 May (total 71) were aged or women and children unable to escape landslides and floods. [The Age, May 23 1986.]
- These mud slides caused major damage and were the major contributing factor in the death of over 100 people, the injuries of more than 1,000 people and the 90,000 homeless people. Only minor damage was caused by wind. [Kingston, G. 1986.]

Rainfall monitoring

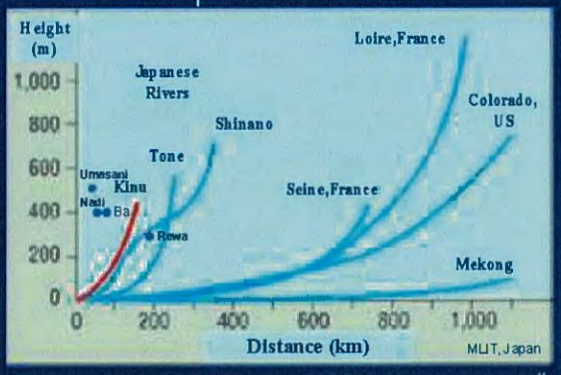
	Meteorology service	Water resource department
Monitoring	Manual	Automated
Frequency	Every 3 hours	Every hour
Communication	Manual reading	Off line
No. of stations	2 stations	?
Available data	1960-	?

Rainfall in Jan. 2009



9

Comparison of rivers



Unasami river: D=20 km. H=500 m .Even steeper than Japanese rivers

11

Date	Time	Hourly	Cumlative
29-Jan-09	13:00:00	0	
29-Jan-09	14:00:00	1	1
29-Jan-09	15:00:00	12	13
29-Jan-09	16:00:00	3	16
29-Jan-09	17:00:00	0	16
29-Jan-09	18:00:00	1	17
29-Jan-09	19:00:00	0	17
29-Jan-09	20:00:00	4	21
29-Jan-09	21:00:00	11	32
29-Jan-09	22:00:00	40	72
29-Jan-09	23:00:00	50	122
29-Jan-09	24:00:00	39	161
30-Jan-09	1:00:00	39	200
30-Jan-09	2:00:00	19	219
30-Jan-09	3:00:00	9	228
30-Jan-09	4:00:00	6	234
30-Jan-09	5:00:00	0	234
30-Jan-09	6:00:00	7	241
30-Jan-09	7:00:00	1	242
30-Jan-09	8:00:00	1	243
30-Jan-09	9:00:00	5	248
30-Jan-09	10:00:00	11	259
30-Jan-09	11:00:00	2	261

Heavy rain started

←Flood happened

Hourly rainfall at WRD Honiara

10

2. Weekly meeting @NDMO

4 meetings were held at NDMO office with stakeholders.
Topics:
Preparedness task for clusters.
Possible early warning system.
Tasks & lead agency for disaster response.

12

Potentials of Solomon Is.

- Observation & historical data
  - Russell catalog 1586-1990
  - Meteorology data since 1960
  - 1986 Namu flood & landslide map
- Disaster management system
  - Cluster system & SOP
  - Provincial DM plan drafted
  - Disaster awareness radio program
- Communication infrastructure
  - HF radio @ health facilities
  - Mobile phone & radio @ school
  - Radio stations in Guadalcanal

13

3. School Inventory development

- Location
- No. of class room
- Structure type
- No. of floor
- Established year
- No. of teachers
- No. of students
- Communication
- Water source
- Food garden
- Kitchen
- Electricity
- Disaster experience
- Preparedness

15

Weakness of Guadalcanal

- No disaster operation room.
- No evacuation centers defined.
- Only two rainfall stations by SMS.
- No mobile phone in west - south.
- No traffic road in southern coast.

14

Schools in East Guadalcanal

Radio at school (Turarana)

Turarana school was built by relocated residents affected by 1977 earthquake. They have working experience of disaster response. They have radio in teachers' room. 19

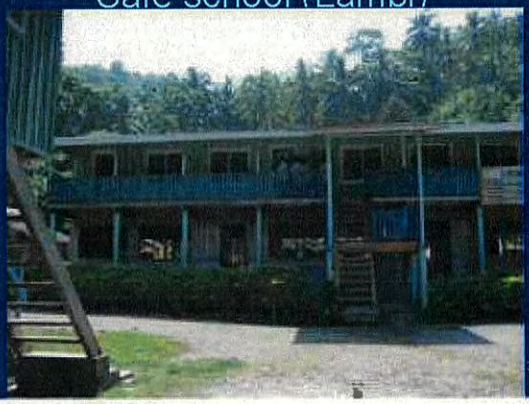
Safe school (Kulu)

18

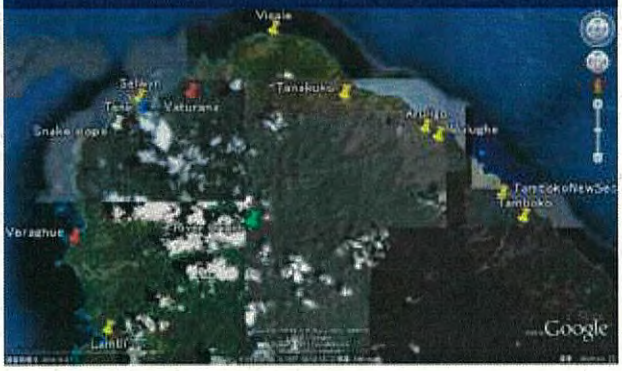
Schools in Central Guadalcanal

School in flood prone area (Mercy)

Safe school (Lambi)



Schools in West Guadalcanal



Selwyn Collage

Selwyn collage was destroyed by the 1986 Cyclone Namu.
It was rebuilt in western Guadalcanal in 1991.

Teacher at Selwyn collage

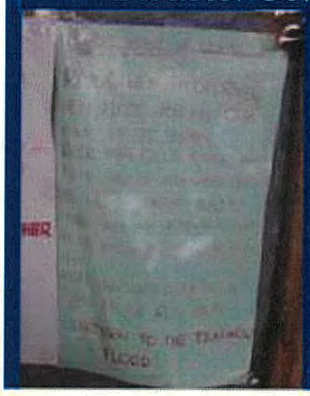
- "I teach disaster to students in the beginning of my geography class, because our school was destroyed by cyclone Namu in 1986."

25

HF radio in clinics

- Most clinics has radio.
- Some are close to school.
- However
  - Station code to be informed.
  - Operation manual needed.
  - Operator in HQ needed.

Disaster Songs (Aruligo)



- Flood, cyclone, earthquake, Tsunami are considered.
- Target: Kinder garden
- Developed by Caritas, NDMO, & teachers.

26

Commercial radio

Station	Wave	Coverage	Operation	Generator
SIBC	AM/FM	National	6am-11pm	(Yes)
BBC	FM	Guadalcanal	24 hr.	No
ABC	FM	Guadalcanal	24 hr.	No
PAOA	FM	Guadalcanal	24 hr.	Yes
GFM	FM	Guadalcanal	24 hr.	Yes
ZFM	FM	Honiara	?	?

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Summary

- Guadalcanal has been frequently affected by floods, landslide, besides earthquake & Tsunami.
- Children & women are most victims by disaster.
- Provincial disaster plan is developing.
- Safe schools can be evacuation centers.
- More school inventory survey in future.

Thank you !

Your comments to: tangi.joseph4@gmail.com

29

Community-Based Disaster Management in The Solomon Islands

Herrick Savusi
Provincial Disaster Officer
Guadalcanal Province
National Disaster Management Office

Community Based Disaster Management

Purpose: To enhance People's Awareness of Disaster Prevention

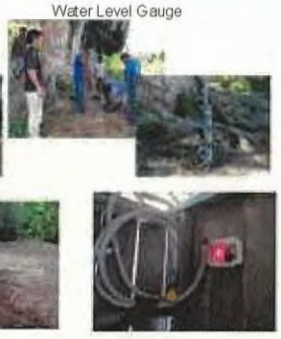
1. Preparation Stage (October 2010 to March 2011)
   - Baseline Survey : Living standard, Resource, Experiences
   - Workshop : Introduction of the Project
2. Practice Stage (April 2011 to March 2012)
   - Risk Assessment : Risk Map, Community EW (Hydro Gauges)
   - Exercise : Evacuation Plan & Drill
3. Systematization (April 2012 to March 2013)
   - Documentation : Village Awareness Programme / CDMP
   - Memorization : Voice Record, Radio Drama, Role Play, Museum
4. Extension (April to Oct 2013)
   - National Development Strategy : CBDM Promotion
   - Seasonal Event : National Day for Disaster Preparedness

2. Practice Stage (April 2011 to March 2012)

Risk Assessment : Risk Map, Community EW (Hydro Gauges)
Exercise : Evacuation Plan & Drill

Rain Gauge

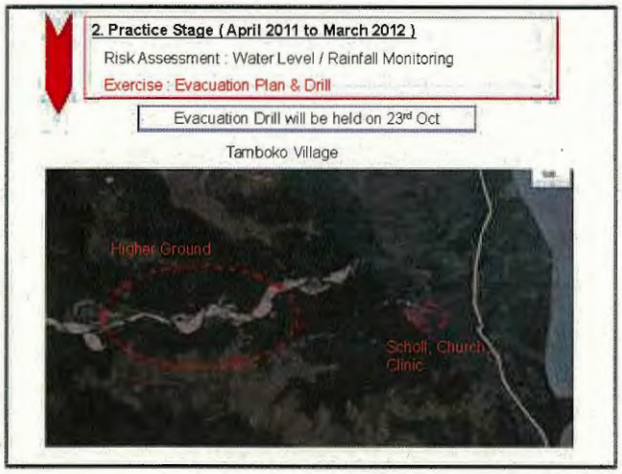
Water Level Gauge

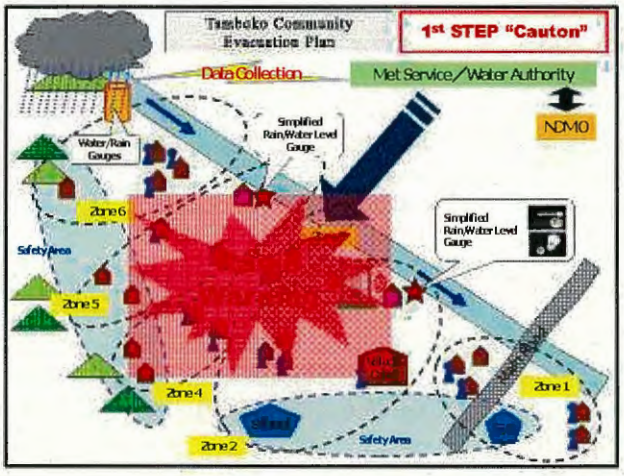


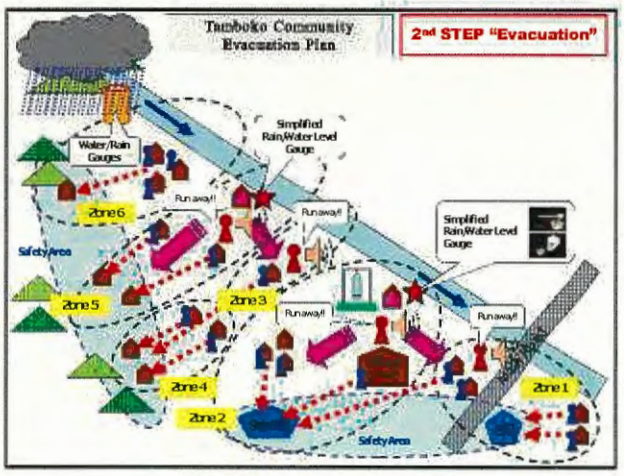
2. Practice Stage (April 2011 to March 2012)

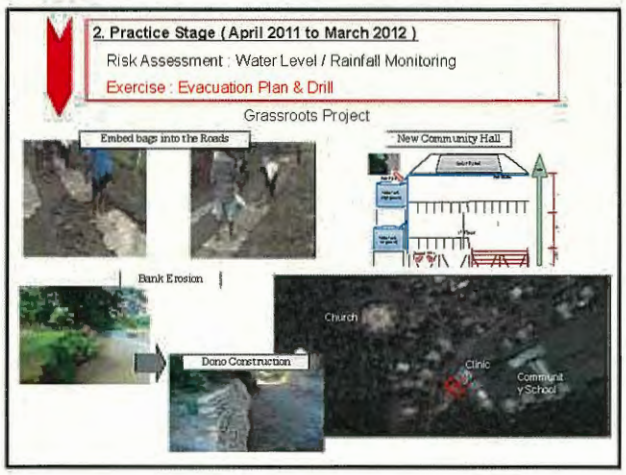
Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill

Community Disaster Committee


2. Practice Stage (April 2011 to March 2012)
Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill
Evacuation Drill will be held on 23rd Oct
Tamboko Village
Higher Ground
Scholl, Church
Clinic


Tamboko Community Evacuation Plan
1st STEP "Cauton"
Data Collection
Met Service/Water Authority
NDMO
Water/Rain Gauges
Simplified Rain,Water Level Gauge
Zone6
Safety Area
Zone5
Zone4
Zone1
Zone2
Safety Area


Tamboko Community Evacuation Plan
2nd STEP "Evacuation"
Water/Rain Gauges
Simplified Rain,Water Level Gauge
Runaway!
Zone6
Safety Area
Zone5
Zone3
Zone4
Zone2
Zone1
Safety Area


2. Practice Stage (April 2011 to March 2012)
Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill
Grassroots Project
Embed bags into the Roads
New Community Hall
Bank Erosion
Church
Clinic
Community School
Dono Construction

Annual SOP

	Month	Gov't	Community
Normal	Jun.-Aug.	Update info.	Update info.
Before	Sep.	Drill	Drill
During	Oct.-Apr.	Cyclone season	Cyclone season
After	May	Report, revise plan	Revise plan

Community Based Disaster Management

Purpose: To enhance People's Awareness of Disaster Prevention

1. Preparation Stage (October 2010 to March 201
   - Baseline Survey : Living standard, Resource, Exp
   - Workshop : Introduction of the Project
2. Practice Stage (April 2011 to March 2012)
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4. Extension (April to Oct 2013)
   - National Development Strategy : CBDM Promotion
   - Seasonal Event : National Day for Disaster Preparedness

Attendance of International Seminar at Fiji Met Service

27-Sep-11

NO.	Name	Title	Country	Phone
1	Kanaya masaaki	JICA		8326477
2	Samson Bata	MMERE	Solomon	21522
3	Fred Ferah	SIMS	Solomon	23021
4	Lloyad Tahani	SIMS	Solomon	24218
5	Michael Maehaka	MMERE	Solomon	21522
6	Michael Siau	SIMS	Solomon	36310
7	Jack Kaobata	WRD, MMERE	Solomon	67721522
8	Litiana Bainimarama	NDMO Fiji	Fiji	9238825
9	Sipuru Rove	NDMO	Solomon	27937
10	Paula	WAF	Fiji	7051400
11	Manoa	WAF	Fiji	7052747
12	Samuela Kanalawa	NDMO	Fiji	9031385
13	Joseva Vocea	Prov. Development	Fiji	9098060
14	Jale Uluilakeaa	FMS	Fiji	9317152
15	Tomasi. N	WAF Hydro	Fiji	7051423
16	Seremaia. K	WAF Hydro	Fiji	7052835
17	Epeli Tuda	Ministry of Defence	Fiji	3211613
18	Ropate Rakadi	NDMO	Fiji	9803414
19	Frank Manola	NDMO SI	Solomon	27936
20	Herrick Savusi	NDMO SI	Solomon	27936
21	Maureen Hazelman	IWRM	Fiji	6281233
22	Josatoki Teuo	Strategic Planning Officer	Fiji	3222322
23	Mosese Ravasakula	Ministry of Finance	Fiji	3222157
24	Joseph Tangi	Gusadalcanal Province Edu. Dept	Solomon	28042
25	Mahendra Kumar	MPI, IWRM	Fiji	8354339
26	M Mua	Provincial Dev Ba	Fiji	6674056
28	Antheny Blahe	NDMO	Fiji	9803414
29	Sera Tualagi	JICA Ba	Fiji	9188743
30	Jiuta Waqavonovono	CWD Office	Fiji	9296565
31	Viliame Kava	CWD Office	Fiji	9537372
32	Pajiliani Dobui	Director, NDMO	Fiji	9995492
33	Megumi Matsuoka	JOCV, Ba	Fiji	8652481
34	Yohei Hashimoto	JICA	Fiji	9928522
35	Mamoru Nakahara	Ryukyu Univ.	Japan	
36	Hiroshi Inoue	National Inst. Earthquake	Japan	
37	Nemani Bolaqace	WAF	Fiji	7052751
38	Kolinio Sawkuru	NDMO	Fiji	6662350
39	Niko Nadalo	Ba Rural Local Authority	Fiji	6674050
40	Ashok Kumar	Water Authority	Fiji	7052438
41	Iosefo Erenio	Water Authority	Fiji	7052740
42	Akisi Korodrau	NDMO	Fiji	
43	Ooi	JICA Adviser	Japan	
44	Toshikatu Oomachi	JICA Adviser	Japan	
45	Yamazaki	JICA Project Expert	Japan	9441984
46	Kameyama	JICA Project Expert	Japan	9235773
47	Alifereti Abenisga	Assistant BDO	Fiji	8776708

The Strengthening Community-Based Disaster Risk Management Project In The Pacific Region

Workshop for Assembling of Simplified Gauges

FMS, Nadi

28-30 September, 2011

National Disaster Management Office,

Ministry of Provincial Development and National Disaster Management

Day 2 (28th, September)

TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
0830-0900	**Registration**		*All Participants*
0900-0910	**Opening Remarks**	Welcome Greeting	*Mr. David, Director SIMS*
0910-0930	**Session 4**	Brief of Community-Based Simple Warning	*Mr. Ooi, JICA Adviser*
0930-1150	**Session 5**	Simplified Rain Gauge Assembling	*Mr. Ooi* *Dr. Oomachi* *All Participants*
1150-1300	**Lunch**		*Ditto*
1300-1630		Assembling	*Ditto*

Day 3 (29th, September)

TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
0830-0900	**Registration**		*All Participants*
0900-0910	**Opening Remarks**	Welcome Greeting	*Mr. Illisony, WAF Lautoka*
0910-1150	**Session 6**	Simplified Water Level Gauge Assembling	*Mr. Ooi* *Dr. Oomachi* *All Participants*
1150-1300	**Lunch**		*Ditto*
1300-1630		Assembling (Continue)	*Ditto*

Day 4 (30th, September) at Votua

TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
0800-0900	**Registration**	*Call Together**	*All Participants*
0900-0910	**Opening Remarks**	Welcome Greeting	*Mr. Aisea, NDMO* *Mr. Romilusi, Votua Village Leader*
0910-1150	**Session 7**	Setting Work at Votua	*Mr.Ooi* *Dr. Oomachi* *All Participants*
1150-1200	**Lunch**		*Ditto*
1210-1410		Setting Work(Continue)	*Mr.Ooi* *Dr. Oomachi* *All Participants*
1610-1630	**Closing Remark**		*Dr. Oomachi* *Mr. Cawaki, Commissioner CWD*

*Bus arrangement for Participants from Nadi to Votua, Ba

2010-10-01alt
Amended 2010-12-25
Amended 2011-08-20

Hydrological Equipment for Community Early Warning

-Explanatory Note-

- Introduction
- Equipment
  - Characteristics (Advantages and Limitations)
  - Assembly
  - Installation
  - Operation
  - Details of apparatus
  - Tools and parts
- End Note

VOLUNTEERS for the promotion of

COMMUNITY EARLY WARNING (VCEW)

■ Introduction

The World Conference for Disaster Reduction (1995 Japan) emphasized the importance of community-based disaster management (CBDM) in that community operated early warning (COEW) should be a key component.

COEW is necessary especially for communities located in small steep river basins because:

- Floods/debris flows/landslides occur by localized heavy rainfall within the river basin where the communities are located. However in most countries the national observation network is not so dense to cover all such basins.
- Floods/debris flows/landslides occur shortly after heavy rainfall. Therefore people should be warned immediately after rainfall. However in most countries the national early warning system may not be so quick in operation.

To meet such necessity water level equipment and rainfall equipment were developed in the Central America and the Caribbean.

- Water level equipment with automatic alarm function was developed by CONRED (Guatemala)/CEPREDENAC[1)] after Hurricane Mitch (1998) and has since been in use for COEW in Central America.
- Rainfall equipment of similar type was developed by the University of West Indies (Trinidad & Tobago)/CDERA/JICA [2)] in 2004-2005 and has been distributed to Caribbean countries for COEW.

Of various types of equipments being used for COEW, these equipments may be the one suitable for a majority of communities because of the advantages mentioned in the next chapter. For a wider use of these equipments in developing countries, "Volunteers for the promotion of Community Early Warning (VCEW)" (Ref. End Note) has been producing them with some modification of the originals for donation to developing countries[3)]. The equipments are also being sent to international organizations for information sharing among variety of users in the world[4)].

The intention of VCEW is not to provide the equipments to all communities of developing countries but to a limited number of organizations (government agencies, NGOs, academic institutes etc) in each country which will serve as the core for mass production and dissemination and will support communities in O/M, thus establishing a self-reliant system for production and use of the equipments in each country.

■ Equipment

■ Characteristics (Advantages and Limitations)

Advantages

- Cheap in cost: All parts will be available even in developing countries except the relay for the monitoring apparatus which may not be available in some countries;
- Simple in structure: An armature/inexperienced person will be able to assemble but involvement of technician, electric engineer, hydrologist are desirable for the reliable assembling and future improvement. .
- Easy for O/M: Any trouble in O/M can be solved by the persons who assembled the equipment, without resorting to external help which may take time and cost;
- Effective measurement: The observer can measure heavy rainfall and sudden rise in water level without fail even if they occur in the mid-night, due to the alarm system;
- Safe measurement: The observer can measure rainfall and water level safely in the house without going out to the observation sites under storm, mid-night and other difficult conditions.

Limitations

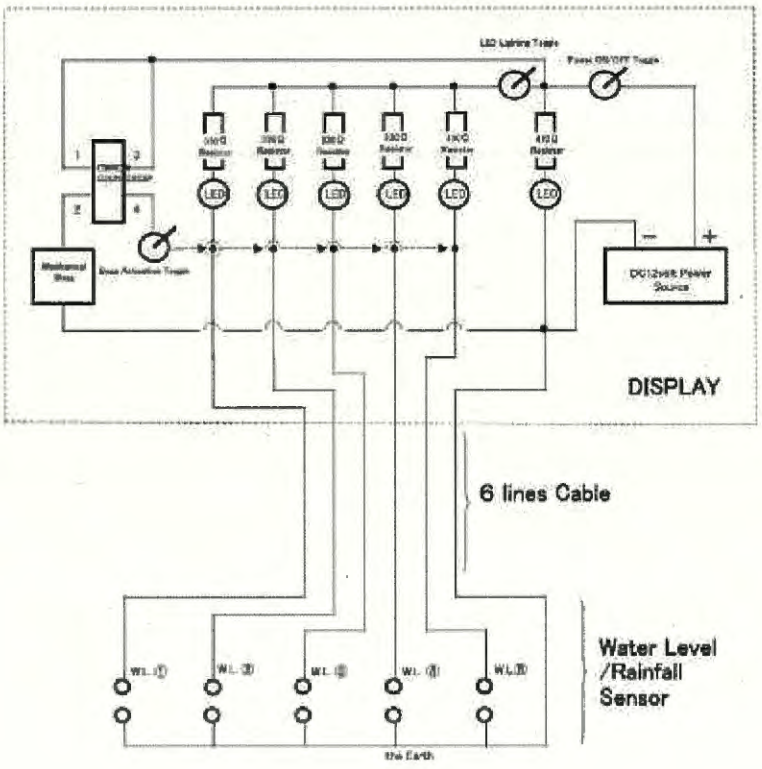
- Rainfall and water level equipment are:
  - not for "real time observation"
  - not for "automatic recording"
- Rainfall equipment is:
  - not for "automatic drain" of accumulated rainfall
  - for accumulated rainfall and not for "intensity "(rainfall during any optional unit time)

Despite "Limitations", the equipments will be suitable for COEW in developing countries due to "Advantages", especially "Simple in structure" and "Easy for O/M". There are many cases where hydrological equipments are not working which were imported and installed with external assistance.

■ Assembly

- The equipment (rainfall equipment and water level equipment) consists of a sensor for measurement and a monitoring apparatus for display and warning.
- Power is to be supplied by a 12 volt battery or by an AC converter. Solar battery may be considered where power supply is not stable.
- Circuit diagram is given in Figure 1.
- Details of tools for assembly and parts are given in Table 1 and 2 respectively.
- One day will be enough to assemble a set of the monitoring apparatus, rainfall equipment and water level equipment after experiences of assembly of several sets of equipment, if all tools and parts are readily at hand.

Figure 1 Circuit Diagram



- Rainfall equipment
  - The size of the bottle depends on the rainfall amount. 2 litter bottle might be appropriate for many cases, but 3 litter or more can also be considered. When it is necessary to measure a larger amount of rainfall than the depth of the bottle, a smaller bottle can be used for the receiving part.
- Water level equipment
  - Depth/velocity/floating rubbish etc. should be taken into account in the design and installation.

Photo 1
Monitoring apparatus

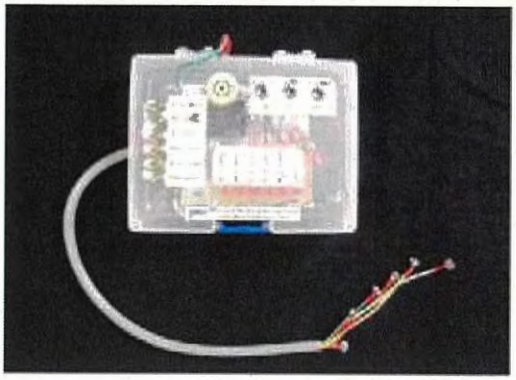


Photo 2 Rainfall equipment and
Monitoring apparatus

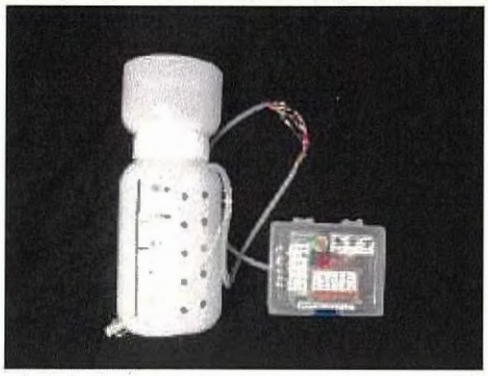
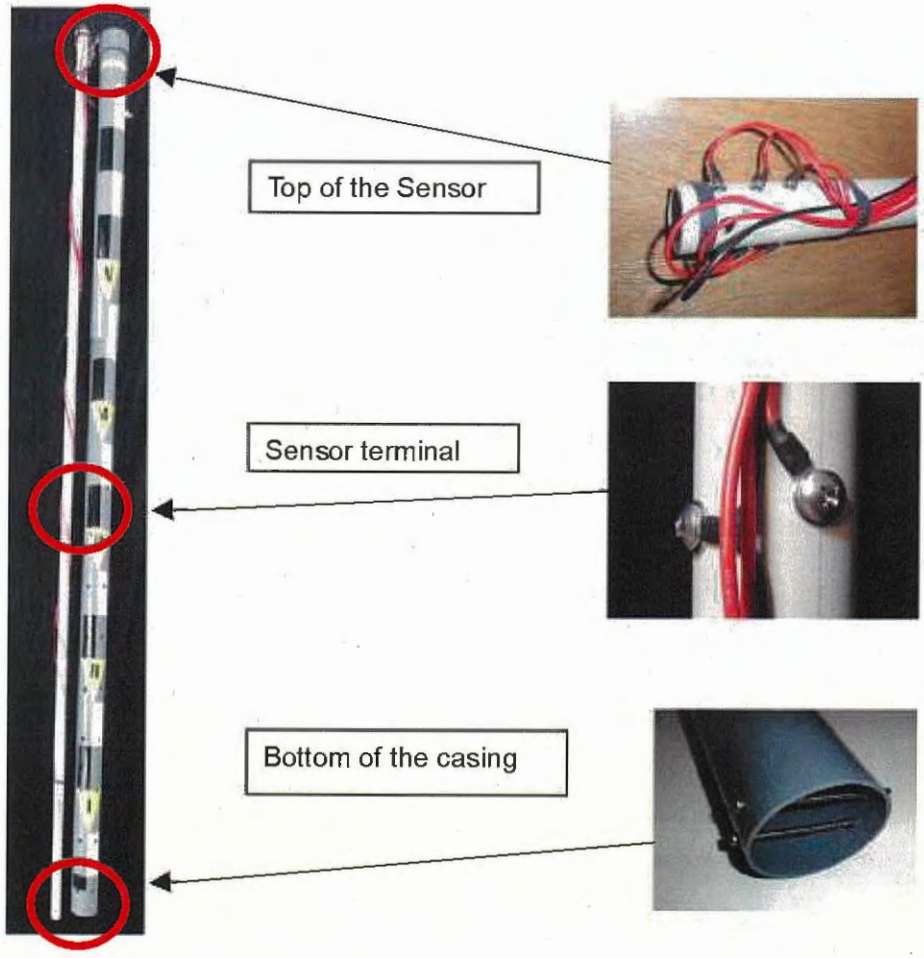


Photo 3 Water level equipment



■ Installation

- Rainfall equipment
  - The sensor is to be installed outside the house and connected by a cable to the monitoring apparatus in the house. The connecting cable can be extended to more than 100 m.
- Water level equipment
  - The sensor is to be installed by the river bank attached to the revetment (photo 4) or a tree (photo 5), or on the artificial basement (photo 6). The sensor is connected by a cable to the monitoring apparatus in the house in the same manner as the rainfall equipment.
  - It is important to ensure that the cable should not be stolen or damaged.
  - The bottom is to be set higher than the river bed because the measurement is made not of low water levels but of floods levels.

Photo 4
(attached to revetment, Nepal)

Photo 5
(attached to a tree, Costa Rica)

Photo 6
(Installation on the concrete basement, Guatemala)

■ Operation

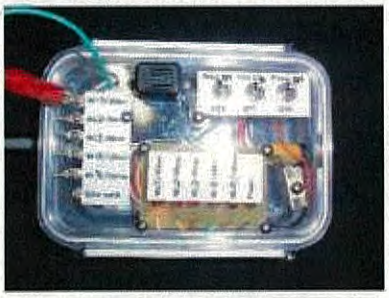
- Using a 6-line cable, 5 stages of accumulated rainfalls and water levels can be monitored, and the alarm buzzer can be activated at any of the selected stage of accumulated rainfall and water level.
- It is recommended to turn OFF either the LED switch or buzzer, because having the both LEDs and buzzer activated at the same time may cause instability in functionality of the buzzer.
- For the rain observation, it is required to add a pinch of salt in the rain storage bottle before observation to improve electric conductivity of the rainwater.

- Rainfall observation
  - The critical rainfall amount (for alarm, warning, evacuation etc) shall be determined based on the relationship between rainfalls (accumulated rainfalls or the combination of accumulated rainfalls and rainfall intensity) and inundation areas and occurrence of debris flows/landslides.
  - The rainfall intensity can be known from the accumulated rainfall and the time from the previous accumulated rainfall and the time.
  - The observation is to be made only during monsoon season. During the monsoon season the observer records the daily rainfall amount. The accumulated rain should be drained every morning at the fixed time.
  - When information on possible disaster (floods, debris flows, landslides etc) is announced by the meteorological agency, the observer should be stand-by for observation.
  - Each time the accumulated rainfall reaches one of 5 stages, the observer records the amount and the time, and informs to the community leader and the municipal authority etc.
  - It is required to add a pinch of salt in the rain storage bottle before observation to improve electric conductivity of the rainwater.

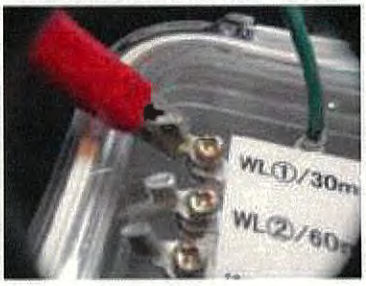
- Water level observation
  - Operational procedure similar to the rainfall observation will be applied to the water level observation.
  - The critical water levels (for alarm, warning, evacuation etc) shall be determined based on the relationship between the water levels at the observation point and areas of possible inundation.
  - When a possible flood is announced by the meteorological agency, the observer should be stand-by for observation.
  - Each time the water level reaches one of 5 stages, the observer records the water level and the time, and informs to the community leader and the municipal authority etc.

■ Details of Apparatus

Monitor



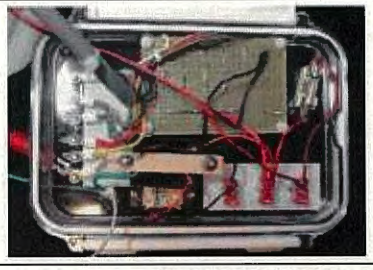
Front face



Selective terminal

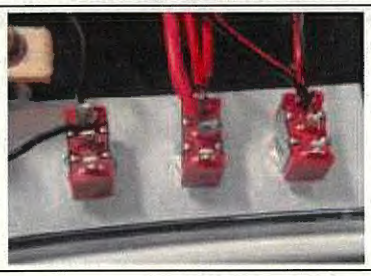
Buzzer

Tong switch

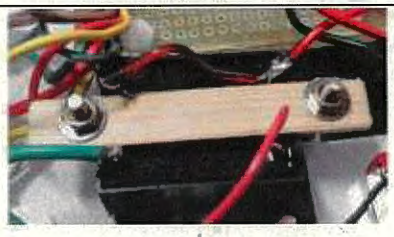


Back

Selective terminal (back)



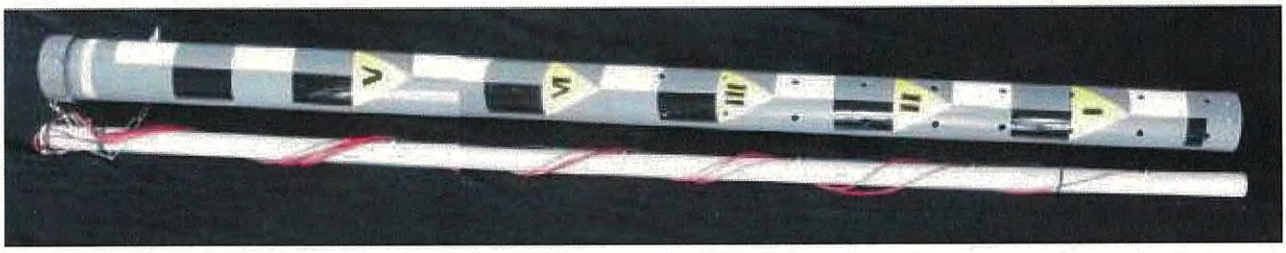
Tong switch (back)



Relay

Fuse

Water Level Equipment



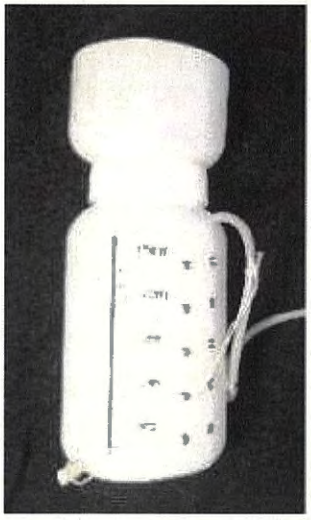
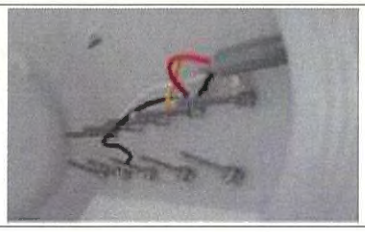
Casing(L:2 m, ϕ: 75mm) tube and Sensor pole(L:2m, ϕ:40mm)

Head cover and connecting terminal

Bottom of casing tube

Sensor terminal

Rainfall Equipment

		
	Sensor terminal	Drain cap
		
Total view	Rain receiving parts	

■ Tools and Parts

Table 1 Tools for assembly

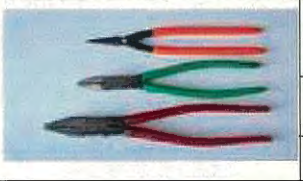
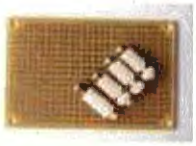
	Soldering iron for electric work Solder for electric work Flux for soldering		Screw driver
	Radio pliers		Mini driver Hexagonal nut driver for M3
	Pliers (small) Nipper Pinchers		Soldering iron stand and a piece of wood
	Rasp		Tap for M3 screw
	Metal cutting saw		M3 hexagonal nut socket driver for M3
	Scissors (small) Scissors (large)		Electric driver drill
	Cutter (small) Cutter (large)		Awl
	Drills 2mm, 2.5mm, 3.1mm, 4.5mm 6.5mm, 9mm etc.		Press for aluminum terminal
	Measure and Ruler		Knife
	Tester		Hair dryer

Table 2 Parts

(1) Parts for Monitoring Apparatus

Appearance	Item	Model	Standard	Unit	No.	Reference. Price (yen)	Reference cost (yen)
	Plastic case		0.5 litter	pc.	1	600	600
	Universal basis	AE-3G	2.54mm pitch 72x47mm	pc.	1	100	100
	Spacer for basis	10mm	4pcs. 1 set	pc.	1	100	100
	Mechanical buzzer	PB21-5Z02	9v(3-12volt) with activating circuit	pc.	1	200	200
	M3 Screw to fix buzzer	6mm		pcs.	2	5	10
	Relay	OMRON G3CN-DX02P		pc.	1	1,250	1,250
	M3 Screw to fix relay	20mm		pcs.	2	5	10
	M3 washer			pcs.	2	5	10
	M3 nut			pcs.	2	6	12
	Wood bar						
	Carbon resistor	1/4W 330Ω		pcs.	5	10	50
	Carbon resistor	1/4W 430Ω		pc.	1	10	10
	High brightness LED	Red		pcs.	6	10	60
	Tong switch	ST-1061		pcs.	3	100	300
	Bagworm clip			pc.	1	100	100
	M3 screw for selecting terminal	6mm		pcs.	6	5	30
	M3 nut			pcs.	6	6	36
	M3 squash terminal	Round		pcs.	11	5	55
	Glass pipe fuse	N30C	2A	pc.	1	40	40
	Fuse holder			pc.	1	140	140
	M3 bolt	6mm		pc.	1	5	5

	M3 Nut			pc.	1	6	6
	DC jack	inner φ2.1mm outer φ5.5mm		pc.	1	100	100
	Wire (2)	6 lines cable	0.25mm.sq.	cm	10	3	30
	Wire (3)	Black/red wire		cm	50	1	50
	Wire (1)	6 lines cable	0.5mm.sq.	m	1	100	100
	M3 bolt			pcs.	6	5	30
	M3 nut			pcs.	6	6	36
	M3 squash terminal			pcs.	6	5	30
	Heat contract insulation tube or insulation tape	3mm & 4mm		roll	0.1	300	30
	AC converter	Input: 100-240V Output: 12V, 2A		pc.	1	1,000	1,000
TOTAL							4,530

(2) Parts for Rainfall Equipment

Appearance	Item	Model	Standard	Unit	No.	Reference price (yen)	Reference cost (yen)
	2 litter large neck bottle			pc.	1	600	600
	2 litter narrow neck bottle			pc.	1	600	600
	M3 stainless bolt	25mm		pcs.	10	5	50
	M3 stainless nut			pcs.	16	6	96
	Stainless wire			cm	30		10
	6 lines cable	0.5mmsqr		m	1	100	100
	M3squash terminal	Round		pcs.	6	5	30
	M3 squash terminal	Y shaped		pcs.	6	5	30
	Metal strip	10mm x 80mm		pc.	1		10
	M3 stainless bolt	8mm		pc.	1	5	5
	M3 stainless nut			pc.	1	6	6
	M3 stainless washer			pc.	1	5	5
	Wood Peg			pc.	1		
	Heat contract insulation tube or insulation tape	3mm & 4mm		roll	0.1	300	30
TOTAL							1,572

(3) Parts for Water level Equipment (Height: 2m, Distance: 30m)

Appearance	Item	Model	Standard	Unit	No.	Reference Price (yen)	Reference cost (yen)
	Plastic pipe for sensor	φ40mm x 2m		pc.	1	700	700
	Plastic pipe for casing	φ75mm x 2m		pc.	1	800	800
	Stainless wood screw			pcs.	10	13	130
	M4 Stainless washer			pcs.	10	5	50
	M4 Squash terminal	Round		pcs.	10	6	60
	Wire	Black		m	3	30	90
	Wire	Red		cm	8	30	240
	End cap	75mm		pc.	1	190	190
	M3 Stainless bolt	6mm		pcs.	3	5	15
	M5 Stainless bolt	100mm		pcs.	2	20	40
	M5 Stainless nut			pcs.	4	10	40
	M3 Stainless bolt	6mm		pcs.	6	5	30
	M3 Squash terminal	Round		pcs.	6	5	30
	Wire (1)	6 lines cable	0.5mm.sq.	m	30	100	3000
	M3 Squash terminal	Round		pcs.	6	5	30
	M3 squash terminal	Y shaped		pcs.	6	5	30
	Heat contract insulation tube or insulation tape	3mm & 4mm		roll	0.1	300	30
	Color adhesive seal	Outdoor use	10cmx4 5cm	pcs	3	240	720
TOTAL							6,225

■ End Note

Volunteers for the promotion of Community Early Warning (VCEW) is a group of persons who wish to work voluntarily for the promotion of Community Operated Early Warning (COEW) in developing countries, making use of their respective experiences in developing countries and international organizations as well as in Japan.

There are various types of equipment ranging from simple one to advanced one, of which each community chooses the most suitable one considering the O/M capacity etc. VCEW wishes that the equipment it offers will be useful for a number of communities in the world.

VCEW further wishes that such an offer will lead to further development of hydrological equipment by voluntary groups, academic institutions, private firms etc. in the world so as to meet the needs of so many communities of different O/M capabilities and other conditions.

Members of VCEW :

- Mr. Hidetomi Oi : Ex-staff of Japanese Government (Min. of Construction), UN (UNDRO) and JICA. JICA expert in Nepal, the Caribbean, Central America and others. Email:Oi-Hidetomi@jica.go.jp
- Dr. Toshikatsu Omachi : Ex-staff of Japanese Government (Min. of Construction) and UN (ESCAP). JICA expert in Indonesia, Panama and others. Email:omachi-t@gyao.ne.jp
- Mr. Susumu Ueda : Electric engineer belonging to Electric Safety Association. Voluntary works for community early warning in Nepal and Japan. Email:sin@kisnet.ne.jp

Foot notes :

1) The development of water level equipment was initiated by Dr. Juan Carlos who worked for CEPREDENAC, UN Platform for the Promotion of Early Warning (UNPPEW) and is currently working for UN SPIDER. when he was working for CEPREDENAC.
2) The development of rainfall equipment was initiated by Prof. Jacob Opadeyi of University of West Indies, Trinidad and Tobago, He produced 50 units of rainfall equipment for distribution to CDEMA member countries and conducted training for concerned personnel of CDEMA member countries regarding the use of the equipment in 2007.
3) The equipment has been sent to Guatemala, El Salvador (SNET), Trinidad and Tobago (University of West Indies), Indonesia, Lao PDR, Sri Lanka, Nepal and Thailand (as of 1 October 2010)
4) The equipment has been sent to UN Platform for the Promotion of Early Warning (UN PEW), ESCAP, WMO, ICIMOD, CEPREDENAC and CDEMA (as of 1 October 2010).

Project Seminar

for The Strengthening Community-Based Disaster Risk Management Project

Flamingo Conference Room at Honiara Hotel
Honiara

22 February, 2012

AGENDA

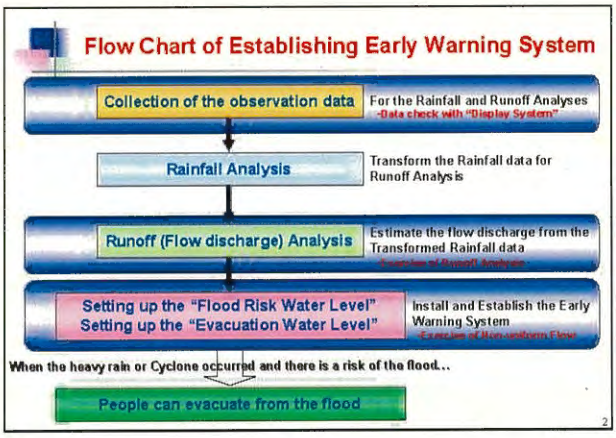
Seminar Objectives:

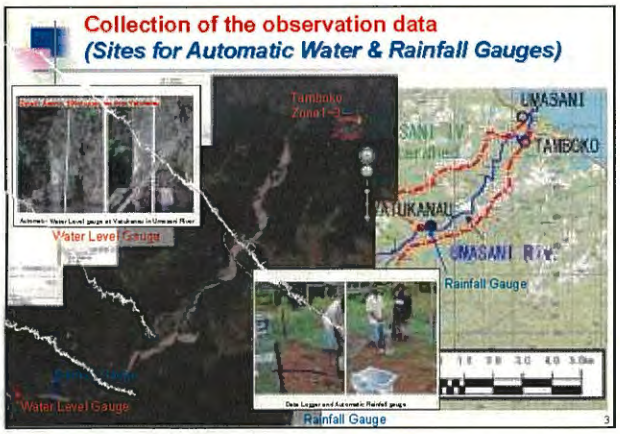
1. To report the progress of the JICA Project
2. To share the good practices and lesson among the stakeholders

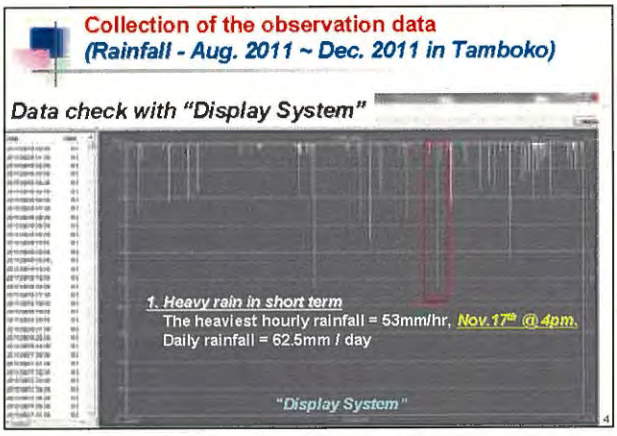
TIME	SESSION	FOCUS	RESOURCE AGENCY/PERSON
09:00-09:30	**Registration**		*All Participants*
09:45-10:00	Opening Remarks	Greeting	*Deputy Director of NDMO Solomon* *Representative of JICA Solomon Office*
10:00-10:30	**Session 1**	Outcome 1	*WRD, Senior Hydrologist*
10:30-11:00		Outcome 2	*G-Province, Educational Officer*
11:00-11:20		Break	*All Participants*
11:20-11:50		Outcome 3	*NDMO, Provincial Disaster Officer*
11:50-12:10		Q & A	*All Participants*
12:10- 13:30	**Lunch**		
13:30-14:00	**Session 2**	Outcome 1	*WAF, Senior Hydrologist*
14:00-14:30		Outcome 2	*CWD, Administration Officer*
14:30-14:50		Break	*All Participants*
14:50-15:20		Outcome 3	*BDO, Assistant District Officer*
15:20-15:40		Discussion	*All Participants*
15:40-15:50	**Closing Remarks**	Vote of Thanks	*Representative of Fiji counterpart Team*

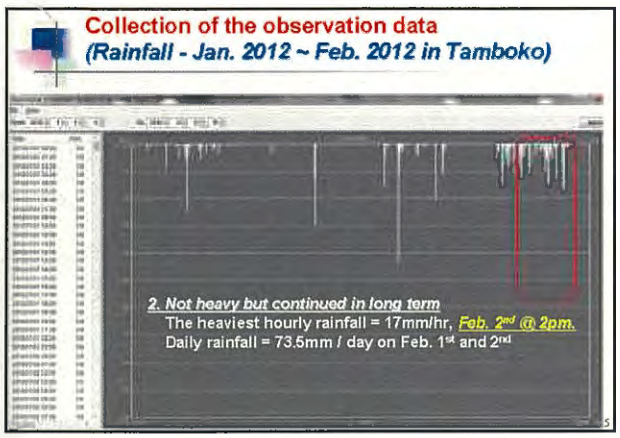
NDMO: National Disaster Management Office
WRD: Water Resource Division in Honiara
G-Province: Guadalcanal Provincial Government Office
WAF: Water Authority in Fiji
CWD: Commissioner Western Division Office
BDO: Ba District Office

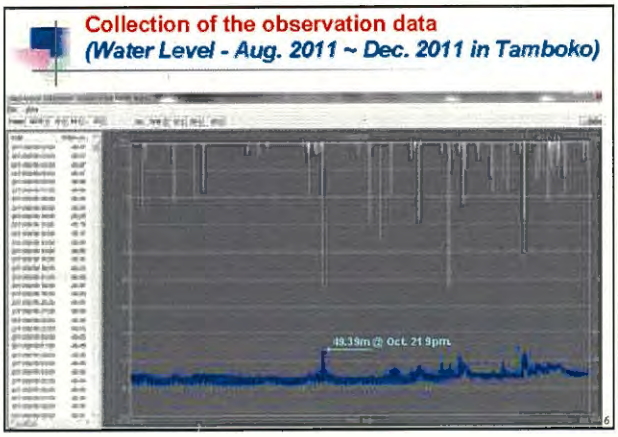

HYDROLOGICAL ACTIVITY
2nd Project Year
©Michael Maehaka Senior Hydrologist
Jack Kaobata Senior Hydro Geologist
Water Resources Division, The Solomon Islands


Flow Chart of Establishing Early Warning System
Collection of the observation data
For the Rainfall and Runoff Analyses
-Data check with "Display System"
Rainfall Analysis
Transform the Rainfall data for Runoff Analysis
Runoff (Flow discharge) Analysis
Estimate the flow discharge from the Transformed Rainfall data
Setting up the "Flood Risk Water Level"
Setting up the "Evacuation Water Level"
Install and Establish the Early Warning System
When the heavy rain or Cyclone occurred and there is a risk of the flood...
People can evacuate from the flood
2

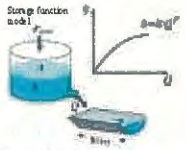

Collection of the observation data
(Sites for Automatic Water & Rainfall Gauges)
UNASANI
TAMBOKO
UNASANI R.
Water Level Gauge
Rainfall Gauge
Water Level Gauge
Rainfall Gauge
3


Collection of the observation data
(Rainfall - Aug. 2011 ~ Dec. 2011 in Tamboko)
Data check with "Display System"
1. Heavy rain in short term
The heaviest hourly rainfall = 53mm/hr, Nov.17th @ 4pm.
Daily rainfall = 62.5mm / day
"Display System"
4


Collection of the observation data
(Rainfall - Jan. 2012 ~ Feb. 2012 in Tamboko)
2. Not heavy but continued in long term
The heaviest hourly rainfall = 17mm/hr, Feb. 2nd @ 2pm.
Daily rainfall = 73.5mm / day on Feb. 1st and 2nd
5


Collection of the observation data
(Water Level - Aug. 2011 ~ Dec. 2011 in Tamboko)
6

Storage Function Model in Umasani River basin
(using Storage Function Model)



$$S = K \cdot Q^{p}$$

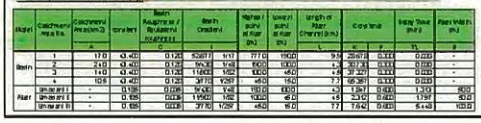
$$\frac{dS}{dt} = \frac{1}{3.6} \cdot f \cdot r_{ave} \cdot A - Q$$

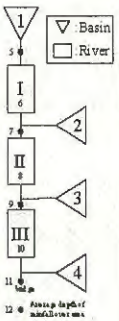
f : Runoff coefficient
K,p : Constants for Storage function method
S : Storage in basin area (m^2)
Q : Direct run - off from basin area (m^3/s)
R_{ave} : Average depth of rainfall in basin area
A : Basin areas(km^2)

"Program of Storage Function Model"

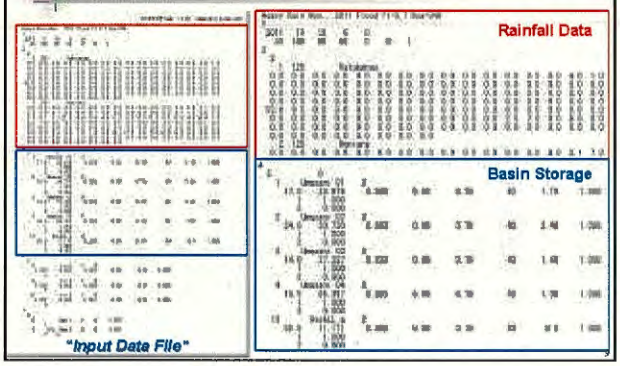
Storage Function Model in Umasani River basin
(Building up the model)

Model Parameter



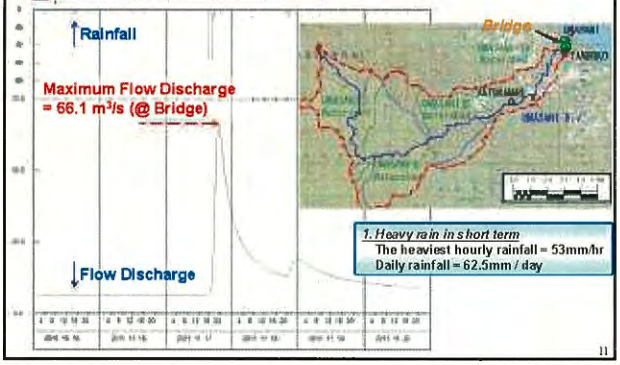


Storage Function Model in Umasani River basin
(Preparation for Input Data 1)

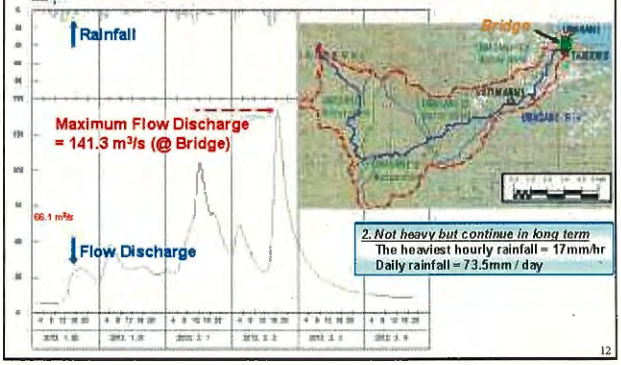


Storage Function Model in Umasani River basin
(Preparation for Input Data 2)

Storage Function Model in Umasani River basin
(Result of Runoff Analysis using observed data 1)

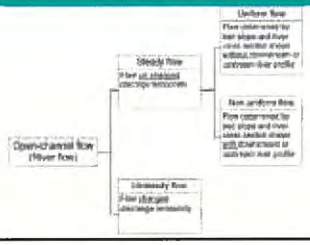


Storage Function Model in Umasani River basin
(Result of Runoff Analysis using observed data 2)



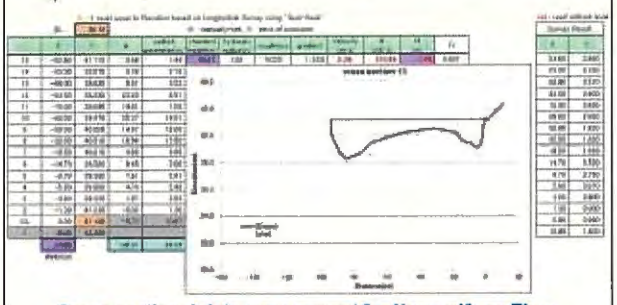
Non-uniform Flow in Umasani River

Uniform Flow	If a constant discharge flows through a channel with unchanging shape of section and gradient, the hydraulic quantities should be determined by uniform flow calculations as a rule.
Non-uniform Flow	When a constant discharge flows through a channel with longitudinally changing shape of section and gradient, the hydraulic quantities should be determined by non-uniform flow calculations as a rule.



13

Non-uniform Flow in Umasani River
(River surveyed data arrangement)

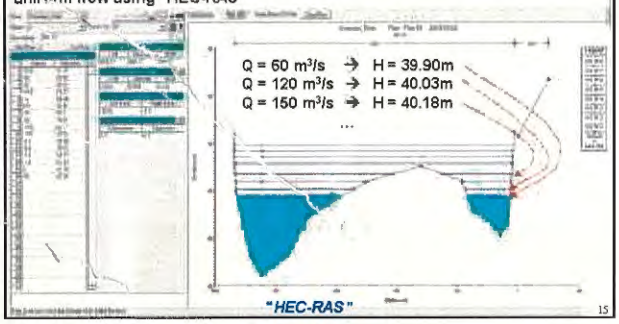


Cross sectional data arrangement for Non-uniform Flow

14

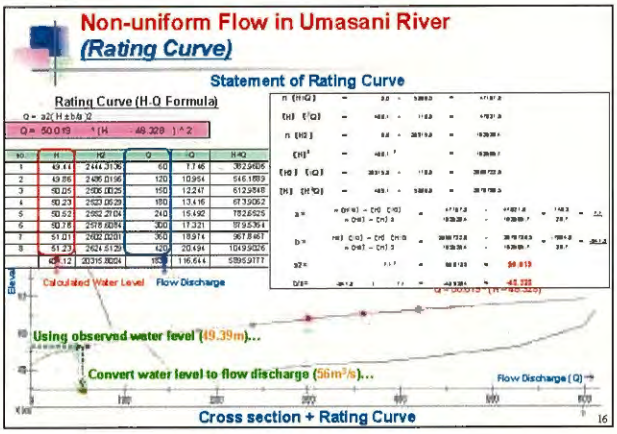
Non-uniform Flow in Umasani River
(using HEC-RAS)

Set the flow discharge and calculate the corresponding water level by non-uniform flow using "HEC-RAS"



15

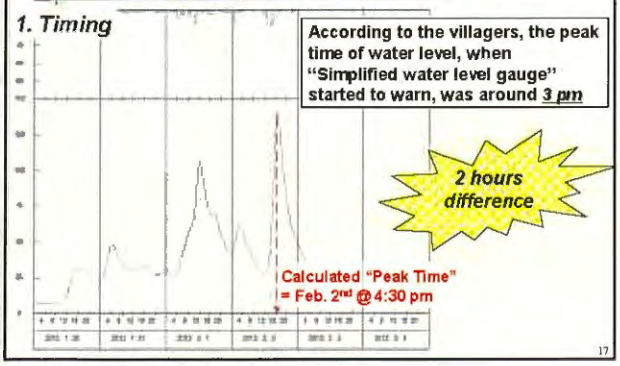
Non-uniform Flow in Umasani River
(Rating Curve)



16

Storage Function model & Non-uniform Flow
(Model verification based on observed data 1)

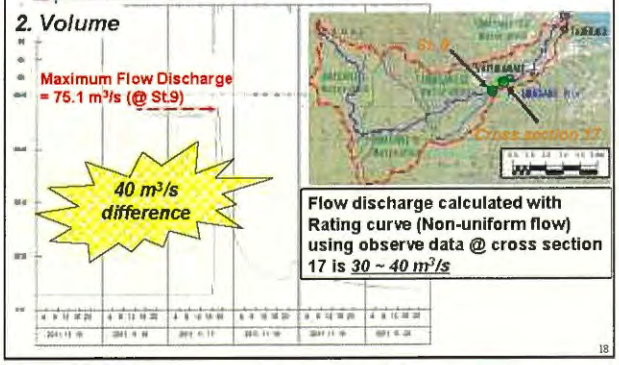
1. Timing



17

Storage Function model & Non-uniform Flow
(Model verification based on observed data 2)

2. Volume



18

Conclusion

- The runoff model and Non-uniform model which were developed for Umasani river basin are primary model. ***Model verification using long term observed data is required.***
However it is important for such models to be developed for the purposes of future flood forecasting.

- Because there is no telemetry System available, real time forecasting is not possible as yet (Hopefully, when we have such a system in place, the out come might be different from now).

19

Progress in Flood DRM Plan for Guadalcanal Province

The strengthening community-based disaster risk management project in the pacific region

February 22, 2012, Honiara
Joseph Tangi
(tangi.joseph4@gmail.com)
Guadalcanal Education Department

Outline

- 1. DRM plan framework
- 2. Informal Flood Warning in Guadalcanal
- 3. Table top exercise
- 4. Information sharing

1. Cluster system in Solomon Is.

N-DOC	P-DOC	RCC
Logistics & support	Response initial assessment & logistics	Damage & hazard mapping
Response & initial assessment		
Welfare/IDP	Welfare/IDP	Shelter & welfare
Livelihood	Public services & livelihood	Livelihood
Public services		Public services & facilities
Infrastructure	Infrastructure	

National Disaster Management Plan, 2009

Village DR planning

Warning Codes	Flooding/Wave surge – Features/Characteristics
BLUE ALERT	Heavy rain warning - flooding **may follow in 24 – 48 hours** Heavy swell warning – high waves **may occur in 24 – 48 hours** Start taking pre-cautionary measures
YELLOW ALERT Likely within 12 hours	Heavy rain warning - flooding **likely in next 12 hours** Heavy swell warning – high waves **likely in next 12 hours** Take action to secure gardens, property and canoes
RED ALERT	**Heavy rain warning** – flooding **expected within 3 – 12 hours** Heavy swell warning – 3.5m+ waves **expected within 3 – 12 hour hours** Complete preparations urgently and move to a secure place

Extension of plans

	Normal	Warning	Response	Recovery
National / Province			Cluster	Cluster
Province (JICA)	Cluster	Cluster	Cluster	Cluster
Village DR plan		Blue, Yellow Red		
Community (JICA)	White	Blue, Yellow Red	Purple	Green

Annual SOP

	Month	Gov't	Community
Normal	Jun.-Aug.	Update info.	Update info.
Before	Sep.	Drill	Drill
During	Oct.-Apr.	Cyclone season	Cyclone season
After	May	Report, revise plan	Revise plan

2. Formal Rain gauges

Formal Rainfall monitoring

	Meteorology service	Water resource department
Monitoring	Manual	Automated
Frequency	Every 3 hours	Every hour
Communication	Manual reading	Off line
No. of stations	2	5
Available data	1960-	1965-

Needs for "Informal" warning

- Dense monitoring station is needed.
  - Rainfall may vary from place to place.
- Real time monitoring is needed.
  - Data transmission is a key.
- Schools can be informal station.
  - Mobile phone & radio can be used.
  - School committee as dissemination channel.

Early Warning dissemination

- Formal warning
- SIMS
- NDMO
- WRD
- Radio, TV, web
- PDMO
- Public

- Informal warning
- School, Clinic
- Residents, Police
- PDMO
- Radio, School
- Police, Clinic
- Public

Schools in East Guadalcanal

Schools in West Guadalcanal

Early warning strategy

Area	River	Habited area	Communication	Early warning
North east	Longer	Coast to inland	Mobile, FM radio	Feasible
North west	Smaller	Mostly in coast	HF radio, AM radio	Possible
South	Steep	?	HF radio	Difficult

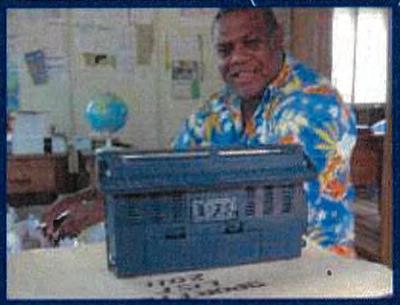
Commercial radio

Station	Wave	Coverage	Operation	Generator
SIBC	AM/FM	National	6am-11pm	Yes
BBC	FM	Guadalcanal	24 hr.	No
ABC	FM	Guadalcanal	24 hr.	No
PAOA	FM	Guadalcanal	24 hr.	Yes
GFM	FM	Guadalcanal	24 hr.	Yes
ZFM	FM	Honiara	?	?

Conditions of school for simplified rain gauge installation

- School in Upstream
- Have mobile phone
- Have solar panel
- Disaster aware school & teacher

Radio at school (Turarana)



Turarana school was built by relocated residents affected by 1977 earthquake. They have working experience of disaster response. They have radio in teachers' room.

Teacher at Selwyn collage

- "I teach disaster to students in the beginning of my geography class, because our school was destroyed by cyclone Namu in 1986."

3. Needs for disaster exercise

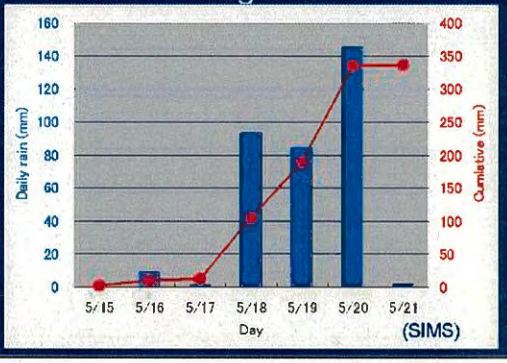
- Disaster does not happen every year.
- Officers changes position time to time.
- People forget disaster experience.
- Each disaster is different.

↓

- Exercise to keep memory.
- Exercise with different scenario.

Cyclone Namu 1986

Rainfall during the 1986 Namu



Scenario 1986 Namu

Date	Situation	Phase
5/16 18h	TC Namu formed	Stand by
5/18 9am	Daily rain 93mm	Warning
5/19 9am	Cumulative rain 188mm	Evacuation
5/21 9am	Rainfall stopped	Response
5/28	1 week after	Recovery

Clusters in province

- Response initial assessment & logistics
- Welfare/IDP
- Public services & livelihood
- Infrastructure

Tabletop exercise

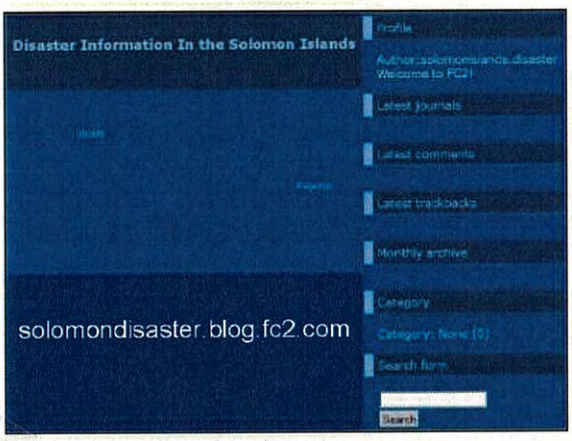
Results of exercise

Needs found by exercise

- Access from coast.
- Liaison with G-Pol.
- Rapid initial assessment template.
- Liaison with other clusters.
- Information management.

4. Information sharing

- Information floods during disaster.
- Information sharing needed.
- Blog (web log) is easy to use to publish daily events.
- Start using Common Blog among stakeholders.
- Learning by using.



Summary

- Provincial plan in line with National plan.
- Informal Flood Warning to be installed.
- Tabletop Simulation for 1986 TC Namu.
- Common Blog for Information sharing.

Thank you.

Community-Based Disaster Management in The Solomon Islands

Herrick Savusi
Provincial Disaster Officer
Guadalcanal Province
National Disaster Management Office

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2. Implementation Stage (April 2011 to March 2012)
Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill

Community Disaster Committee

Community Based Disaster Management

Purpose: To enhance People's Awareness of Disaster Prevention

1. Preparation Stage (October 2010 to March 2011)
Baseline Survey : Living standard, Resource, Experiences
Workshop : Introduction of the Project

2. Practice Stage (April 2011 to March 2012)
Risk Assessment : Risk Map, Community EW (Hydro Gauges)
Exercise : Evacuation Plan & Drill

3. Systematization (April 2012 to March 2013)
Documentation : Village Awareness Programme / CDMP
Memorization : Voice Record, Radio Drama, Role Play, Museum

4. Extension (April to Oct 2013)
National Development Strategy : CBDM Promotion
Seasonal Event : National Day for Disaster Preparedness

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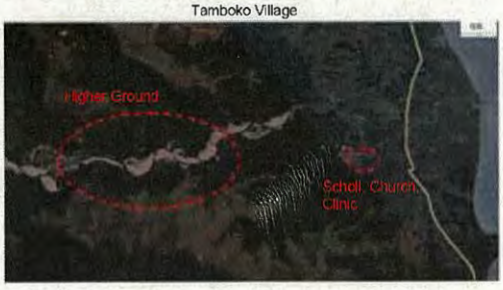
2. Implementation Stage (April 2011 to March 2012)
Risk Assessment : Water Level / Rainfall Monitoring
Exercise : Evacuation Plan & Drill

Evacuation Drill on 23rd Oct

Tamboko Village



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2. Implementation Stage (April 2011 to March 2012)
Risk Assessment : Risk Map, Community EW (Hydro Gauges)
Exercise : Evacuation Plan & Drill

Rain Gauge

Water Level Gauge

Community Based Disaster Management

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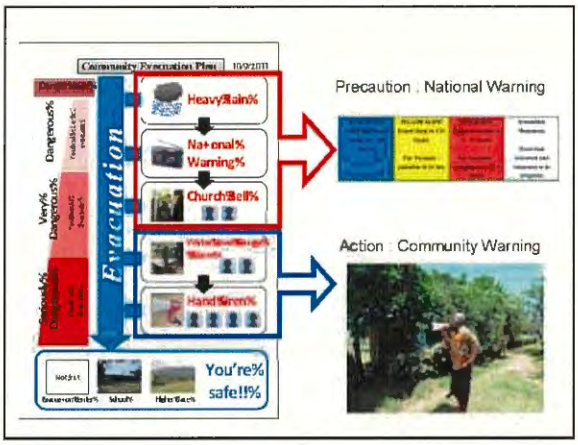
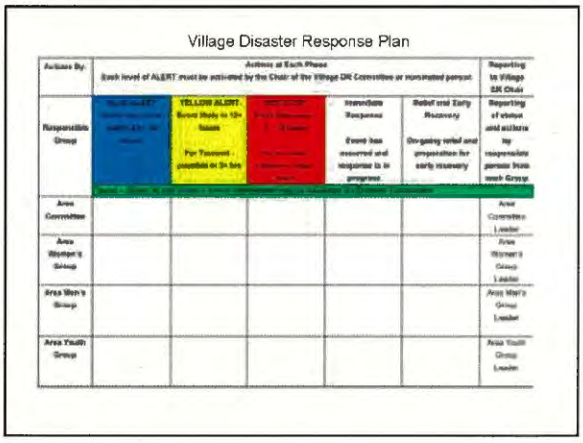
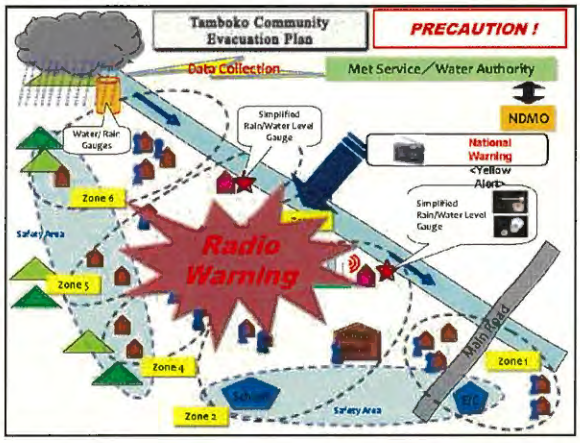
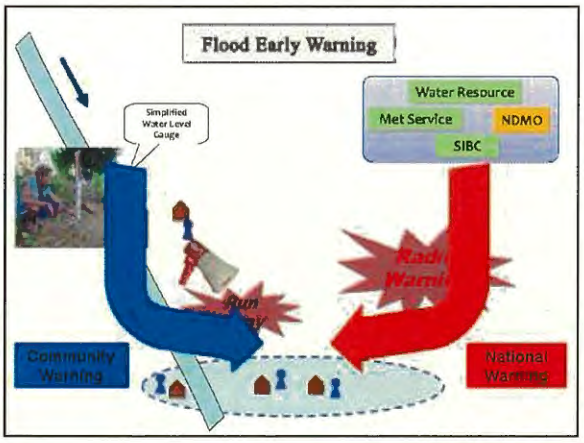
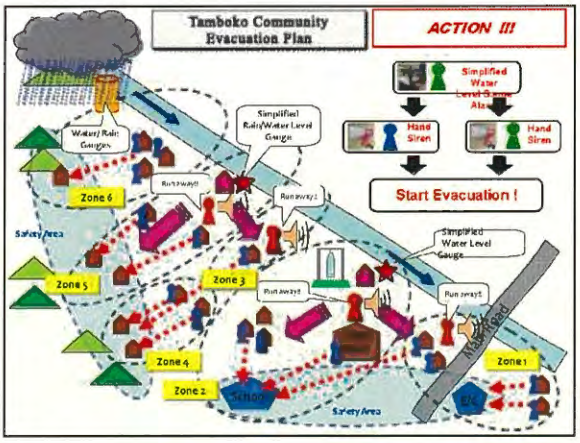
Community Flood Warning
Rain Gauge
Water Level Gauge


Evacuation
Heavy Rain%
National Warning%
Church Bell%
Hand Siren%
You're safe!!%
Precaution : National Warning
Action : Community Warning


Village Disaster Response Plan


Tamboko Community Evacuation Plan
PRECAUTION !
Data Collection
Met Service / Water Authority
NDMO
National Warning
<Yellow Alert>
Water/ Rain Gauges
Simplified Rain/Water Level Gauge
Radio Warning
Zone 6
Zone 5
Zone 4
Zone 3
Zone 2
Zone 1
Safety Area
Main Road


Flood Early Warning
Simplified Water Level Gauge
Water Resource
Met Service
NDMO
SIBC
Community Warning
National Warning


Tamboko Community Evacuation Plan
ACTION !!!
Simplified Water Level Gauge
Hand Siren
Start Evacuation !
Water/ Rain Gauges
Simplified Rain/Water Level Gauge
Runaways
Zone 6
Zone 5
Zone 4
Zone 3
Zone 2
Zone 1
Safety Area
Main Road

Simplified Water Level Gauge

- To visualize traditional knowledge
  → villagers have known danger water level
- A complementary warning
  → a trigger for run away
- Maintained by Community
  → Technical Support by NDMO, Water Resource Div.

Gauge Assembling Workshop in Nadi on 28 Sep 2011



Republic of Fiji Islands

The Strengthening Community-Based Disaster Risk Management Project in The Pacific Region

(Technical Cooperation Project)

<For Outcome 1>

Water Authority of Fiji, Western Division

Task for Outcome 1

(1) Develop Capacity of WAF Hydrology for Flood Forecasting

- ✓ Capacity development to collect flood runoff data
- ✓ To set and calibrate flood runoff model, training for C/Ps personnel

(2) Strengthen a system for issuing a flood warning

- ✓ To establish flood warning code based on flood runoff model
- ✓ To improve the system for data transmitting from FMS and WAF to NDMO
- ✓ To improve the system by which NDMO informs residents of warning information

Output in 1st Year

- ✓ To attend lectures on Hydrological Cycle and Flood Runoff
- ✓ To collect rainfall data during past floods
- ✓ To prepare the configuration under Flood Runoff Model
- ✓ To order Ba River cross section survey to local contractor
- ✓ To do reconnaissance survey on existing hydrological stations
- ✓ To prepare the specification and order of Ba hydrological network system
- ✓ To recommend data transmitting system from WAF/FMS to NDMO
- ✓ To enlighten communities on simplified warning system

FLOOD FORECASTING
Rainfall Impact and River Respond]

- Flood forecasting is the real – time estimation of stage , discharge , time of occurrence and duration of flooding, especially of peak discharge at a specific catchment discharge outlet resulting from rainfall

TYPES OF RAINFALL WITH RESPECT TO TYPES OF FLOOD

Rainfall Type	Duration	Intensity	Scale	
Long Rain Floods	Several day or Week	Low	Up to several thousands of Km²	Hindering rainfall in a wide area
Short Rain Floods	Short Duration	High	Local and Regional Scale	Heavy Rainfall
Flash Floods	Very Short Duration	Very High	Local	Localized heavy Rainfall

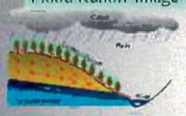
Ba River Catchment Model

BA RIVER DRAIN AN AREA =937KM²

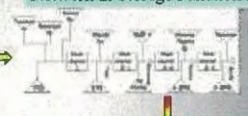
FLOODS IMPACT JAN 2012 west FIJI

Concept of Flood Hydrology

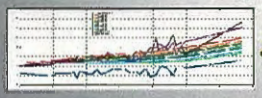
Flood Runoff Image



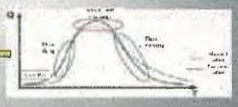
Network in Storage Function Model



Hydraulic Calculation from Discharge



Parameter Calibration of Model



Lecture and Drill, starting from October, 2011

Run-off Analysis Manual 1
[Collection and Arrangement of Rainfaa and Water level Data]

Run-off Analysis Manual 2
[Formulating of Alood Forecast Model and verification]

Hydraulic Analysis Manual

Four (4) manuals shall be prepared as flowchart

Establishing of Flood Warning Standards Manual

Lecture and Drill from October 2011

- Current Survey at Key Channel Section
- Preparation of observation O&M manual
- Hydrological Data Arrangement and Detection of Abnormal Values
- Drill and Data arrangement of Average Rainfall Depth in the sub-Catchment
- Drill of Parameter and Constants for Flood Runoff Model (Storage Function Model)
- Lecture and Drill of Model Verification
- Drill of Hydraulic Calculation applying Non-Uniform Flow
- Rating Curve (H-Q) Estimation through Current Survey
- Lecture on Setting Flood Warning Code (Water Level)
- Preparation O&M Manuals on Simplified Warning Gauge
- Develop a Manual on Warning Transmitting, applying to Evacuation Drill

Technical transfer for WAF

(1) How to transfer hydrological technique

- Lecture was carried out at once a week or twice from mid Oct. to beginning of Dec.
- According to document manual, we were taught hydrological knowing those is a basic way of thinking and a principle and a real calculation method by JICA project team.

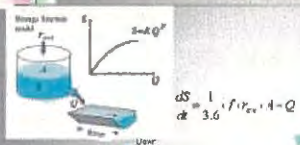
(2) Technical parts menu

- 'Average depth of rainfall over area (Thiessen method)'
- 'Arrangement of HQ curve'
- 'Hydraulic accounting (Steady flow)'
- 'Runofff analysis'
- And else

Manual documents

Lecture scenery

Flood Runoff Model (Storage Function Model)

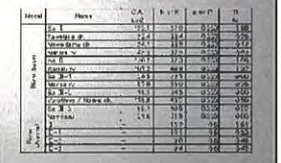


f : Runoff coefficient
K_p : Constants for Storage function method
S: Storage in basin area (m^3)
Q: Direct run - off from basin area (m^3/s)
R_{av} : Average depth of rainfall in basin area
A: Basin areas(km^2)

$$\frac{dS}{dt} = \frac{1}{3.6} \cdot f \cdot r_{av} \cdot A - Q$$

Constants of Catchment & River Channel

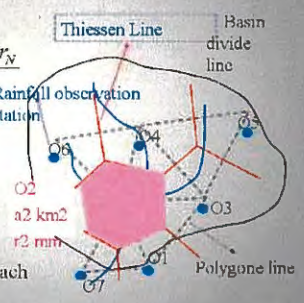
Sub Catchment Division



Average depth of rainfall over area Calculation (3)-Thiessen Method

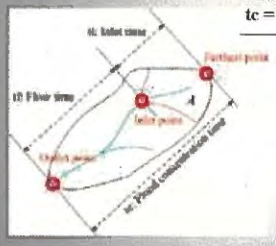
$$r = \frac{a_1 r_1 + a_2 r_2 + \ldots + a_N r_N}{A}$$

r: Average rainfall(mm)
A: All Basin areas(km^2)
N : Number of rainfall observation points
a_i : Polygonal area(km^2)
r_i : Amount of rainfall in each observation point(mm)



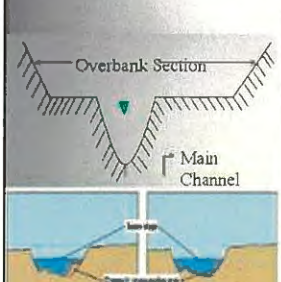
Flood concentration time

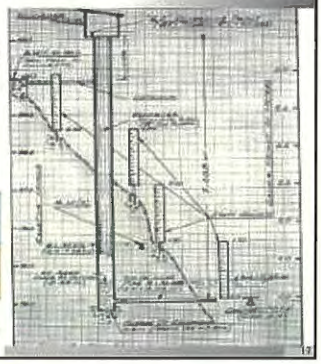
Flood concentration time (tc)
tc = ti + tf



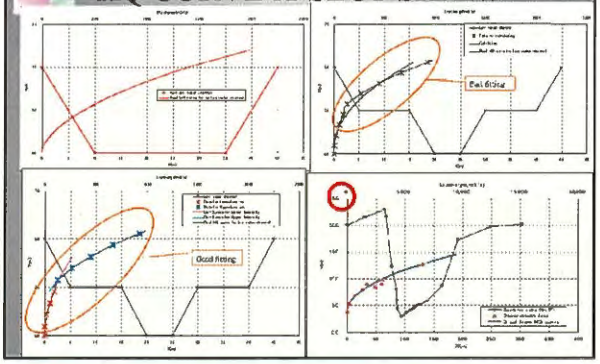
ti =inlet time
tf = flow time = L / V
time it takes for flow from the remotest point to the inlet point or farthest
point of river channel
time it takes from the inlet point or farthest point of the river channel to the
outlet point or point under consideration
L: Length of river channel from its outlet
point to its farthest point (m)
V: flow velocity (m/s)

Catchment Calibration Apparatus



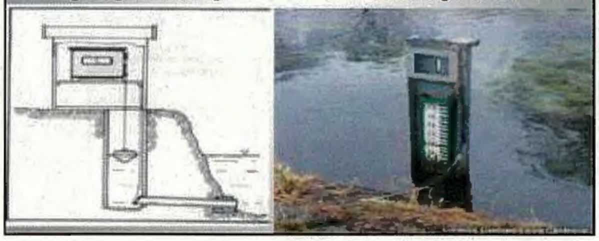


HQ CURVE X-SECT SHAPE



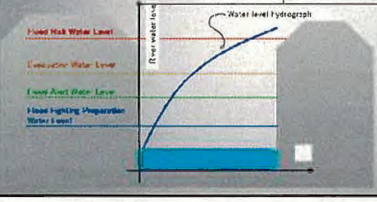
Flood Risk Water Level

- Due to Law in Japan, installation of some 4 kinds of river water level for prevention of flood disasters, occurrence of every water level means measure of beginning flood fighting works, degree of risk for flood damage, as bellow.



Flood Risk Water Level

Water level name	Measure or Action
Flood Risk Water Level	Water level that might have a possibility for being considerable housing inundation.
Evacuation Water Level	Water Level that governor or province/municipality/village issues evacuation.
Flood Alert Water Level	Water Level that governor or province/municipality/village informs attention for flooding to the resident. And flood fighting corps is to be mobilized
Flood Fighting Preparation Water Level	Water Level that flood fighting corps is to stand ready



20

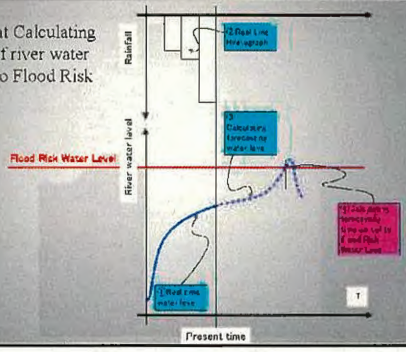
Case of Ba river

- Flood Risk Water Level is having **situation of not securing to safely flow flood by river channel**, minimum water level of inundation by another means. When river water level make as same as Flood Risk Water Level and people start to evacuate on this time, not securing to safely evacuation on a defense of disaster of flood.

21

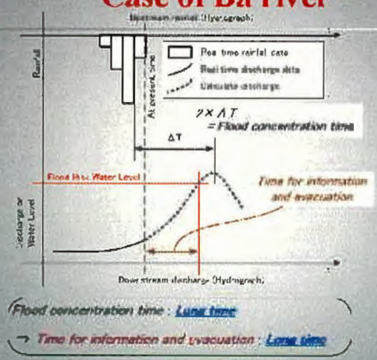
Case of Ba river

This case is that Calculating forecast time of river water level arriving to Flood Risk Water Level.

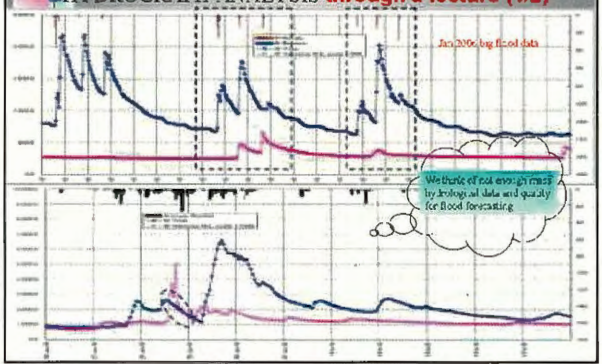


22

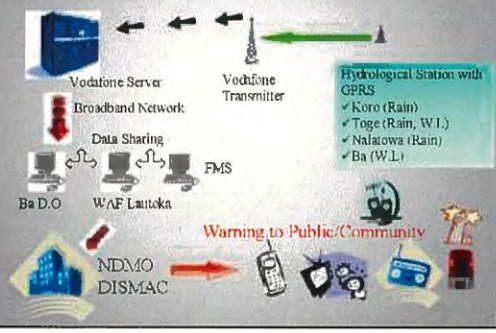
Case of Ba river



DATA QUALITY PROBLEM DETECTABLE BY HYDROGRAPH ANALYSIS through a lecture (1/2)



General Configuration of Ba Hydrological Network System



Ba Hydrological Network with New Equipment

- Rain Gauge Station
  - Toge
  - Koro
  - Nalatowa
- Water Level Gauging Station
  - Toge
  - (Navala)

Location of Hydrological Station

Result of GPRS test at Navala

1. Downstream from Navala Village we could not receive any Vodafone wave signal.
2. Downstream near Toge, receive some wave signal, but are unstable.
3. When we move to higher places but away from the river we received good wave signals.

BROADBAND CONNECTION

- A need for a new broadband line for the Ba Project Server to be installed at the WAF office in Lautoka.
- Have installed a server for the Nadi Flood Early Warning System at the WAF Operation Room.
- The two servers should collect data from the project stations in Ba and Nadi and one should work as a backup for the other server.

Preparation Work

Preparation work was smoothly done with the support of Hydrology staffs

Frame Work for Base Concrete Placing

Adjustment of Frame with Solar Panel

New Equipment Installation

Nalatowa station are identified through GPRS Frequency Test by WAF

Nalotawa Raingauge Station

WAF Staff, at Koro Raingauge Station

New Equipment Installation at Toge

Toge station is a base station for flood forecasting calculation

Assembling by WAF Staff

- Data logger, Flash Net, Battery in the box

Completed Toge Station with Rain gauge, W.L Gauging

Simplified Warning Gauge for Community

- Promote greater awareness for communities prior to flooding
- Complementary warnings from government agencies
- Teaching the principles of hydrological monitoring to young engineers

More detailed information and trial assembling coming tomorrow

Reducing Vulnerability in Community

- As we are all aware of that river flooding in Fiji is a frequent risk due to high rainfall, small river catchments on low lying coastal areas. With the frequent floods occurring in Fiji, the installation of the early warning system will help reduce the flood damages to towns and rural areas.
- Machines that are installed along the Ba River will be transmitting data into a server installed at Ba NDMO's office. During flood periods the river levels will be closely monitored by the NDMO officers and the levels will be sent to all the residents in Ba through text messages or by radio for early evacuation.
- For the critical levels along the Ba River, it will differ according to the geographical structures where people live.
- The JICA Engineers have installed three critical level machines at **Nasolo, Votua** and **Nawaqarua** Village, that triggers a warning siren for early evacuation.

Installation of Simplified gauges in Nasolo (Water Level Gauge)

Installation of Simplified gauges in Nasolo (Rainfall Gauge)

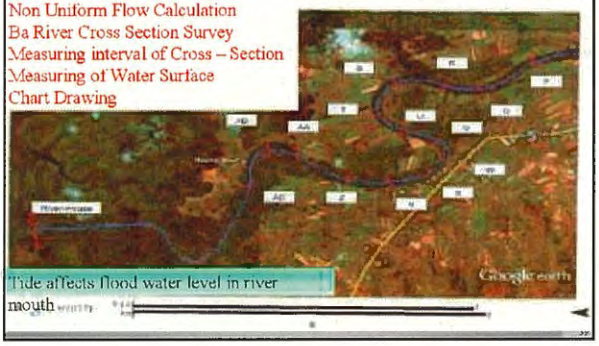
Installation of Simplified gauges in Nawaqarua (Water Level Gauge)

Installation of Simplified gauges in Nawaqarua (Rainfall Gauge)

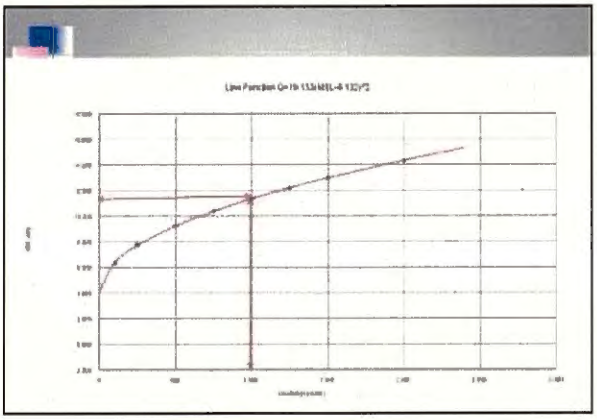
Installation of Electric Siren in Nawaqarua (at Community Leader's house)

PRACTICAL APPROACH -2012

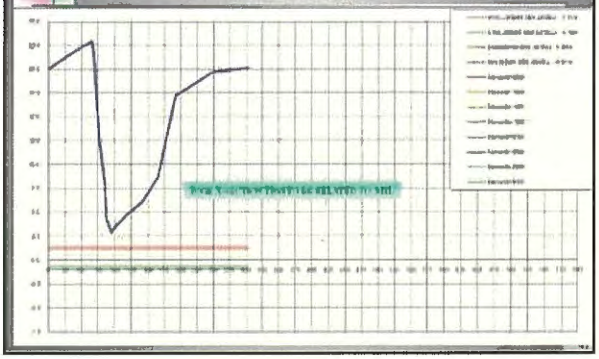
Non Uniform Flow Calculation
Ba River Cross Section Survey
Measuring interval of Cross – Section
Measuring of Water Surface
Chart Drawing



Tide affects flood water level in river mouth



Some point noticed through a lecture (2/2)

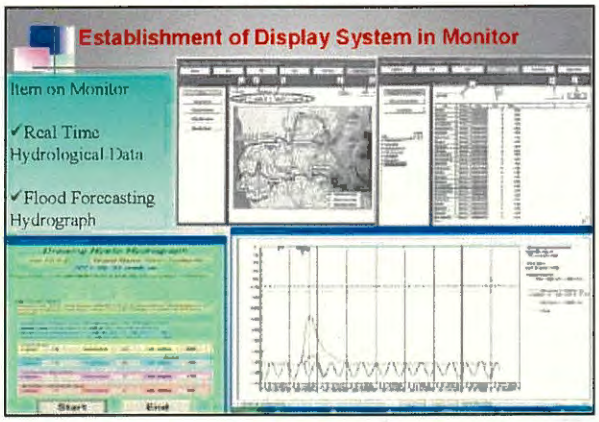


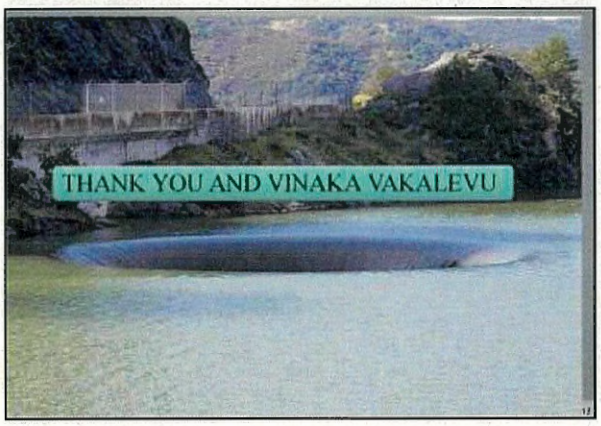
Establishment of Display System in Monitor

Item on Monitor

✓Real Time Hydrological Data

✓Flood Forecasting Hydrograph




THANK YOU AND VINAKA VAKALEVU