

Country Name	the Project for Improvement of Equipment for Disaster Risk Management
Republic of Fiji	

**I. Project Outline**

Background	<p>The Fiji Meteorological Service (FMS), which oversees meteorological-related operations in Fiji, was designated as the Regional Meteorological Center for Tropical Cyclone Programme (RSMC for TCP) by the World Meteorological Organization (WMO) in 1995. It had played a vital role in forecasting cyclones not only in Fiji but also in the southwestern Pacific region issuing warning, as well as performing weather forecasting in the Pacific region. It also played a central role in developing human resources in the weather area of the Pacific region.</p> <p>The FMS observation network was not sufficiently developed, and there were rooms for improvement in terms of disaster risk management such as high accuracy forecasting for tide levels and cyclones, information analysis, and information Transmission systems.</p>			
Objectives of the Project	To observe abnormal tide levels such as storm surges due to cyclone, heavy rains, lightning strikes and collect observation data to FMS in near real time by installing meteorological and oceanographic observation and communication equipment, thereby contributing to development and strengthening of a system for observing factors of disasters in the country.			
Contents of the Project	<ol style="list-style-type: none"> <li>1. Project Site: whole nation</li> <li>2. Japanese side: Installation of: Tide Observation System (1 set), VSAT (Very Small Aperture Terminal) Satellite Communication System (5 sets), Wind Profiler System (1 set), Automatic Weather Station (AWS) (1 set), Calibration Equipment (1 set), Lightning Detection System (4 sets)</li> <li>3. Fiji side: Removal of existing equipment and logistics</li> </ol>			
Project Period	E/N Date	April 20, 2012	Completion Date	February 27, 2015
	G/A Date	April 20, 2012		(Completion of installation)
Project Cost	E/N Grant Limit / G/A Grant Limit: 300million yen, Actual Grant Amount: 300 million Yen			
Executing Agency	Fiji Meteorological Service (FMS)			
Contracted Agencies	Main Contractor(s): NBK CORPORATION Main Consultant(s): Yachiyo Engineering Co., Ltd Agent: Japan International Cooperation System (JICS)			

**II. Result of the Evaluation**

<Special Perspectives Considered in the Ex-Post Evaluation>

“Effectiveness/Impact” is judged based on the target year (2018), while “Sustainability” is judged as at the time of ex-post evaluation (2021).

1 Relevance
<p>&lt;Consistency with the Development Policy of Fiji at the Time of Ex-Ante Evaluation&gt;</p> <p>The project was consistent with the development policy of Fiji. Based on the “National Disaster Management Plan” prepared in 2006, FMS drafted a business plan (Fiji Meteorological Service Business Plan 2012 January-December), updated weather observation equipment, and made observation data online. It aimed to establish a system that enables more accurate and more prompt observation through automatic creation of meteorological maps.</p> <p>&lt;Consistency with the Development Needs of Fiji at the Time of Ex-Ante Evaluation&gt;</p> <p>The project was consistent with the development needs of Fiji for disaster management. As stated above (“Background”), the FMS observation network was not sufficiently developed, and there were many issues to be improved for disaster control systems such as high accuracy forecasting for tide levels and cyclones, information analysis, and information transmission systems.</p> <p>&lt;Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation&gt;</p> <p>The project was consistent with Japan’s ODA Policy. Climate Change and Environment including disaster risk reduction is one of the priority areas of assistance to Fiji<sup>1</sup>.</p> <p>&lt;Appropriateness of project design/approach&gt;</p> <p>Some equipment were damaged and repairs were not undertaken. More attention should have been given to the selection of equipment (to procure equipment for which spare parts are available in Fiji) and also more technical support is required for FMS to be able to effectively repair and maintain the equipment. Nonetheless, project design/approach/measures are mostly appropriate to address development issues, as most of the equipment was functional at the target year of the ex-post evaluation as of 2018 and is being effectively used in daily observation and operations of the FMS.</p> <p>&lt;Evaluation Result&gt;</p> <p>In light of the above, the relevance of the project is high.</p>
2 Effectiveness/Impact
<p>&lt;Effectiveness&gt;</p> <p>The project partially achieved the objective of “to observe abnormal tide levels and collect observation data to FMS in near real time”.</p> <p>As for the tide observation interval (Indicator 1), the gauge procured under the project in Vatia, Viti Levu transmitted data at 10 minute intervals. During Tropical Cyclone (TC) Winston (February 2016), the system was very robust and continued its services hence there was no damage to the system where the eye of the cyclone crossed.</p>

<sup>1</sup> ODA Country Databook 2012

All sets of VSATS were good and operational condition as of 2018. With VSAT introduced under the project, communication with the remote islands became more reliable and the network has increased as expected (Indicator 2).

After the introduction of the wind profiler system, the wind data has been displayed for forecasters daily use to provide real time data. (Indicator 3). The wind profiler was first of its kind installed in Fiji. The innovative technology helped to improve quality of forecasting especially for the wind profiler that was installed at the Nadi International Airport and this was evaluated as a great asset to the forecasters to provide critical aviation related products to the busiest international airport in Fiji. The equipment is in a good working condition and is well maintained by FMS.

Under this Project one AWS was provided and this was the only AWS in Fiji. With the installation of the AWS, the data is well received on hourly basis at FMS for daily use and observations have been available from the Weather Station automatically as expected (Indicator 4). FMS with the assistance of UNDP has installed 3 more additional AWS.

All sets of the lightning detection system are functional and observation data can be transmitted to FMS HQ properly. (Indicator 5).

Overall, it has been noted that accuracy of information provided has improved and the real time observation and automatic data collection become possible under this project and the expected quantitative effects were achieved at the time of ex-post evaluation. The equipment provided by this project met FMS's standard in verifying data against other observation data. This verification process ensures provision for quality data.

In terms of availability of spare parts, FMS does not have any spare parts and neither these spare parts are available locally in the market therefore it is difficult for FMS to replace or to repair the equipment. The officials that were trained under the project have moved to the headquarters of Ministry of Infrastructure and Meteorological Services while the other staff has migrated. Hence staff from other Divisions were posted to fill in the positions who had little knowledge on the maintenance of the equipment. The Staff had on-site training provided by the Consultants who installed the equipment however there was no in-depth training provided. FMS's technical staff through the hands-on training have been trying to rectify issues faced with the equipment and try to carry out minor repairs.

<Impact>

It was expected that anomalous tide level and meteorological information are conveyed to citizens promptly and accurately after the completion of the project. As a result of this project, the daily marine forecast for Fiji and the South West Pacific is issued to the public, while the Marine Weather Bulletin covers the whole South West Pacific area. Weather Bulletin is issued twice daily. Therefore, during the cyclone season and adverse weather conditions, the public has been adequately for-warned. Timely marine weather bulletin is issued for mariners to ensure that they refrain from going out to sea for fishing or sailing. In addition, the timely bulletins has also increased air-safety as vessels and aircrafts operations have been issued with timely warnings from FMS specially for sever weather and thunder storms.

In terms of other project impacts, vacant sites were selected for installation of all the equipment under the project and no resettlement was required accordingly. As for the site for tide observation system at Vatia in Viti Levu, a memorandum of understanding with a private company was signed for the use of site. No negative impact on natural environment was observed.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

#### Quantitative Effects

	Baseline (2012) Baseline Year	Target (2018) 3 Years after Completion	2015 Year of Completion	2018 3 Year after Completion (Ex-post evaluation)
Indicator 1-1 Tide Observation and interval time	60 minutes	30 minutes	10 minutes	10 minutes
Indicator 1-2 Number of tide observation stations	2 sites	3 sites	1 <sup>2</sup>	3
Indicator 2 Locations within satellite telecommunication network	0 (Currently communication through telephone/radio)	5	5	5
Indicator 3-1 Wind Profiler System	Radiosonde: 1	Wind Profile System :1 Radiosonde: 1	Wind Profile System :1 Radiosonde: 1	Wind Profile System :1 Radiosonde: 1
Indicator 3-2 Frequency of wind profile	2 times per day	1 time per 10 minutes	Real time data	Real time data
Indicator 4 AWS in capital area	0	1	1	1
Indicator 5: Lightning Detection System	Just only within 56 km radius from Nadi international airport	Approximately whole areas of Viti Levu and Vanua Levu islands	Approximately whole areas of Viti Levu and Vanua Levu islands are covered	Approximatel y whole areas of Viti Levu and Vanua Levu islands are covered

<sup>2</sup> The Tide gauge installed by FMS before 2012 were broken before 2015 and Secretariat of the Pacific Community (SPC) installed 2 more tide gauge in Suva and Lautoka

Source : FMS

### 3 Efficiency

Although the project cost was as planned (the ratio against the plan: 100%), the project period slightly exceeded the plan (109%). Therefore, the efficiency of the project is fair.

### 4 Sustainability

#### < Institutional/Organizational Aspect>

FMS, as the country's only meteorological organization, has performed tasks such as observation, forecasting, and warning on weather, therefore, it is responsible for the operation and maintenance (O&M) of the equipment installed under the project. FMS have six (6) divisions namely, "Corporate", "Hydrology", "Climatology", "Forecasting", "Computing Information System" and "Reporting, Network and Facilities". The Reporting Network and Facilities Division is responsible for the operation and maintenance of all the FMS equipment including the equipment that was provided under this Project.

The number of staff at FMS is 125 as of February 2020. According to FMS, it has sufficient number of staff to carry out work as required by FMS network including operation and maintenance of equipment.

However, some observations were made on the equipment which is not in operational now, especially due to the damage from massive Tropical Cyclone in 2019. In April 2020 during TC Harold with the maximum Category 5 did some damages to the equipment. The tide observation sustained damages during this Cyclone thus it became nonfunctional. The other equipment that was damaged was the tidal gauge wind profiler (air cooling system), 1 lighting detector and 1 lighting sensor and server for disaster recovery site. FMS has been liaising with Japan Meteorological Agency (JMA) to assist with the repairs of these equipment therefore it could continue with the services it provides.

#### <Technical Aspect>

The staff of FMS were provided basic training on the maintenance and operation before handing over of the equipment. Moreover, additional training including calibration of equipment were provided by the technical cooperation project which was implemented following to this project. In addition to this, manuals were made available with the equipment and these have been well kept. Occasionally these are utilized by FMS's technical staff in order to rectify issues faced with the equipment and try to carry out minor repairs.

However, the trainings provided only focused basic skills and technical officers understood the basic frontline maintenance. Therefore, FMS technicians do not have much knowledge on which parts of the equipment needs replacement or repairs. And in results, the equipment has been repaired for a long period of time. Thus additional training has been requested to JICA especially on tide gauge, wind profiler and lighting detector and at the same time, Technicians try to improve their skills on their own.

In terms of the internal training for new staff, most of the technicians have learned through on job training and FMS has not had structured internal training program for any other activity apart from observer training conducted by FMS trainers.

#### <Financial Aspect>

In recent years, FMS receives an annual budget of 60,000 Fijian dollars (FJD) for maintenance of all meteorological equipment. The budget had been utilized in buying spare parts of priority and critical equipment such as AWS (Airports/Airstrips/WIGOS Stations). This budget is not sufficient in carrying out repairs for the equipment provided in this project as the replacement cost of equipment is relatively high and spare parts needs to be procured from Japan to replace or repair the equipment. In the preparatory study of the project, it is proposed that the maintenance plan of the equipment that incorporates not only the maintenance cost for new and existing equipment but also the cost of periodic equipment upgrading by increasing government subsidy, however, it is not easy to increase government budget.

Based on the Ministry of Infrastructure, Transport, Disaster Management and Meteorological Services Strategic Plan 2019-2022, the Operation Budget of FMS for 2020-2021 is FJD8.46M and for 2021-2022, the estimated Operation Budget will be FJD8.46M. Out of it, the estimated Capital project budget for 2020-2021 will be FJD6.8M. With the project budget, FMS is trying to allocate budget to carry out replacement and repairs of the equipment provided in the project. Due to COVID-19 pandemic in Fiji, all the Government Ministries and Departments budget were reduced as this budget was directed towards the pandemic. In addition to that, FMS and JICA has started to discuss on the JICA's follow up program for repairing the equipment as well as the additional trainings.

#### <Current Status of Operation and Maintenance>

FMS has been maintaining and operating equipment by their own. AWS inspection and maintenance has been carried out based on the plan by FMS. However at the time of ex-post evaluation, FMS has not been able to purchase spare parts for equipment which is not operational.

Regarding VSAT, 1 set was installed in Matuku Island that was damaged by storm surge event during TC Sarai in Dec 2019 and no repairs were carried out by FMS as of 2021 due to budget issues faced by COVID -19 pandemic and network not working efficiently. FMS had replaced VSATs with local mobile network in 2020 and 2021. FMS is currently discussing with Vodafone regarding the replacement of VSAT that is currently not working. An agreement between FMS and Vodafone will be concluded for the maintenance and service fee which will be borne by FMS.

One set of lightning detection system which has been installed in Nadi has been working well. The others installed in Lautoka, Ba, Labasa are facing some operational issues with data logger and data transmission due to the communication network changes after 2019. FMS technicians were not able to carry out maintenance and rectify the issues.

No planned maintenance has been scheduled for the tidal gauge nor the wind profiler. The equipment under the project was procured from Japan therefore no dealers in Fiji are selling spare parts of the equipment provided under the project. Technical skills and knowledge which is required for the repairs of such system configuration for AWS, Lighting Detector, Wind Profiler and Tide Gauge is not available as the FMS staff trained under the project are no longer employed. Therefore the newly assigned staff needs to be trained to be able to identify parts required and the repair works which needs to be undertaken.

#### <Evaluation Result>

Some serious problems have been observed in terms of the technical and financial aspect. Therefore, sustainability of the project effects is low.

### 5 Summary of the Evaluation

The project achieved its target at the timing of ex-post evaluation (2018, three years after the completion of the project). However, due to

the impact of severe Tropical Cyclone which hit Fiji in 2019, some equipment was damaged. Therefore, the project partially achieved the objective “to observe abnormal tide levels and collect observation data by FMS in near real time”. In addition, the tide observation interval has been shortened as communication become more reliable with the increased network thus the wind data is displayed at real time and the data from AWS is released now on hourly basis.

One out of four lighting detectors procured under the project is operational while 3 is not operational due to VSAT network upgrade at the sites. FMS was also not successful in changing the configurations of these VSAT’s as a result data transmission had stopped.

As the impact of the project, anomalous tide level and meteorological information have been conveyed to citizens promptly and accurately. As for the sustainability, some problems have been observed in terms of the institutional/organizational, technical, and financial aspect. Considering all of the above points, this project is evaluated to be partially satisfactory.

### III. Recommendations & Lessons Learned

#### Recommendations to Executing Agency:

- FMS needs to secure sufficient budget for operation and maintenance of equipment as proposed at the time of project planning. The request for budget for necessary cost for maintenance needs to be submitted by FMS to the government at the time of budget preparation. Some of the equipment became non-operational from 2019 and 2020 and FMS could not secure any budget to carry out any repairs or replacement of the equipment.
- The officials that were trained on the maintenance and operation of these equipment are no longer employed with FMS and very little handing over or training was provided to other technicians who have taken over. It is requested that FMS to take more responsibility of these equipment provided for sustainability by utilizing the manuals provided as well as conducting internal training.
- FMS only requested JICA to support in maintenance of equipment when this evaluation was carried out. The issues could have been identified earlier and measures undertaken as soon as the equipment related issues were identified.
- The equipment at FMS is critical in ensuring effective weather forecasting and needs capacity in strengthening and managing of all the equipment and make recommendations to Senior Management for repairs or replacement as required. FMS should also make arrangements in securing sufficient budget for any repairs or replacement of the equipment.

#### Lessons Learned for JICA:

##### 1. Selection of equipment based on the conditions in each country:-

Some equipment provided in this project was very unique, therefore, FMS had difficulty to procure spare parts in Fiji. For the selection of equipment, it is important to study and analyze the technical and financial capacities of the executing agency, as well as the domestic market for equipment and its parts and to consider appropriate specifications during the preparatory stage.

##### 2. Enhancement of institution and capacity for operation and maintenance

In order to provide meteorological services in appropriate and effective manner, it is necessary for the executing agencies to properly operate and maintain the installed equipment for a longer period. However, it has been observed that the Government Ministries and Departments do not allocate budget for maintenance of equipment donated by development partners or even bought by the Ministries. In addition, high turnover of staff is very common in the Pacific. Therefore, for a sustainable use and maintenance of the equipment, a feasible O&M and monitoring plan including the training and finance needs to be discussed with the implementing agency at the planning stage of the project. If necessary, concluding an Agreement or Minutes for proper monitoring and maintenance of equipment is effective after the completion of Project. As for the financial plan, it is important to examine and discuss its future budget plans of the executing agency. Lastly, depending on the organizational resource and capacity, it is advisable to consider including adequate training on O&M in the soft component to facilitate the entire agency to acquire the necessary knowledge. (eg: Equipment for which spare parts are not available in the country or that is being introduced for the first time in the country, intensive training through OJT needs to be provided on maintenance that enable trained staff to acquire enough knowledge to conduct TOT.)



Tide Gauge, Vatia Wharf



Digital barometer calibration namely (PTB series) JICA provided Tough Book HP laptop and calibration equipment.