conducted by El Salvador Office: March 2025

Country Name	**Project for Improvement of Equipment for Disaster Risk Management in the Republic of El Salvador**
Republic of El Salvador	

I. Project Outline

Background	Earthquakes frequently occur in the area around the Mesoamerican Trench in Central America, where El Salvador is located. Natural disasters were on the rise, and strengthening the monitoring of earthquakes and the tsunamis that accompany them, as well as warnings and forecasts for residents was an urgent issue. In El Salvador, it was pointed out that there was a lack of existing seismometers and tide gauges. Additionally, there was a lack of systems and communication equipment to transmit observed data, making it necessary to strengthen warnings for residents.					
Objectives of the Project	To improve the earthquake and tsunami disaster prevention capacity and early transmission of warnings in El Salvador by installing earthquake and tsunami observation equipment and early warning system equipment, therefore contributing to the reduction of disaster damages.					
Contents of the Project	1. Project Site: Whole country. 2. Japanese side: (1) Equipment: Strong monitor accelerometer system, broadband station system, GPS station system, tide observation system, tsunami monitoring web camera system, radio communication system, etc., (2) Technical training for technicians of Ministry of Environment and Natural Resources (MARN) and the Central American University "José Simeón Cañas" (UCA): Data collection and analysis, training on the seismograph system, GPS observation system, tide level measurement system. 3. El Salvador side: Tax exemptions, securing a building or room for equipment installation, concrete foundation construction, flooring, power supply work, internet connection, maintenance of radio relay equipment, etc.					
Project Period	E/N Date	May 2, 2012	Completion Date (ex-ante)	July 2014	Completion Date (actual)	April 25, 2017 (Equipment Handover)
	G/A Date	November 27, 2012				
Project Cost	E/N Grant Limit / G/A Grant Limit: 400 million yen, Actual Grant Amount: 400 million yen Additional procurement: 5 million yen					
Executing Agency	Ministry of Environment and Natural Resources (MARN), General Direction of Civil Protection (DGPC)					
Contracted Agencies	Main Contractor(s): Marubeni Protechs Corporation., Comforce Inc. Main Consultant(s): Yachiyo Engineering Co., Ltd. Agent: Japan International Cooperation System					

II. Result of the Evaluation

<Special Perspectives Considered in the Ex-Post Evaluation>

1. Planned cost of the project.

- Additional procurement was carried out using the estimated compensation of JPY 5,738,638 collected from the equipment procurement company for the delay in shipping the equipment for the original contract. In this ex-post evaluation, the planned project cost was considered as 405 million yen.

2. Verification of the qualitative effects.

- One of the indicators for quantitative effects was the accuracy of seismic intensity measurement. However, this could not be verified with countable data, so this indicator was used for verifying qualitative effects.
- In the ex-ante evaluation, expected qualitative effects included the contribution to the early evacuation and damage reduction. However, these are changes to be brought by the accurate tsunami and seismic measurement, and therefore these were verified as impacts.
- Also, raising awareness for disaster preparedness in the community was expected as a qualitative effect. However, this is a synergy effect with the technical cooperation and therefore this was verified as an impact.

1 Relevance/Coherence

[Relevance]

<Consistency with the Development Policy of El Salvador at the Time of Ex-Ante Evaluation>

In 2005, the "Civil Defense and Disaster Mitigation Decree" was enacted, which defined the national disaster management system, clarified relevant institutions, and stipulated warning systems in the event of a disaster. In addition, the government's "Five-Year Development Plan" (2010-2014) included the concept of disaster prevention and mitigation as one of the main issues. Thus, the project was consistent with the development policy of El Salvador at the time of ex-ante evaluation.

<Consistency with the Development Needs of El Salvador at the Time of Ex-Ante Evaluation >

As mentioned in the background, El Salvador was exposed to the risks of earthquakes and tsunamis, but it did not have a sufficient system or equipment for observation and warning of these risks. Thus, the project was consistent with the development needs of El Salvador at the time of ex-ante evaluation.

<Appropriateness of Project Design/Approach>

The sites for installing the monitoring of earthquakes and tsunamis were selected strategically to cover most of the territory so that the population including the vulnerable groups would be equally benefited. Sustainability is judged as moderately low because equipment maintenance has financially depended on support from donors, which, however, has no relation with the project design/approach. Therefore, it is judged that the project design/approach was appropriate.

<Evaluation Result>

In light of the above, the relevance of the project is ③[1].

[1] ④：very high, ③：high, ②：moderately low, ①：low

[Coherence]

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

In the "Country Assistance Policy for Republic of El Salvador" (2012), one of the priority areas was disaster prevention and environment conservation for sustainable development. The project was consistent with the Japan's ODA policy to El Salvador at the time of ex-ante evaluation.

<Collaboration/Coordination with JICA's Other Interventions>

The collaboration/coordination between the project and the "Project on Capacity Development for Disaster Risk Management in Central America, Phase 2" (2015-2020) of JICA was planned at the time of ex-ante evaluation and was implemented, the positive effects expected were confirmed at the time of ex-post evaluation. In the areas where the radio system was installed by this project, disaster awareness-raising activities were promoted.

<Cooperation with Other Institutions/ Coordination with International Framework>

No cooperation/coordination with other donors was clearly planned at the time of ex-ante evaluation or implemented during the project period.

<Evaluation Result>

In light of the above, the coherence of the project is ③.

[Evaluation Result of Relevance/Coherence]

In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Effectiveness>

The project objectives were achieved as planned. Most of the procured equipment has been utilized, and the tsunami height observation unit became observable in 1 cm increments after the time of project completion (Indicator 1). Also, the tsunami observation and interval time was reduced to approximately 30 minutes as planned (Indicator 2). This time of 30 minutes was an average of the various seismic sources along the subduction off Salvadoran coasts, depending on the location of the epicenter and the coast where the equipment is located. With the equipment for detecting the arrival of tsunami, it became possible to ratify the estimated time of arrival that the tsunami would arrive off the coasts, traveling over the bathymetry. Until the time of ex-post evaluation, the observation level of the tsunami height observation unit and the tsunami observation and interval time have been sustained.

Regarding the qualitative effects of the project, first, the accuracy of the seismic intensity measurement has been improved. According to MARN, the preparation of instrumental intensity maps has been improved, as well as the detection of ground accelerations even for small and moderate magnitude earthquakes, although only large magnitude earthquakes could be detected before the project. Second, after receiving the training during the project period, MARN technicians acquired skills to i) extract effective disaster information on earthquakes and tsunami from the observed data; ii) edit and store the observed data; and iii) analyze the observed data for disaster information on earthquakes and tsunami. These skills have been sustained, as follows; i) MARN has provided disaster information on earthquakes and tsunami to the general population and DGPC to articulate risk prevention and mitigation mechanisms, ii) kept a historical record of the collected information, and iii) issued information on natural events immediately through different media.

<Impact>

The following impacts were confirmed in the ex-post evaluation. First, due to the improved capacity to measure earthquakes and tsunamis and analyze the observed data, the seismic information delivery time to the population has been reduced from 10-20 minutes to 5-10 minutes, according to MARN. With the use of mass media including social networks, the information is spread to the population. Second, the accurate information in less time has made the population aware of the seismic phenomenon, which would lead to risk reduction, according to MARN. Earthquake and tsunami evacuation drills organized by DGPC have also contributed to the risk reduction. Third, MARN's seismic and tsunami data and information have been shared with other observatories in the Central American region. For example, the data and information were utilized by JICA's "Project for Strengthening of Capacity of the Central American Tsunami Advisory Center" (2016-2019) in Nicaragua. Also, MARN's data and information have been used for research purposes by Salvadoran researchers in Japan or the workplace in El Salvador. Fourth, MARN's seismic information has been provided for the design of major national projects, such as the construction of hospitals, roads, ports, and airports as part of the risk reduction measures, following the approach established in the SENDAI Framework for Disaster Risk Reduction.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ③.

Quantitative Effects

Indicators	Baseline 2012 Baseline Year	Target 2020 3 years after completion	Actual 2017 completion year	Actual 2018 1 year after completion	Actual 2019 2 years after completion	Actual 2020 3 years after completion	Source
1. Tsunami height observation unit	Observable in 10 cm increments	Observable in 1 cm increments	Observable in 1 cm increments	Observable in 1 cm increments	Observable in 1 cm increments	Observable in 1 cm increments	MARN.
2. Tsunami observation and interval time	Approx. 60 minutes	Approx. 30 minutes	Approx. 30 minutes	Approx. 30 minutes	Approx. 30 minutes	Approx. 30 minutes	MARN.

Note: In the ex-ante evaluation, the target year was set as 2017, 3 years after the project completion. However, the project was completed in 2017, and therefore the target year was reset to 2020 for the ex-post evaluation.

3 Efficiency

Although the project cost was as planned (the ratio against the plan: 100%), the project period considerably exceeded the plan (the ratio against the plan: 165%). The excess of the project period was caused mainly by the delay in the installation of the equipment for DGPC. This was delayed because the necessary permits were not in place for the installation at the private properties. Another reason

was that it took time to clarify which local authority would be responsible for the equipment.

	Project Cost (Japanese side only, yen)	Project Period (months)
Plan (ex-ante)	405 million yen	23 months
Actual	405 million yen	38 months
Ratio (%)	100%	165%

Outputs were produced as planned.

In the light above, the efficiency of the project is ②.

4 Sustainability

<Institutional/Organizational Aspect>

The organizational structure for disaster risk management has been sustained; MARN is responsible for promptly reporting disaster information on earthquakes and tsunami to the National Commission for Civil Protection, which is the highest national authority related to disaster risk management, with seismic information. MARN reports disaster information on earthquakes and tsunami to DGPC. DGPC provides disaster prevention and mitigation services to the public and implements effective responses to disasters. However, in both organizations, the number of staff members for proper operation and maintenance (O&M) of the procured equipment has not been sufficient, due to the budget shortage.

<Technical Aspect>

Staff members of both MARN and DGPC have sustained the necessary skills and knowledge for O&M of the procured equipment, as they have continued the tasks such as i) extracting effective disaster information on earthquakes and tsunami from the observed data; ii) editing and storing the observed data; and iii) analyzing the observed data for disaster information on earthquakes and tsunami, as explained above. On the other hand, a small concern is that training opportunities are not enough to update the current members' skills and train new members, because they have depended on limited opportunities in international cooperation projects.

<Financial Aspect>

Both MARN and DGPC answered that they have secured some funds for O&M which would continue to be maintained in the future. However, the funds have not been sufficient for equipment repair and renewal or transportation to the sites, which have depended on international partners.

<Environmental and Social Aspect>

No issue on environmental and social aspects has been observed, and it has not been necessary to take any countermeasures.

<Current Status of Operation and Maintenance>

Most of the procured equipment safeguarded by MARN has been in good conditions, except for sensors of the strong motion accelerometer systems, some devices of the GPS station systems, and the tsunami monitoring web camera systems, which were damaged due to lightning strikes and other reasons and remained unrepaired due to financial constraints, and they have not been changed by MARN, but they have been still working. Some radio communication radios have not been delivered yet and safeguarded by DGPC, because it has not been determined which department or office will be responsible for them due to restructuring of local governments. Although, as regular maintenance activities, daily inspection of the meters and fault indication, connecting part of the equipment, etc. were expected at both institutions, they have conducted the maintenance activities to the financially possible extent. Spare parts are generally not available in the country. In addition, the equipment is very specialized, and repair is not the best option. Only radio components can be repaired locally. Consumables such as batteries have been purchased and replaced according to the needs of each station.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the institutional/organizational, technical, and financial aspects and the current status of operation and maintenance. Therefore, the sustainability of the project effects is ②.

5 Summary of the Evaluation

The project achieved the project objectives as planned. The earthquake and tsunami disaster prevention capacity and early transmission of warnings were improved, as the tsunami height observation became more accurate and quicker. Regarding the project efficiency, the project period considerably exceeded the plan. As for sustainability, although both MARN and DGPC have faced budget shortages for assigning staff members and conducting equipment O&M, both institutions have sustained skills and knowledge for equipment O&M.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Non-score Items

Adaption and Contribution:

- JICA El Salvador Office coordinated the participation of not only MARN and DGPC, but also other relevant institutions including the Ministry of Public Works and Transportation, the Ministry of Education, the San Salvador Metropolitan Area Planning Office, the University of El Salvador and municipalities in various JICA training course related to disaster risk prevention such as earthquakes and tsunamis in Japan or third countries for their continuous capacity building.

IV. Recommendations & Lessons Learned

Recommendations to Executing Agency:

- It is recommended that each of MARN and DGPC should develop a maintenance plan including regular inspection and equipment renewal according to the available resources for the proper functioning of the equipment and review the plan's implementation at least twice a year.
- It is recommended that both MARN and DGPC should assign staff members to ensure proper O&M tasks through the replacement of retired staff or staff in other departments, while it is difficult to employ new staff. It is necessary that MARN and DGPC design and carry out a plan for training and replacement of personnel responsible for O&M of the equipment.
- Recipient municipalities should designate a department or office to store the radio equipment that the DGPC still has in storage and

notify which will be responsible. Municipalities where antennas have been installed should consult with DGPC and consider other institutions such as community organizations, if they cannot maintain the equipment. It is important that the equipment is used for its intended purpose and does not remain in storage.

Lessons Learned for JICA:

- Seven years after the project completion, it was found that the communication equipment installed in the coastal area had deteriorated due to the high amount of salt in the air. The environmental conditions in the ocean were not taken into consideration when selecting the equipment. When planning the equipment in coastal areas, these conditions should be carefully investigated in the project formulation phase, and measures should be taken to purchase equipment that can withstand these conditions and include the application of anticorrosive for the equipment. In addition, appropriate maintenance plans for these conditions should be developed in the project.
- Some radio communication radios have not been delivered yet and safeguarded by DGPC, because it has not been determined who would be responsible for them due to changes in territorial configurations under the current administration. This had not been foreseen at the planning stage. It is important to examine the possibility of restructuring of local governments at the planning stage, and if there is even the slightest possibility, it is necessary to agree with the implementing agency about responses to changes in the responsible agency for the equipment installation, operation and maintenance.

DGPC staff testing the radio equipment procured by the project during field visits in the ex-post evaluation.

MARN engineering and maintenance unit team inspecting the equipment procured by the project during field visits in the ex-post evaluation.